



United States  
Department of  
Agriculture

Forest Service



United States  
Department of  
the Interior

Bureau of Land  
Management



February 1994

# Final Supplemental Environmental Impact Statement

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

## Volume II - Appendices



# Abbreviations and Acronyms

ACEC	Area of Critical Environmental Concern
ASQ	Allowable Sale Quantity
AQRV	Air Quality Related Values
BLM	Bureau of Land Management (USDI)
BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CMAI	Current Mean Annual increment
dbh	diameter at breast height
DCA	Designated Conservation Area
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
FEMAT	Forest Ecosystem Management Assessment Team
FLPMA	Federal Land Policy and Management Act
FSH	Forest Service Handbook
FSM	Forest Service Manual
FWS	U.S. Fish and Wildlife Service (USDI)
GIS	Geographic Information System
ISC	Interagency Scientific Committee
LS/OG	Late-Successional and Old-Growth Forest
MFP	Management Framework Plan
MMBF	Million Board Feet
MUSYA	Multiple-Use Sustained-Yield Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NFMA	National Forest Management Act of 1976
NMFS	National Marine Fisheries Service (U.S. Dept. of Commerce)
O&C	Oregon and California Railroad Company revested lands (see Glossary)
PM10	Particulate Matter (10 microns in diameter)
PSD	Prevention of Significant Deterioration
PSQ	Probable Sale Quantity
RMP	Resource Management Plan
RPA	Forest and Rangeland Renewable Resources Planning Act
RNA	Research Natural Area
ROD	Record of Decision
SAT	Scientific Analysis Team
SEIS	Supplemental Environmental Impact Statement
SIP	State Implementation Plan
TAMM	Timber Assessment Market Model
USDA	United States Department of Agriculture
USDI	United States Department of the Interior

In this Supplemental Environmental Impact Statement, any reference to "owl" or "spotted owl" refers to the northern spotted owl (*Strix occidentalis caurina*) unless specifically identified as another species or subspecies. Any reference to "the Assessment Team" refers specifically to the Forest Ecosystem Management Assessment Team.



# Appendices

## Changes Between the Draft and Final SEIS

The following changes were made to the appendices between the Draft and Final SEIS. Minor corrections, explanations and edits are not included in this list.

- Appendix B2, Principles for Management, was retitled Ecological Principles for Management of Late-successional Forests and was shortened and clarified.
- Appendix B3, Adaptive Management Areas, was revised.
- Implementation guidelines for Adaptive Management Areas were added.
- Proposals for funding of Adaptive Management Areas were deleted.
- The guidance for Late-Successional Reserves within the Finney and Northern Coast Range Adaptive Management Areas was changed. Adaptive Management Area plans in these two areas may modify Late-Successional Reserve designation or management, but must continue to meet the emphasis of these Adaptive Management Areas, which is restoration and maintenance of late-successional forest habitat and riparian or marbled murrelet habitat.
- The maximum age for thinning in the Northern Coast Range Adaptive Management Area was raised to 110 years.
- The provision for a stable timber supply from the Finney Adaptive Management Area was deleted because a substantial portion of that area is devoted to protection of marbled murrelet habitat.
- Within the Olympic Adaptive Management Area, Late-Successional Reserves were expanded to include LS/OG1s and LS/OG2s for protection of marbled murrelet habitat.
- The 5,400-acre Quinalt Special Management Area was removed from Late-Successional Reserve status and added as a portion of the Olympic Adaptive Management Area.
- Appendix B4, Protection Buffers, was clarified to show which buffers apply to which alternatives, and in what ways.
- Appendix B5, Recovery Plan Standards and Guidelines, adapted from the Final Draft Spotted Owl Recovery Plan was expanded to include direction for Managed Pair Areas and Reserved Pair Areas.
- Appendix B6, Aquatic Conservation Strategy, was expanded to provide a context for the Aquatic Conservation Strategy. In addition, Key Watershed status was extended to the Little Sandy River east of Portland, and to two subdrainages of the Eel River in Mendocino County, California. On the Siuslaw National Forest, two Key Watersheds were dropped and three others were added.
- Appendix B7, Late-Successional Reserve Standards and Guidelines, was added to show management direction for Late-Successional Reserves for resources other than silviculture.

- Appendix B8, Fire Management Standards and Guidelines, was added, and clarifies the role of fire and fuels management across all land designations.
- Appendix B9, BLM Spotted Owl Standards and Guidelines, was added to clarify management of northern spotted owl habitat on lands administered by the BLM. The standards and guidelines apply to all alternatives except Alternative 7.
- Appendix B10, Grants Pass Line, was not changed, but appeared as Appendix B7 in the Draft SEIS.
- Appendix B11, Standards and Guidelines Resulting from Additional Species Analysis and Changes to Alternative 9, was added to describe the standards and guidelines added and the land allocation changes made to Alternative 9, to benefit certain species through improved habitat conditions.
- Appendix E, Implementation Structure, was changed. The Report of the Agency Coordination Working Group that appeared in the Draft SEIS is not reprinted in this Final SEIS. A section on the adaptive management process as currently envisioned was added. A copy of the interagency Memorandum of Understanding for Forest Ecosystem Management that establishes the implementation structure to implement the provisions of the selected alternative was added.
- Appendix F, Response to Public Comments was added. It includes summaries of the public comments received on the Draft SEIS and responses to those comments.
- Appendix G, Biological Opinion, was added. It includes the Biological Opinion on the preferred alternative of the Final SEIS and the Biological Assessment on the Draft SEIS.
- Appendix H, Scientific Analysis Team (SAT) Report, was added as an uncirculated appendix.
- Appendix I, Monitoring and Evaluation Plan, was added. This plan will be used in conjunction with the selected alternative to guide the monitoring and evaluation processes.
- Appendix J, Technical Information, was added. It contains *Estimation of Vital Rates of the Northern Spotted Owl*, a report that presents new, spotted owl demographic analysis, as well as additional uncirculated documents and working papers that support the additional species analysis in the Final SEIS.

# Appendix A

## **Forest Ecosystem Management: An Ecological, Economic, and Social Assessment**

**Report of the Forest Ecosystem  
Management Assessment Team**

# Appendix A

## Forest Ecosystem Management: An Ecological, Economic, and Social Assessment

This appendix consists of the report *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*. It was prepared by the Forest Ecosystem Management Assessment Team (FEMAT) and was presented to the Office of Environmental Policy at the White House on July 1, 1993. It is frequently referred to in this SEIS as "the FEMAT Report."

### Organization of the FEMAT Report

The Assessment Team's report *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment* consists of 9 chapters:

- I. Executive Summary
- II. Overview and Summary
- III. Option Development and Description
- IV. Terrestrial Forest Ecosystem Assessment
- V. Aquatic Ecosystem Assessment
- VI. Economic Evaluation of Options
- VII. Social Assessment of Options
- VIII. Implementation and Adaptive Management
- IX. Glossary

The report also contains a list of the scientists and analysts who prepared the report, and a bibliography.

The report is bound separately from the Final SEIS. It was included with copies of the Draft SEIS that were sent to agencies, libraries, and those readers who requested it. It is readily available upon request.

To receive a copy of *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*, send a request in writing to:

FEMAT Report Request  
Interagency SEIS Team  
P. O. Box 3623  
Portland, OR 97208-3623

# Appendix B

## **Additional Information on Standards and Guidelines**

# Appendix B

## Additional Information on Standards and Guidelines

This appendix contains additional information about specific standards and guidelines or processes. The individual alternative descriptions in Chapter 2 indicate when and how these elements apply to each alternative.

- B1. Revised Preferred Alternative for Western Oregon BLM - Description of the Bureau of Land Management's Revised Preferred Alternative (USDI BLM unpub.),** which was developed following receipt of public comments to the August 1992 Draft Resource Management Plans.
- B2. Ecological Principles for Management of Late-Successional Forests -** This section is adapted from the FEMAT Report to provide additional information on the objectives and assumptions regarding management of late-successional forests.
- B3. Adaptive Management Areas -** Describes overall objectives for Adaptive Management Areas and provides specific objectives for each particular area. Adapted from the FEMAT Report.
- B4. Protection Buffers -** Additional standards and guidelines for other species in the upland forest matrix. Adapted from the Scientific Analysis Team Report (Thomas et al. 1993).
- B5. Recovery Plan Standards and Guidelines -** Guidelines for silvicultural activities and salvage in Late-Successional Reserves and Managed Late-Successional Areas, adapted from the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.).
- B6. Aquatic Conservation Strategy -** Excerpts from Chapter V of the FEMAT Report specific to delineation and management of Riparian Reserves, Key Watersheds, watershed analysis, and watershed restoration.
- B7. Late-Successional Reserve Standards and Guidelines -** Late-Successional Reserve standards and guidelines for multiple-use activities other than silviculture. Adapted from the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.).
- B8. Standards and Guidelines for Fire Management -** Consolidation of the standards and guidelines of the FEMAT Report to provide clarification of fire and fuels management objectives.
- B9. BLM Spotted Owl Standards and Guidelines -** Standards and guidelines retained or adapted from the BLM Revised Preferred Alternative (USDI BLM unpub.) that are specific to northern spotted owl habitat.
- B10. Grants Pass Line -** Line between northern and southern General Forest Management Areas, from the map of the Preferred Alternative, Draft Medford District Resource Management Plan and Environmental Impact Statement (USDI BLM 1992d), August 1992.
- B11. Standards and Guidelines Resulting from Additional Species Analysis and Changes to Alternative 9 -** Standards and guidelines developed to increase protection of habitat for species whose habitat assessments were relatively low under Alternative 9 in the Draft SEIS.



# Appendix B1

## Revised Preferred Alternative for Western Oregon BLM

This appendix discusses the Bureau of Land Management's Revised Preferred Alternative which was developed following receipt of public comments to the August 1992 Draft Resource Management Plans. This section applies to all alternatives.

### PREFACE

In August 1992, the Salem, Eugene, Coos Bay, Roseburg and Medford Districts and the Klamath Falls Resource Area of the Lakeview District of the Bureau of Land Management (BLM) published Draft Resource Management Plans and Environmental Impact Statements (RMP/EISs) (USDI BLM 1992a-f). This portion of Appendix B contains part of an unpublished draft document that summarizes the BLM revision intended for the Draft RMP/EISs for western Oregon. The entire document was provided to the Forest Ecosystem Management Assessment Team for use in developing various options for the FEMAT Report (Appendix A). The sections that are not reproduced in this appendix are those portions that have little bearing on the development of an overall strategy for managing late-successional and old-growth forests.

Following the analysis of public comments on the Draft Plans, resource specialists and managers revised the strategy set forth in the preferred alternatives. This revision was intended to be developed into the Proposed Resource Management Plans and Final Environmental Impact Statements for the western Oregon BLM Districts. This was originally expected to be published during the summer of 1993. Work was stopped on this project as a result of President Clinton's directive to develop an interagency approach that would consider forest management within the range of the northern spotted owl. The reader should note that this portion of Appendix B reflects the developmental stage of the Revised Preferred Alternative at the time work was interrupted. The editing and revision that was anticipated did not take place. However, the text and accompanying maps show the management direction and land use allocations that were used by the Assessment Team and which are part of the various alternatives described in this SEIS.

Important revisions to the Draft Plans include:

- The change of connectivity design from a corridor concept to an island biogeography concept that uses islands of habitat to link large habitat areas, and to add richness and diversity to the General Forest Management Area (the matrix). These habitat islands, usually 600 acres or larger, are referred to as Connectivity/Diversity Blocks.
- The addition of Managed Pair Areas and Reserved Pair Areas as described in the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.).
- The adjustment of Old-Growth Emphasis Area (OGEA) boundaries to coincide with boundaries of Designated Conservation Areas (DCAs) in the *Final Draft Spotted Owl Recovery Plan*.



## Appendix B

The BLM's District maps show land allocations and are included at the end of this section. The redesigned connectivity areas are shown along with combined categories of reserve or conservation areas. For a clear and full view of the land allocations and management guidelines these maps should be used in conjunction with the original maps and text published with the Draft RMP/EISs for western Oregon and the standards and guidelines contained in the Final Draft Spotted Owl Recovery Plan (see Appendix B5; Recovery Plan Standard and Guidelines). The relationship of the strategy used in the BLM Draft Plans to the alternatives in this SEIS is described in Chapter 2 of this document.

Subsequent to the public comment period for this SEIS, further revisions were made to the management direction to the Draft Plans. These changes are listed in Appendix B9, BLM Spotted Owl Standards and Guidelines. In addition, other changes and revisions are anticipated as the BLM completes the Proposed Resource Management Plans and Final Environmental Impact Statements for the western Oregon Districts, making them consistent with this SEIS.

### Abbreviations used in Appendix B1:

ACEC	Area of Critical Environmental Concern
ASQ	Allowable Sale Quantity
BLM	Bureau of Land Management
BMP	Best Management Practice
CRMP	Coordinated Resource Management Plan
dbh	diameter breast height
DCA	Designated Conservation Area
DEQ	Department of Environmental Quality
GFMA	General Forest Management Area
HMP	Habitat Management Plan
INSOCG	Interagency Northern Spotted Owl Conservation Group
LWD	Large Woody Debris
MPA	Managed Pair Area
NSO	No Surface Occupancy
ODFW	Oregon Department of Fish and Wildlife
OGEA	Old-Growth Emphasis Area
ORV	Off-Road Vehicle
PRMP	Proposed Resource Management Plan
RMA	Riparian Management Area
RMP	Resource Management Plan
RPA	Reserved Pair Area
SMA	Special Management Area
TPCC	Timber Production Capability Classification
VRM	Visual Resource Management

# **Bureau of Land Management Western Oregon Resource Management Plan Revised Preferred Alternative**

## **Introduction**

### **Vision**

The Bureau of Land Management (BLM) will manage the natural resources under its jurisdiction in western Oregon in a manner complementary to and in cooperation with other land owners, so that both the ecological condition of the natural environment and the social well-being will be maintained and enhanced.

The basic principles supporting this vision are that:

- it is possible to manage resources in a manner that harmoniously provides for human use and a healthy natural environment;
- stewardship, the intelligent involvement of people working with natural processes, will be essential for successful implementation;
- BLM cannot achieve the vision alone but can, by its management processes and through cooperation with others, be a significant catalyst for achievement;
- the focus must be ecological rather than on a single resource or species;
- a carefully designed program of monitoring, research and adaptation will be the change mechanism for this long term mission.

### **Strategy - Western Oregon and District Wide**

Lands administered by the BLM can be managed to maintain healthy, functioning ecosystems while providing a sustainable production of natural resources. This management strategy (Ecosystem Based Management) is the careful and skillful use of ecological, economic, social, and managerial principles which ensure the sustained desired conditions of the whole. Ecosystem management is a strategy that emphasizes the whole, and the relationships within the ecosystem; instead of individual independent components. Ecosystem management looks at sustainable systems and products that people want and need. It is a balance between social acceptability, economic feasibility, and physical/biological possibility.

The building blocks for this strategy consist of four major land use allocations, which are designed to meet the overall vision of ecosystem based management of BLM-administered lands in western Oregon. These building blocks are arranged on the landscape to complement assumed management strategies of other landowners, while restoring or maintaining the diversity, abundance, and distribution of both plant communities and wildlife habitat to prevent species loss.

Objectives for the four major land use allocations are described below:

**Old-Growth Emphasis Areas (OGEAs)** would be managed to maintain, increase, or develop old-growth characteristics. They would be located where they would support regional biological diversity and would represent approximately 25 to 30 percent of BLM administered lands in western Oregon.

**General Forest Management Areas (GFMAs)** would be managed for forest production while providing for long term site productivity, forest health, cavity nester habitat, and biological legacies. A variety of seral stages would be represented. In the next few decades older forest seral stages would be retained but in the long term, the landscape in the GFMA would have a mosaic of even-aged stands (except southern GFMAs and the Klamath Falls Resource Area) ranging from young stands to stands 70 to 110 years old.

**Connectivity/Diversity Blocks** would be managed to provide movement, dispersal, connectivity opportunities and add to the richness and diversity of the landscape. Approximately 25 to 30 percent of these blocks would be retained in old-growth condition. Where old growth was not available, 25 to 30 percent of the oldest available forest would be retained. These areas would be located within the GFMA to complement larger old-growth areas such as OGEAs, Wilderness, and parks.

**Special Management Areas (SMAs)** would be managed to maintain the special values they represent such as riparian, research natural areas, recreation, or environmental education. They contribute to the overall strategy by providing a diversity of habitats throughout the landscape. Special Management Areas are scattered throughout the landscape and often overlap the other three land use allocations. These areas contribute to the overall strategy by providing a diversity of habitats throughout the landscape.

The specific objectives for these Special Management Areas are identified in the following resource by resource discussion.

## Implementation

The resource management plan (RMP) establishes objectives and land use allocations at a relatively broad level. Under ecosystem based management, implementation is best accomplished at the landscape level. Landscape level management considers all resources and social and economic values at the same time when designing actions; looks at an entire landscape (watershed, subwatershed or other logical ecological landscape); considers all lands in landscape (ignore property lines); builds partnerships to facilitate and enhance landscape/ecosystem management; and where appropriate, consolidates and replaces individual resource specific activity plans with landscape level plans. These plans will be developed considering all components of the ecosystem, rather than the prior method of concentrating on one resource, such as a recreation area that only discussed recreation opportunities and not wildlife habitat projects.

A landscape is a heterogeneous area composed of a cluster of interacting ecosystems that are repeated in similar form throughout. For example, an area drained by a major stream, within a climatic regime, geomorphic processes, and natural vegetation patterns are fairly uniform. A landscape is larger than a stand and smaller than a region, and thus can vary greatly in size.

A key feature of landscape management is considering the landscape in relationship with the next larger and next smaller landscape. For example, when planning for a landscape consisting of a 6,000 acre subwatershed, one would also consider its relationship to the entire watershed as well as looking at how seral stages, stands, or plant communities are distributed within the subwatershed and next larger landscape. Regardless of the scale, the relationship of each resource with all other components of the ecosystem must be weighed. Social aspects were also regarded as an important aspect of prescribing management actions, and will continue to be important while implementing the plan.

In order to implement landscape level activities most efficiently, information on particular components (such as rare species and animals with a range of occurrence in more than one landscape unit) will be collected across the larger ecosystem. Ecosystem level strategies providing the "big picture" of the resource will need to be developed to provide flexibility and broad-based management of these components over the long term in the various landscape units where they occur across the ecosystem.

Actions proposed where landscape plans are not complete would consider landscape issues in order not to preclude options for landscape management. For example, the design of a timber sale would look beyond the stands proposed for harvest and consider its impact on the spatial patterns, seral diversity, etc., of the subwatershed or watershed that may be part of the landscape they are in. Ecosystem based management implies looking at our actions in terms of the various ecosystem scales, most importantly to consider the next larger scale in the landscape, looking at all the interacting pieces, not just one specific resource.

## Adaptive Management

The management actions/direction are intended to be adaptive in nature and subject to changes from monitoring and/or research. An intensive monitoring program closely linked to established resource objectives and thresholds or a range of thresholds is a critical part of implementation. Monitoring results may lead to amendments of the Proposed Resource Management Plan (PRMP) or modifications to specific management directions. Adaptive management is critical to assuring the success of an ecosystem based management approach reflecting the complexity and variation found "out on the ground".

Adaptive management could entail modification of silvicultural prescriptions to respond to increasing knowledge providing greater certainty about anticipated climate change, or to respond to increasing knowledge about the habitat needs of northern spotted owls, to cite two examples that could have widespread application. It could equally entail modification of rather localized management practices to respond to the results of monitoring.

Another example of adaptive management would include changing or updating inventory information to reflect new information. For example, revisions or refinements to the Timber Production Capability Classification (TPCC) are ongoing. If these changes became significant, corresponding adjustments would be made in RMP decisions and/or outputs (expected allowable sale quantity [ASQ]).

## Resource by Resource Discussion

The following discusses Objectives, Land Use Allocations, and Management Actions/Direction for the various resources, commodities, and programs. Although described separately, each contribute collectively and cumulatively to meeting the overall strategy of managing the bioregion and must be considered together to accurately reflect the concept of ecosystem based management.

In this document, an **objective** is the desired condition of a resource that the BLM will work toward using prescribed management actions and land use allocations. **Land Use Allocations** are the uses for an area that are allowed, limited, or excluded, as well as the terms and conditions of these uses. **Management actions/direction** are those specific actions that the BLM intends to take in order to achieve the objectives described for each resource or program. It is anticipated that as we implement the plan we may adapt these management actions/direction to assure that we meet the objectives.

### BIOLOGICAL DIVERSITY

#### Resource Condition Objectives

Restore or maintain the diversity of naturally occurring ecosystems, communities and native species in abundances and distributions which prevent the loss of native plant community types or indigenous plant or wildlife species habitat within the District.

Maintain representative examples of the full spectrum of ecosystems, biological communities, habitats and their ecological processes. Provide for the increase of the scientific understanding of biological diversity and conservation.

Protect, enhance and restore the plant community structure, species composition and ecological processes of special habitats to sustain healthy function.

Restore or maintain or old-growth forest areas to provide for those plant and animal species and processes associated with these habitats.

Establish a system of old-growth habitat islands (connectivity/diversity blocks) across the GFMA to provide for movement, dispersal, and connectivity of plant and animal species, and to maintain ecotypic richness and diversity in the forest matrix of the GFMA. These **connectivity/diversity blocks** would be arranged on the landscape in size and number to provide for the following:

- wide ranging animals can travel, migrate, meet mates
- genetic interchange can occur
- populations can move in response to environmental change and natural disasters.
- individuals can recolonize habitats from which populations have been locally extirpated.
- link physiographic regions, large habitat areas (ecological continents) i.e., OGEAs, Wilderness, Forest Service, Designated Conservation Areas (DCAs), etc.
- add or maintain richness and ecotypic diversity to the landscape
- allow for unknown species and processes (keep the pieces strategy).

Within the GFMA emphasis would be placed on use of intensive forest management practices and investments to maintain a high level of sustainable timber production while maintaining long-term site productivity, biological legacies, and a biologically diverse forest matrix.

## Land Use Allocations

Manage **old-growth emphasis areas (OGEAs)** for old-growth forest conditions. These are located where they support regional biological diversity. These areas would also be managed to provide large blocks of habitat for spotted owls and are coincident with the DCAs in the *Final Draft Recovery Plan for the Northern Spotted Owl* [USDI unpub.].

**Connectivity/diversity blocks** would be established, usually about 640 acres in size, using a landscape strategy which incorporates the following considerations:

- value of the old-growth habitat island is related to the matrix or context within which it occurs; e.g., agricultural, industrial forest, residential, etc.
- structure or content of the island; e.g., forestable acres, existing age classes or condition, etc.
- complement the landscape pattern, make use of, strengthen, tie-in landscape features such as special areas, Visual Resource Management (VRM), special status species habitat, wild and scenic rivers, Riparian Management Areas (RMAs), TPCC, watershed, etc.
- areas that either presently lack or would lack under GFMA management landscape ecotypic diversity and richness
- strategic location for function and integrity; e.g., connectivity of OGEAs, DCAs, physiographic regions, etc.
- opportunity for travel corridors and connectivity e.g., riparian, VRM, TPCC, etc.

The strategy for establishing the **connectivity/diversity blocks** would incorporate the concepts of island biogeography. The number of islands would be an important consideration and the balanced against size. The large habitat islands or continents would be set in the OGEAs, Reserved Pair Areas (RPAs), Managed Pair Areas (MPAs), DCAs, Wilderness and other large reserves on BLM and Forest Service land. The biological diversity blocks would create habitat archipelagos and connect the large habitat islands. The biological diversity blocks would complement the large islands by creating a greater number of habitat islands with smaller inter-island distances which would provide greater connectivity and greatly increase the prospect for frequent colonization, movement, etc. The potential flora and fauna interaction between habitat areas would be increased.

The number of biological diversity blocks needed to create or maintain landscape richness and diversity would vary depending on the specific context or matrix of an area.

**General Forest Management Areas** would be managed for forest production while providing for long term site productivity, forest health, cavity nester habitat, and biological legacies. A variety of seral stages would be represented. In the next few decades older forest seral stages would be retained but in the long term, the landscape in the GFMA would have a mosaic of even-aged stands (except southern GFMA and the Klamath Falls Resource Area) ranging from young stands to stands 70 to 110 years old.

**Special Management Areas** would be managed to maintain the special values they represent such as riparian, Areas of Critical Environmental Concern (ACECs), research natural areas, recreation,

marbled murrelet sites, fragile sites, or problem reforestation sites. They contribute to the overall strategy by providing a diversity of habitats throughout the landscape. Special Management Areas are scattered throughout the landscape and often overlap the other three land use allocations. These areas contribute to the overall strategy by providing a diversity of habitats throughout the landscape.

**Special habitats** (forested or nonforested) which are distinct from the general forest matrix such as ponds, bogs, springs, seeps, marshes, swamps, prairies, meadows, oak woodlands, dunes, balds, cliffs, caves, talus slopes, rock outcrops, serpentine barrens, bluffs, caves, salt licks, and mineral springs would be maintained in a natural condition in the same abundance and distribution across the landscape. Protect and maintain species composition, ecotones and ecological processes of these habitats to sustain a healthy ecosystem and contribute to maintenance of biological diversity. Special habitats occur across all land use allocations.

## **Management Actions/Direction**

**Old-Growth Emphasis Areas** - Existing old-growth forests and spotted owl habitat would be maintained. Stands would be managed to accelerate the development of old-growth forest conditions and spotted owl habitat.

Management activities would include young stand maintenance and management and density management thinning to speed up or enhance old-growth habitat. Density management harvests would be limited to 10 percent of any OGEA per decade. Regeneration harvest would be deferred for 80 years. After 80 years, regeneration harvesting would be limited to systems designed to reestablish ecological old-growth conditions or to maintain those conditions.

Prescribed fire and density management would be used where appropriate to maintain or restore ecological processes and forest health, or prevent appreciable loss of habitat. In some cases there are significant threats to habitat maintenance posed by forest health factors, such as unnaturally dense stands or understories resulting from fire suppression. In these situations, departures from the established management direction could be allowed from the established management direction in order to preclude the loss of spotted owl habitat or old-growth forest stands. Proposals for such departures would be contingent upon concurrence by the Interagency Northern Spotted Owl Conservation Group (INSOCG).

Management activities would maintain or improve the present function of spotted owl habitat (e.g., nesting roosting, foraging, or dispersal). In addition, activities would not retard the development of suitable habitat or old-growth characteristics. In addition, no activities would be allowed within 1/4 mile of active spotted owl nesting centers of activity and no density management would occur within 1/4 mile.

Activity plans would be developed for the OGEAs to direct site-specific management activities. These plans would include an assessment of wildfire potential, role of prescribed fire, and road management. Unless these plans direct otherwise, intensive fire suppression strategies would be used when controlling wildfire and new road construction would be minimized to that necessary for thinning. Only arterial and major collector roads would remain open to the public in these areas.

**Connectivity/Diversity Blocks** - The connectivity/diversity blocks would be managed to maintain a minimum of 25 to 30 percent old-growth condition both long term and short term where it exists. The

percentage of old-growth habitat may be measured at a sub-watershed or compartment level that consists of logical groups of connectivity diversity blocks. The percentage of habitat could include existing SMAs. The size and arrangement of habitat within the block should provide as effective habitat as possible.

The silvicultural retention system used would be designed to recreate forest ecosystems that closely resemble natural old-growth systems in composition, structure, and function. Retained structural components would include live trees, snag, and large down woody material. These would be distributed in various ways in the stand on the landscape. Hardwoods would be retained or restored in stands at a level consistent with the identified target stand. The silviculture retention system would mimic a moderately heavy large scale natural disturbance event which results in the initiation of a new stand cohort. The regeneration harvest would resemble a shelterwood cut with trees scattered irregularly and/or grouped. Retained trees would represent a range of species, vigor and condition.

The connectivity/diversity blocks would be managed with 12 to 18 green conifers retained per acre at regeneration harvest. The silvicultural goal of the retention trees and subsequent density management would be the recovery of old-growth conditions in approximately 100 to 120 years. Following wildfires or other large disturbances, salvage logging would be allowed, leaving at least 4 snags per acre, all remaining green trees and at least 4 tons of coarse woody debris. Stands under 150 years old, and smaller, more fragmented stands, would have a higher priority for harvest than older, more intact stands.

**General Forest Management Areas** - Emphasis would be placed on the use of intensive forest management practices and investments to maintain a high level of sustainable timber production while maintaining long-term site productivity, biological legacies, and a biologically diverse forest matrix.

Regeneration harvest units would retain a minimum of 6-8 green conifers per acre, along with snags, coarse woody debris, and hardwoods to provide a biologically diverse stand.

**Retain Port-Orford-cedar** to identify genetically transmitted resistance mechanisms and for its contribution to biological diversity. Proactively manage to limit the spread of *Phytophthora Lateralis* and reduce the number of infected areas.

**Manage Pacific yew** consistent with Forest Service/BLM strategy. This strategy includes assuring a sustainable supply of taxol while maintaining the presence and function of Pacific yew in the ecosystem.

**Special Habitats** - Generally a 100-200 foot buffer would be maintained but this could be increased, decreased or manipulated based on site specific circumstances and the objective to protect the special habitat values. Ecologically significant buffers would be determined by interdisciplinary teams comprised of all program specialists.

Use silvicultural prescriptions and fire management to manage special habitats such as oak woodlands, prairies, meadows, marshes and grassy balds to prevent the encroachment of dense underbrush, shade-tolerant conifers and other species not naturally found in these plant communities under more natural fire conditions.



New roads and other rights-of-way (pipelines, powerlines, etc.) would avoid special habitats which contain components or are themselves not represented adequately within the landscape to maintain biological diversity. Where new roads or other rights-of-way affect special habitats, they would be located to minimize effects to these habitats where physically possible.

## **WATER, SOIL, RIPARIAN, AND WETLAND RESOURCES**

### **Objectives**

Manage water resources in compliance with legal requirements to protect, maintain, or improve the quality of water resources and watershed values associated with BLM-administered land, including surface and ground water quality and quantity.

Meet or exceed State water quality standards and protect designated beneficial uses.

Maintain or improve the biological, chemical, and physical functions of the stream ecosystem. Manage riparian zones to maintain or improve riparian conditions that support water-related functions (e.g., streambank stability, physical filtering of water, source of coarse woody debris to dissipate flood energy and create aquatic habitat, water storage, aquifer recharge, carrying and storing flood flows, and insulating streams from summer and winter temperature extremes).

Manage riparian zones and wetlands in accordance with the BLM Riparian-Wetlands Initiative for the 1990's. Management would emphasize: protection of riparian-wetland areas and associated uplands; rehabilitation and maintenance of riparian-wetland areas; and partnership and cooperative rehabilitation and management of riparian-wetland areas.

Maintain or improve riparian habitat for wildlife and native plant diversity.

Protect wetlands in accordance with Executive Order 11990 to minimize destruction, modification, loss or degradation and to preserve and enhance their beneficial values.

Protect floodplains in accordance with Executive Order 11988 to restore and preserve their natural and beneficial values.

Manage watersheds providing surface water used by community water systems to comply with the Clean Water Act.

Manage uplands to minimize nonpoint source pollution and moderate extremes in streamflow by maintaining or improving hydrologic functions (e.g., infiltration, instream flow, ground water quantity, etc.).

Protect long-term soil productivity by minimizing erosion, including landslides, and maintaining beneficial physical and chemical properties of soils.

### **Stream/Riparian Management Area Condition Objectives by Stream Order and Type**

The following stream condition objectives apply specifically to the GFMA and Connectivity/Diversity Blocks. Higher levels of protection will be provided in OGEAs and Special Management Areas.

- **Nonfish-Bearing; Intermittent; Order 1**

Stable stream channel and banks.

Adequate vegetation to minimize entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.

Adequate stream structure to minimize sediment movement downstream.

Adequate shade to prevent evaporation of subsurface moisture in stream channel.

50 percent of natural large woody debris (LWD) input.

Low to Moderate level of aquatic habitat.

Marginal habitat conditions along hardwood and shrub buffers for terrestrial amphibians and small mammals.

- **Nonfish-Bearing; Intermittent; Order 2**

Stable stream channel and banks.

Adequate vegetation to minimize or prevent entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.

Adequate stream structure to minimize sediment movement downstream.

Adequate shade to prevent evaporation of subsurface moisture in stream channel.

70 percent of optimum large woody debris input.

Moderate level of aquatic habitat.

Marginal habitat conditions along hardwood and shrub buffers for terrestrial amphibians and small mammals.

- **Nonfish-Bearing; Perennial; Order 1 and 2**

Stable stream channel and banks.

Adequate vegetation to prevent entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.

Adequate stream structure to minimize sediment movement downstream.

95-100 percent of optimum stream shading to maintain or reduce summer maximum water temperatures.

80 percent of optimum large woody debris input.

Moderate level of aquatic habitat.

Limited amounts of suitable habitat for terrestrial amphibians and small mammals.

Low level of large mammal travel zones.

- **Nonfish-Bearing; Intermittent or Perennial; Order 3**

Stable stream channel and banks.

Adequate vegetation to prevent entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.

Adequate stream structure to minimize sediment movement downstream.

95-100 percent of optimum stream shading to maintain or reduce summer maximum water temperatures.

90 percent of optimum large woody debris input.

High level of aquatic habitat.

Limited amounts of suitable habitat for terrestrial amphibians and small mammals.

Low level of large mammal travel zones.

• **Fish-Bearing; Intermittent or Perennial; Order 1, 2, and 3**

Stable stream channel and banks.

Adequate vegetation to prevent entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.

Adequate stream structure to minimize sediment movement downstream.

95-100 percent of optimum stream shading to maintain or reduce summer maximum water temperatures.

100 percent of optimum large woody debris input.

High level of aquatic habitat.

High level of fish habitat.

Limited amounts of suitable habitat for terrestrial amphibians and small mammals.

High level of large mammal travel zones.

High level of nesting for riparian associated water birds and raptors.

• **Fish or Nonfish-Bearing; Intermittent or Perennial; Order 4+**

Stable stream channel and banks.

Adequate vegetation to prevent entry of nonpoint source pollution (e.g., sediment) from upslope activities into stream channel.

Adequate stream structure to minimize sediment movement downstream.

95-100 percent of optimum stream shading to maintain or reduce summer maximum water temperatures.

100 percent of optimum large woody debris input.

High level of aquatic habitat.

High level of fish habitat.

Adequate amounts of suitable habitat for terrestrial amphibians and small mammals.

High level of large mammal travel zones.

High level of nesting for riparian associated water birds and raptors.

**Table B1-1.** Aquatic habitat quality rating scale

Parameter	Level of Habitat Quality		
	Low	Moderate	High
CWD <sup>1</sup> Recruitment	50%	90%	100%
Temperature	Oregon State Standards	Oregon State Standards	Oregon State Standards
Bank Stability	<50% unstable	<30% unstable	<20% unstable
Channel Width: Pool Numbers Ratio	>10:1	7-10:1	2-6:1
Width: Depth Ratio	13-14:1	11-12:1	10:1

<sup>1</sup> CWD - Coarse woody debris.

## Land Use Allocations

**Riparian Management Areas** - Riparian Management Areas will be established on all streams, lakes, and ponds to meet water and riparian objectives. RMA widths will be prescribed to fit on-the-ground stream characteristics. Design of RMA prescriptions will consider overall watershed and riparian condition, occurrence of sensitive species, and designation of a water quality limited stream. Specific elements to be considered when determining RMA widths and prescriptions would include:

- Amount of roads in watershed
- Age and condition of forest stands in watershed
- Amount of watershed withdrawn from disturbance
- Topography of watershed and immediate area (i.e., side slope)
- Current condition of aquatic and riparian habitat in watershed
- Distance to fish habitat if affected stream does not support fish
- Class of stream (i.e., fish-bearing, nonfish-bearing, water quality)
- Width of flood plain
- Width of riparian zone
- Plant community in both riparian and adjacent upland areas
- Stand characteristics of conifers in both riparian and adjacent upland areas
- Amount and type of understory vegetation in riparian zone
- Soil types in both riparian and adjacent upland areas
- Channel type (i.e., constrained, unconstrained, bed rock controlled, alluvial controlled etc.)
- Stream size and order
- Stream gradient
- Windthrow risk
- Stream channel condition upstream and downstream from project area

**Table B1-2.** Expected Riparian Management Area (RMA) widths by stream order and type

Stream Order	Average RMA Width (feet)		
	Intermittent	Perennial	Fish Bearing
1	Partial retention of variable width	75	150
2	Partial retention of variable width	75	150
3		105	150
4		150	
5		210	
6+		240	
Lakes and ponds		150	

Expected average RMA widths (on each side of stream) are displayed in Table B1-2.

Minimum RMA widths on each side of fish-bearing streams (generally third order and larger streams) or adjacent to lakes and ponds will be the larger of the following three widths: the riparian zone, the floodplain, or 100-foot horizontal distance from the high water mark. Average RMA widths will be wider and vary by stream order.

**Timber Production Capability Classification** - As part of the inventory of lands suitable and capable of being managed for timber production, landslide prone soils, and other unstable soils were identified as not suitable, in part to protect watersheds. Other surface-disturbing activities will be prohibited unless adequately mitigated to protect water quality.

### **Management Actions/Direction**

The RMAs along all streams, lakes, and ponds will be managed to meet the water and riparian objectives. Within RMAs along fish-bearing, perennial, or third order and larger streams, lakes and ponds, limited management activities could occur to achieve resource management objectives such as stream/riparian enhancement, enhancement of fish and wildlife habitat, yarding corridors to facilitate timber harvest outside the RMA, and road crossings. Prescribed fire and silvicultural activities could be used to meet RMA management objectives. Snags and down logs will be retained as identified in Chapter 2, Wildlife [of the BLM Draft RMPs].

For RMAs along first and second order, nonfish-bearing, intermittent streams, management activities such as stream/riparian enhancement, timber harvest, road crossings, prescribed fire, planting, and precommercial thinning could occur if designed to meet the water and riparian objectives. Management of these RMAs will emphasize leaving brush, hardwoods, Pacific yew, and nonmerchantable and noncommercial vegetation to achieve objectives, however, it is expected that some conifer retention will also be necessary to meet objectives.

Protection for wetlands could include buffering, not entering, or other measures as needed based on site-specific conditions.

Springs will be managed as special habitat (see Wildlife section [of the BLM Draft RMPs]).

Management activities will comply with Oregon's Regulations Relating to Water Quality Control (Oregon Administrative Rules 340-41), including the Antidegradation Policy. The purpose of the Antidegradation Policy, which includes policies on high quality waters, water quality limited waters, and outstanding resource waters, is to protect, maintain, and enhance existing surface water quality to protect all existing beneficial uses.

Management actions will be consistent with Oregon water quality management programs for designated water quality limited streams.

Management activities will be consistent with Oregon's Nonpoint Source Statewide Management Program. A nonpoint source management program will continue to be implemented in cooperation with the U.S. Environmental Protection Agency and the Oregon Department of Environmental Quality (DEQ) to assure protection of water and water-dependent resources. Oregon's nonpoint source management program requires BLM to implement best management practices (BMPs) which

protect the beneficial uses of water. BMPs will be selected based on site-specific conditions, technical and economic feasibility, and the water quality regulations for waters potentially affected. Timber harvesting, minerals management, recreation, off-road vehicle (ORV) use, and other surface-disturbing activities will be managed to protect water quality.

Watershed and stream enhancement activities such as reducing soil compaction, vegetating disturbed areas, and stabilizing streambanks will be conducted to achieve water and soil resource objectives.

Chemical uses by BLM, authorized contractors, and mining operators will provide for protection of both surface water and ground water. Examples of chemicals used could include, but are not limited to, herbicides, pesticides, fertilizers, fire retardant, solvents at maintenance shops, and fuels and chemicals used in mining operations. Herbicides will not be applied within 500 feet of any residence or other place of human occupancy without the occupant's consent or within 100 feet of any cropland.

Herbicides will not be applied by helicopter within 100 feet of any surface waters, by ground vehicles with boom sprayers within 25 feet of surface water, or by vehicle-mounted handguns or with backpacks within 10 feet of surface water.

Analysis of cumulative effects will help guide overall project scheduling during the life of the plan.

Land exchanges or acquisitions could be used to block up BLM management within watersheds or to obtain key riparian-wetland areas.

## **FISH HABITAT**

### **Objectives**

Maintain or enhance the fisheries potential of fish streams and other waters consistent with BLM's nationwide Fish and Wildlife 2000 plan.

Promote recovery of depressed fish stocks.

See the Water, Soil, Riparian, and Wetland section for condition objectives by stream type. They also apply to fish habitat.

### **Land Use Allocations**

See Land Use allocations and Management Direction for Water, Soil, Riparian, and Wetland Resources.

### **Management Actions/Direction**

See Land Use allocations and Management Direction for Water, Soil, Riparian, and Wetland Resources.

A regional plan for coastal Oregon, Washington, and California will be created. This plan will serve to update the BLM's current anadromous fish management plan and will provide much increased emphasis on watershed-level planning and analysis. In the interim, to the extent of available funding,

implementation of BLM's "A Five-Year Comprehensive Anadromous Fish Habitat Enhancement Plan for Oregon Coastal Rivers, 1985" will continue. Projects would be implemented only when they are compatible with Oregon Department of Fish and Wildlife (ODFW) wild fish management policy. Priority would be given to watersheds supporting "at risk" fish stocks. Rehabilitation efforts could also focus on streams that have been devastated by natural catastrophic events.

To protect investments in fish improvement projects, mineral withdrawal would be pursued for the affected stream reach.

In fish-producing streams, screening facilities would be required on intakes when granting rights-of-way or easements for water diversions (pipelines and ditches) across public land. Facility design would meet or exceed ODFW standards.

Except for land tenure zone 3 lands, riparian and fish habitat would be retained unless land exchanges would improve management of fish, wildlife, or riparian habitat elsewhere.

BLM would work with Oregon Department of Fish and Wildlife to determine appropriate streamflows for in-stream water rights (Oregon revised statute 537.336 to 537.348) in order to maintain or enhance aquatic habitat, particularly for special status species.

#### **SPECIAL STATUS SPECIES HABITAT**

Special status species include species which are federal listed, federal proposed, federal candidate, state listed, Bureau-sensitive, and assessment species.

#### **Objectives**

Protect, manage and conserve 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.

Manage for the conservation of federal candidate, and Bureau sensitive species and their habitats so as not to contribute to the need to list and to recover the species.

Manage for the conservation of state listed species and their habitats to assist the state in achieving their management objectives.

Maintain or restore plant community structure, species composition, and ecological processes of special status plant and animal habitat.

Protect and manage assessment species where possible so as to not increase their status.  
Manage federal listed species to achieve their recovery.

The objectives for special status species apply to all land use allocations (OGEAs, Connectivity - Diversity blocks, GFMA's etc.). Acres of special status species habitat designated on the District will change throughout the life of the plan as inventories are conducted and the status of species change.

Land acquisitions would be pursued where needed to assure survival or recovery of federal listed, proposed, or candidate species.

## Land Use Allocations

See discussion under each species, following.

Many Special Habitats and Special Areas (see also Biological Diversity and Special Areas sections of the RMP) are designated in the RMP for conservation of special status plant or animal habitats.

## Management Actions/Direction

General management actions/direction for special status species habitat are followed by management actions/direction specific to individual species or special habitats.

### General

Management actions pertaining to all special status plant and animal species and their habitats in general are presented immediately below and are followed by management actions which are specific to particular plant and animal species or habitats.

In all land use activities and under all land allocations avoid, protect or mitigate for all special status species populations and habitat so as to not contribute to the need to list the nonfederal listed species and to promote recovery of federal listed species. A variety of mitigation measures are possible and vary according to the specific situation.

All proposed actions will be reviewed for special status species and field surveys will be conducted during the proper season when necessary for agency controlled actions. Field surveys may not be conducted in all cases depending on the number and timing of previous surveys conducted in the proposed action area and the amount or likelihood of potential habitat present. The intensity of field surveys will also vary depending on the same factors.

If a proposed action is determined to affect any federal listed, federal proposed, federal candidate, state listed, or Bureau sensitive species or any of their critical or essential habitat, efforts would be made to modify, relocate, or abandon the project to avoid affecting the species or its habitat. When BLM determines that a management action that could adversely affect a federal listed, federal proposed or federal candidate species can not be altered and should not be abandoned, then consultation or technical assistance with the U.S. Fish and Wildlife Service or National Marine Fisheries Service will be initiated.

We will coordinate with the U.S. Fish and Wildlife Service and National Marine Fisheries Service in compliance with the Endangered Species Act and jointly endeavor to recover the listed and candidate plant and animal species, their habitats and ecosystems.

We will coordinate and cooperate with the State of Oregon whenever necessary to assist the BLM in achieving conservation of state listed species.

The distribution, abundance, reasons for current status, and habitat needs will be determined for federal candidate and Bureau sensitive species occurring on BLM administered land and the significance of BLM administered land or actions in maintaining those species will be evaluated. For



those federal candidate or Bureau sensitive species where BLM administered land or actions have a significant effect on their status, rangewide or site specific management plans will be developed and implemented and will include specific habitat and population habitat objectives designed for recovery.

All habitat essential for the survival of federal and state listed, federal candidate and Bureau sensitive species will be retained in federal ownership. Where appropriate opportunities exist, land acquisitions through exchange, purchase or donation would be pursued where it would contribute to recovery, reduce the need to list by providing protection, block up ownership, or enhance special status species habitat. Specific opportunities and needs would be identified in site-specific management plans.

Consistent with other plan decisions, Bureau assessment species will be protected so as not to increase their status. They will be included in all field inventory and clearance work and all new locations will be documented. Assessment species will be considered in all environmental analyses where impacts, if any, will be clearly identified for the population and the species as a whole. As funding permits and as species conservation dictates, active management for assessment species may be undertaken to assure survival of these species in Oregon. Prior to any vegetative manipulation, surface disturbing activity, or any disposal of BLM administered land, a review of the affected site or areas will be conducted for special status plant and animal species. If a proposed action is determined to affect any federal listed, federal proposed, federal candidate, state listed, or Bureau sensitive species or any critical or essential habitat, efforts would be made to modify, relocate, or abandon the project to avoid adversely affecting the species or its habitat. When BLM determines that a management action that could adversely affect a federal listed, federal proposed or federal candidate species can not be altered and should not be abandoned, then consultation with the U.S. Fish and Wildlife Service will be initiated. Correspondence with the state will be conducted whenever necessary to assist the state in achieving their objectives for state listed species.

### **Habitat (Plant or Wildlife) or Species Specific: Northern Spotted Owl (Federal Threatened Species)**

**Objectives** - Promote recovery, protect existing owls.

**Management Actions/Direction** - **Residual habitat** areas of about 100 acres in size of nesting, roosting, and foraging habitat would be protected around the known activity centers for owl pairs or territorial singles. The intent is to protect the core areas in the short term and to provide potential nest sites in the long term except for those sites that exceed the target number per township identified in the recovery plan. All habitat is reserved for an expected 80 years.

**Reserved Pair Areas** would be protected to supplement DCAs until they become fully functional by maintaining additional suitable habitat and activity centers outside of OGEAs. These reserved pair areas consist of the area surrounding the activity center of a pair or resident single owl at least equal to the median home range size of pairs in the province. All habitat is reserved from harvest for an expected 80 years.

**Managed Pair Areas** managed (and available for harvest) so long as the median amount of suitable habitat in home ranges of observed pairs in the province is maintained. All habitat would be reserved for 10 years.

There would be no tree falling within one-quarter mile of all active northern spotted owl nest sites from approximately March 1 to September 30 to avoid disturbance and harm to young owls.

Human activities which could disturb owl nesting, especially use of large power equipment, would be prohibited within one-quarter mile of all active spotted owl nest sites from approximately March 1 to September 30. Nest located next to roads or other areas of human disturbance would not usually result in restrictions.

### **Marbled Murrelet (Proposed Federal Threatened Species)**

**Objectives** - Will be added.

**Management Actions/Direction** - Inventories and monitoring for this species would be instituted.

Any nest locations and occupied habitat areas would be protected. Human disturbance around these sites/stands would be minimized between approximately March 1 and July 15.

### **Bradshaw's lomatium (*Lomatium bradshawii*) (Federal and State Endangered)**

[The following is an example.]

**Objectives** - Will be added.

**Management Actions/Direction** - A Recovery Plan for Bradshaw's lomatium has not yet been released by the U.S. Fish and Wildlife Service. Interim management of the species will include:

- Identification of Bradshaw's lomatium as a special value in and continue the designation of Long Tom ACEC which is its only present habitat on BLM administered land;
- Prescribed fire for habitat enhancement and maintenance
- Monitoring of the effects of prescribed fire on control of the invading species and of its affect on the species;
- Studies and monitoring of population dynamics, hydrological and soil characteristics required by the plant in its native prairie habitat
- Coordination with U.S. Fish and Wildlife Service, The State of Oregon, the U.S. Army Corps of Engineers and The Nature Conservancy in management of the species across the landscape;
- Pursuit of opportunities for education about conservation of Bradshaw's lomatium;
- Pursuit of opportunities to increase the number of populations of Bradshaw's lomatium under BLM management through acquisition and reintroduction.

When the Recovery Plan is issued, BLM will implement management actions identified for BLM. As needed, we will continue to implement interim management actions identified above. If the Recovery Plan and this RMP are not adequate to cover objectives and actions relative to this species, a management plan will be developed.

As we gain new knowledge about the species requirements and threats we will conduct other activities needed to implement the Recovery Plan.

## **Bald Eagle** (Federal Threatened Species)

**Objectives** - Will be added.

**Management Actions/Direction** - All actions would be consistent with the Pacific Bald Eagle Recovery Plan. Known habitat sites and potential sites identified in the Recovery or Implementation Plans would be protected.

## **Peregrine Falcon** (Federal Endangered Species)

**Objectives** - Will be added.

**Management Actions/Direction** - All actions would be consistent with the Peregrine Falcon Recovery Plan. Known habitat sites and potential sites identified in the Recovery or Implementation Plans would be protected.

Within one mile of active peregrine falcon nest sites, human disturbances with the potential to disturb the nest would be minimized and roads (except major arterial roads) would be closed between February 1 and August 15. The areas would be managed to retain diversity of habitats for prey species. They would be designated fire fuels management areas to reduce fuel loadings and manage habitat conditions. As opportunities exist, forage for prey species could be enhanced through plantings of mast and berry-producing shrubs. All BLM-administered land would be retained in federal ownership. A Habitat Management Plan would be prepared to provide more specific management guidelines for peregrine falcons.

The core area within one-half mile of active peregrine nest sites would receive additional protection. In addition to the measures used in the one-mile radius within the protected core area, there would be no scheduled timber harvest, no aerial application of herbicides or pesticides, and no surface occupancy (NSO) for leasable minerals. There would be no new road construction unless the activity would not adversely effect the integrity of the site. These areas would be designated priority fire suppression areas.

Potential nest cliffs would be managed to provide for future population expansion. The cliffs themselves would be protected and enhanced if necessary. No new road construction would be permitted within one-half mile of these potential nest sites unless the activity would not adversely affect the integrity of the site, and there would be no surface occupancy for leasable minerals. These potential nest sites would be retained under BLM administration.

## **Townsend Big Eared Bat**

**Objectives** - Will be added.

**Management Actions/Direction** - Dense forest conditions would be retained if present or restored where possible around known colony caves. No new road construction would be permitted and human disturbance would be minimized. Seasonal recreational use of these caves could be permitted if it would not interfere with the bats. No surface occupancy would be allowed for leasable minerals. All BLM-administered land would be retained in federal ownership. Caves and mine adits would be inventoried for bats.

## **Siskiyou Salamander and Del Norte Salamander (Federal Candidate Species)**

**Objectives** - Will be added.

**Management Actions/Direction** - Surface-disturbing activities would be avoided where feasible within 100 feet of talus habitat where the species is found. Habitat (talus areas) where the species is found would be protected in order to provide shady, humid micro-habitat. Potential habitat would be inventoried for these species.

**Special Status Fish** (species will vary by District, Medford example follows)

Jenny Creek Sucker (Federal Candidate Species), Redband Trout (Federal Candidate Species), Coho Salmon (assessment species, Rogue River basin), Summer Steelhead, (American Fisheries Society, proposed threatened species, Rogue River basin), and Winter Steelhead (American Fisheries Society, proposed threatened species, Illinois River basin).

**Objectives** - Will be added.

**Management Actions/Direction** - Timber harvest and other surface-disturbing activities would be prohibited within steep canyon areas along Jenny Creek and tributaries.

Surface-disturbing activities would be designed so they do not degrade habitat for the species listed above.

**WILDLIFE HABITAT** (will vary by District, Medford example follows).

The overall objective for managing wildlife habitat is to maintain healthy wildlife populations to contribute to biological diversity and ecosystem health.

## **Cavity Dwellers and Other Snag Associated Species**

**Objectives** - Will be added.

**Management Actions/Direction** - In the General Forest Management Area the following would apply:

Snags, live cull trees, and green merchantable trees would be retained to provide an average of approximately 60 percent of the optimum, primary-excavator population habitat needs. This generally corresponds to 180 snags greater than 16 inches diameter breast height (dbh) per 100 acres of forested habitat.

All unmerchantable snags and culls would be retained unless they pose a safety hazard.

Within OGEAs, the following would apply:

Snags, live cull trees, and green merchantable trees would be retained to provide at a minimum the mean number of snags found in each seral stage of unentered stands, plus one standard deviation. This generally corresponds to 350 snags greater than 16 inches dbh per 100 acres of forested habitat.

Coarse woody debris would be retained to provide an average of approximately 60 percent of the mean amounts of down logs found in each seral stage of unentered stands. This generally corresponds to approximately 1,400 tons per 100 acres, with at least 1,300 pieces greater than 16 inches diameter and 12 feet long.

## **Raptors, Owls, and Great Blue Herons**

**Objectives** - Will be added.

**Management Actions/Direction** - Nest sites, centers of activity, or rookeries would be protected as necessary to maintain the integrity of the site. Human disturbances which may disturb or interfere with nesting would be prohibited within one-quarter mile of active nesting areas between approximately March 1 and July 15.

Nesting platforms, nest boxes, and other structures would be erected to enhance habitat for osprey, other raptors, waterfowl, and other species as opportunities become available.

## **Roosevelt Elk**

**Objectives** - Elk management areas would be managed to enhance elk habitat consistent with the other allocations (timber, old growth, connectivity) for these lands as identified below.

**Management Actions/Direction** - HMPs would be developed.

All roads except major collectors and arterial would be closed. New road construction would be minimized.

Roads would be managed through use of gates and other types of road barricades to limit motorized vehicle use to an open road density of 1.5 miles per square mile, where possible.

Seasonal restrictions on activities could be imposed if needed to avoid disturbance and harassment.

Forage habitat would be maintained or enhanced where appropriate by creating small openings in conifer stands of all ages, broadcast burning, seeding, fertilizing, underburning forest stands, or other means.

The mix of forage areas, thermal cover, hiding cover, and optimal cover would be managed to maintain or attain highly viable habitat condition for each of the four indices using the Wisdom Elk Model or equivalent model.

## **Deer and Elk Winter Range**

**Objectives** - Deer and elk winter range in the Cascade foothills would be managed as winter range with an emphasis on providing thermal cover and minimizing disturbances.

**Management Actions/Direction** - HMPs or coordinated resource management plans (CRMPs) would be developed for the big game management areas.

All roads, except major collectors and arterial, would be closed between November 15 and April 1. New road construction would be minimized.

At least 20 percent of these areas would be maintained in thermal cover, 70 percent canopy closure, canopy height of at least 40 feet, and large enough to avoid edge effects. Management activities would be allowed in these areas consistent with the objectives for maintaining thermal cover and minimizing disturbance.

Seasonal restrictions would be applied to activities to avoid disturbance between approximately November 15 and April 1.

Where elk management areas overlap with winter range areas, management directions for both areas would be applied.

## **Golden Eagles**

### **Objectives -**

**Management Actions/Direction** - Approximately 30 acres would be protected around all known golden eagle nest sites. Within those areas there would be no timber harvest or other habitat removal. Human disturbance would be prohibited between approximately March 1 and July 15. No new roads would be constructed within the 30-acre core area around active nests.

## **TIMBER PRODUCTS**

### **Objectives**

Timber management activities would be planned and designed to produce a sustained flow of forest products in order to contribute to long term stability for dependent communities and local industries. A diversity of forest products (timber and nontimber) would be offered in order to support both large and small commercial operations as well as noncommercial operations.

All silvicultural systems would be sustainable, economically practical, and capable of maintaining the long-term health and productivity of the forest ecosystem.

Forest management practices would be designed to retain long-term site productivity, promote ecosystem health, and assure the sustainability of timber production.

Silvicultural treatments and harvest schedules would be designed to assure that wood quality is suitable for the range of current and forecast uses and that maintenance or enhancement of log value is an objective of silvicultural treatments.

## **Land Use Allocations**

Suitable commercial forest land that would be available for timber management includes land in both the General Forest Management Areas, and Connectivity/Diversity Blocks. In addition, suitable

commercial forest land in OGEAs would be available for density management in the next decade and would be available for regeneration harvests pending deferral for eight decades.

**Economically Marginal Lands:** Lands determined to be economically marginal are not included in the timber allocation. Timber harvest could occur from those lands when changed economic conditions made them economical and where consistent with land use allocations.

**Woodlands:** Timber harvest from woodlands is not planned (or included in ASQ estimates) but could occur to carry out management actions designed to achieve nontimber resource objectives as part of research or to salvage mortality. Any harvest would be consistent with other land use allocations and objectives.

**Site Class V Lands:** Site Class V lands would be managed at a lower level of intensity because of economic considerations and uncertainty about the effect of intensive management on poor sites.

**Hardwood Stands: (Medford example)** Hardwood stands would be managed for production of commodities as markets became available, but regeneration with the same hardwood species mix would follow harvest. Up to one two-hundredths of the total hardwood allocation area could be harvested per year.

**White oak woodlands** would be managed to meet wildlife, range, and biological diversity objectives.

**Enhancement of Other Resources:** Lands unavailable for planned forest management include: woodlands, recreation sites, RMAs, ACECs, wild rivers corridors, and habitat for threatened and endangered and special status species including the northern spotted owl. Timber harvest would occur only as part of strategies to enhance other resources such as riparian habitat, wildlife habitat, or management of special areas. Harvest from these lands, would generally not be included in the planned ASQ.

The following lists some of the reasons that timber harvest could occur on these lands:

- Provide more logical logging units or reduce road construction, thereby reducing overall cumulative effects.
- Salvage timber killed or substantially damaged by fire, wind throw, insect infestation, or other catastrophe. Such harvest would be accomplished under special silvicultural prescriptions designed to meet the needs of nontimber allocations made on these lands.
- Provide for the safety of forest users (including removing hazard trees along roads and trails, in campgrounds and administrative sites, etc.).
- Facilitate construction, operation, and maintenance of new facilities such as roads, trails, power lines, communication facilities, recreation or administrative facilities, etc.
- Scientific or research studies.
- Isolate and release Douglas-fir and sugar pine test trees.
- Maintain or enhance fish and wildlife habitats.

- Facilitate development of mines, quarries, or fluid mineral leases.
- Modify high fuel hazard areas by construction of shaded fuel breaks and/or increase defensible space for fire suppression by maintenance of early seral stage conditions. Such activity could occur to provide protection for timber production areas, old-growth blocks, or developed recreational facilities.

## Management Actions/Direction

**Vegetation management** treatments would be based on attainment of allocation objectives including timber production, maintenance of wildlife habitat, and maintenance of species diversity. Herbicides could be utilized in accordance with the anticipated BLM Management of Competing Vegetation Record of Decision, but preference would be given to strategies which redirected natural ecosystem processes where practical and where scientific knowledge was adequate to support such strategies. After a transition period to complete needed stand maintenance on clearcuts created by past management, aerial application of herbicides would decline to a negligible level.

To minimize the regeneration period, artificial regeneration would be used to supplement natural reforestation. Planting would occur at minimum needed densities using a mix of native species (generally based on the percentage of species existing in the stand) to help assure species diversity.

Forest fertilization would be used with preference given to fertilization of young even-aged stands of site four and higher in the next decade.

Practices that enhance timber quality, including pruning, would be used.

**Water quality and site productivity:** Best Management Practices for soil and water resources would be used in designing site-specific silvicultural prescriptions consistent with the objectives of each plan alternative.

**Salvage of mortality:** Salvage of partial or entire stand mortality would occur where consistent with land use allocations, as well as snag and down wood retention objectives for soils and wildlife (see Wildlife section).

**Species and stocking levels:** The density and species mixture of commercial forest stands would be consistent with the design and theme of each alternative. Both precommercial and commercial thinning would be scheduled to achieve desired levels of timber production, to maintain stand vigor, and to achieve desired stand characteristics.

**Reforestation practices:** All stands subject to regeneration harvest would be promptly reforested using seeding, planting, or natural reforestation techniques. Emphasis would be placed on the use of practices which were based on an understanding of and maintenance of natural ecological relationships.

**Site preparation and stand establishment:** Site preparation, stand maintenance, stand protection, and release practices would be designed to be consistent with ecological site capabilities and would utilize approaches which were ecosystem based. The approaches would utilize biological methods, prescribed burning, chemical treatments, and mechanical or manual treatments to meet plan



objectives and be consistent with decisions in the anticipated Management of Competing Vegetation Record of Decision. Actions would emphasize the use of preventative or ecosystem-based strategies within an integrated approach which considers all available tools, natural ecological processes, human health, economics, fire hazard, environmental quality, and the maintenance of site productivity. Site preparation treatments would occur promptly after yarding to assure timely reforestation.

**Hardwood Conversion to Conifers:** Natural hardwood and shrub communities on suitable commercial forest land would not be converted to conifer production. Stands on commercial forest land which are dominated by commercial conifers, but which also contain a high percentage of hardwoods at a successional stage, would be managed for timber production. Suitable commercial forest land allocated to timber management and dominated by grass, shrubs, and hardwoods which resulted from human activity would be restored to conifer protection. Enough hardwood species would be retained to maintain species diversity.

**Minimum Harvest Age:** The minimum harvest age varies by district, ranging from 60 to 120 years.

**Allowable Sale Quantity:** The allowable sale quantity is based on planned timber harvest. Volume sold per year would be as evenly distributed as possible during the decade. Generally, salvage or other unplanned harvest would replace the planned sale volume.

**Utilization standards:** Sale of forest products would be designed to encourage full utilization of harvested timber while reserving structural components (such as snags and coarse woody debris) consistent with objectives for wildlife habitat management, old-growth management, biological diversity, and site productivity.

**Logging systems:** Harvesting methods and yarding systems would be selected based on suitability for the successful implementation of silvicultural systems, operational and economic practicality, and protection of site productivity and water quality.

**Roads:** The timber access road network for lands allocated to timber management would be based on attainment of ready access for appropriate logging systems, silvicultural treatments, and fire protection. Road management planning would include access needed for silvicultural treatments, inventory, and other administrative work. Planned road maintenance would protect the existing investment and watershed values.

## **SPECIAL FOREST PRODUCTS**

### **Objectives**

Sale of special forest products (firewood, burls, mushrooms, ferns, floral greens, etc.) would be consistent with other land use allocations. Sales would ensure resource sustainability and protection of other resource values such as special status plants or animals species. The market value of such products would be based on their highest and best use.

Develop special forest product programs to support economic diversity of local resource dependent communities.

## Land Use Allocations

Sale of special forest products would be consistent with the objectives for other land use allocations. Areas that would not be available for the sale of special forest products could include:

- Areas of Critical Environmental Concern
- Research Natural Areas
- Outstanding Natural Areas
- Special Status fauna and flora sites
- Wilderness
- Wild river areas
- Areas used by American Indians under existing treaties

## Management Actions/Direction

Species or groups of plants that would be restricted or limited from harvest would vary by district.

## SILVICULTURAL SYSTEMS

The silviculture for the various land use allocations essentially has not been changed for the revised Draft Plans. Although, the Connectivity Areas were redesigned on the landscape level, the silvicultural approach remained the same with the exception of the retention of 25 percent of the oldest forest within the Connectivity/Diversity Blocks.

Table B1-3. BLM Revised Draft Preferred Alternative

Allocation Category	(thousand acres)											
	Salem		Eugene		Roseburg		Coos Bay		Medford <sup>1</sup>		W. Oregon	
Conservation Areas <sup>2</sup>	201	51%	185	59%	173	41%	131	40%	251	27%	942	40%
Special Management <sup>3</sup>	49	12%	23	7%	55	13%	47	15%	272	30%	445	19%
Connectivity <sup>4</sup>	41	10%	16	5%	54	13%	20	6%	17	2%	149	6%
General Forest Management <sup>5</sup>	107	27%	91	29%	137	33%	129	39%	379	41%	843	35%
<b>Total</b>	<b>398</b>	<b>100%</b>	<b>315</b>	<b>100%</b>	<b>419</b>	<b>100%</b>	<b>327</b>	<b>100%</b>	<b>919</b>	<b>100%</b>	<b>2,379</b>	<b>100%</b>

<sup>1</sup> Includes Klamath Falls Resource Area

<sup>2</sup> Conservation Areas = Deferred Old-Growth Emphasis Areas (OGEAs), Non-Deferred OGEAs, Reserved and Managed Pair Areas, and Residual Habitat Areas.

<sup>3</sup> Special Management Areas = Timber Production Capability Classification (TPCC) woodlands, Areas of Critical Environmental Concern (ACECs) riparian buffers, recreation sites, and District allocations.

<sup>4</sup> Connectivity = Connectivity/Diversity Blocks

<sup>5</sup> General Forest Management = General Forest Management Areas



Figure B1-1. BLM - Revised Draft Preferred Alternative

# BLM - REVISED DRAFT PREFERRED ALTERNATIVE

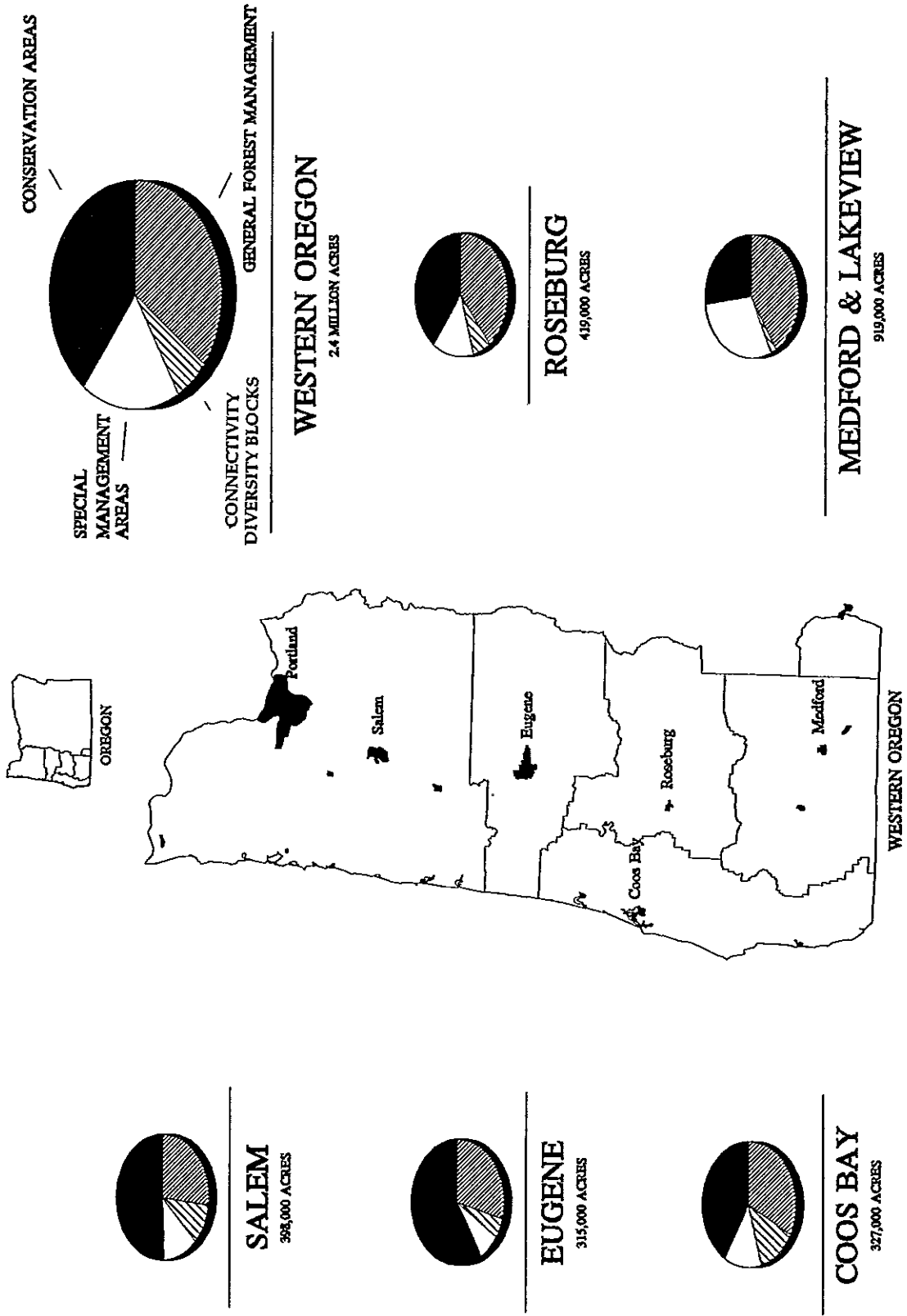


Figure B1-2. Salem District Revised Draft Preferred Alternative

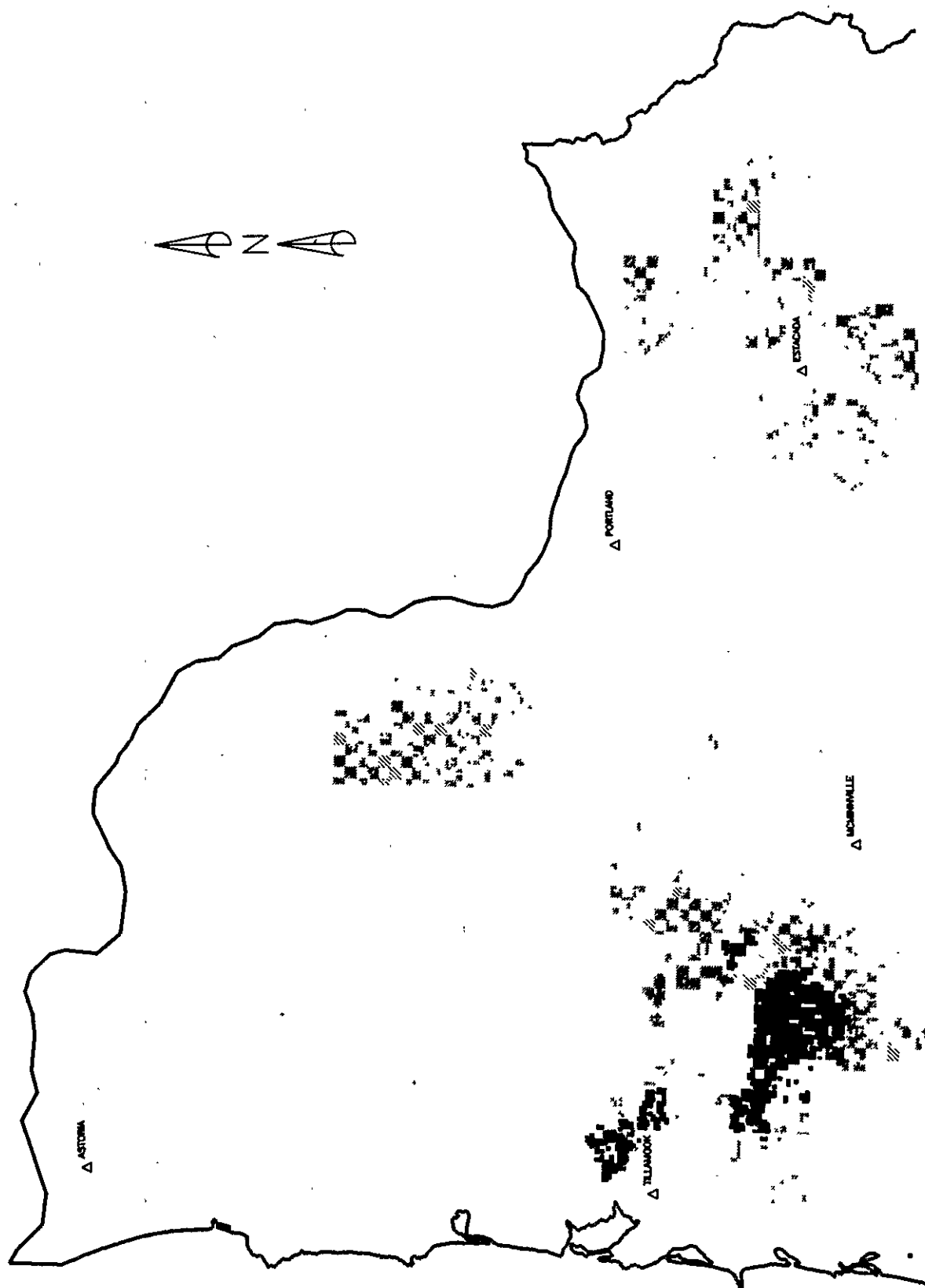
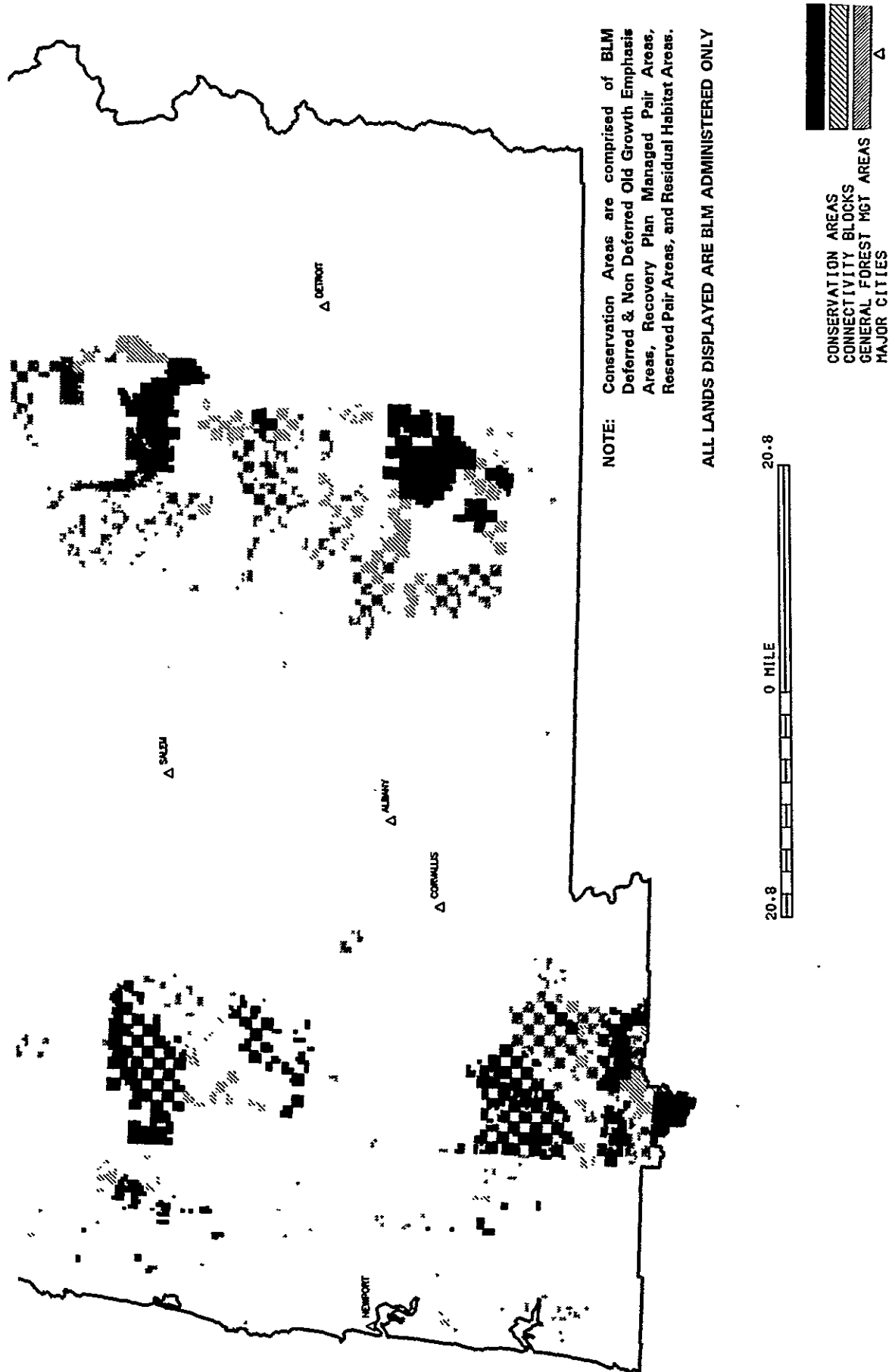


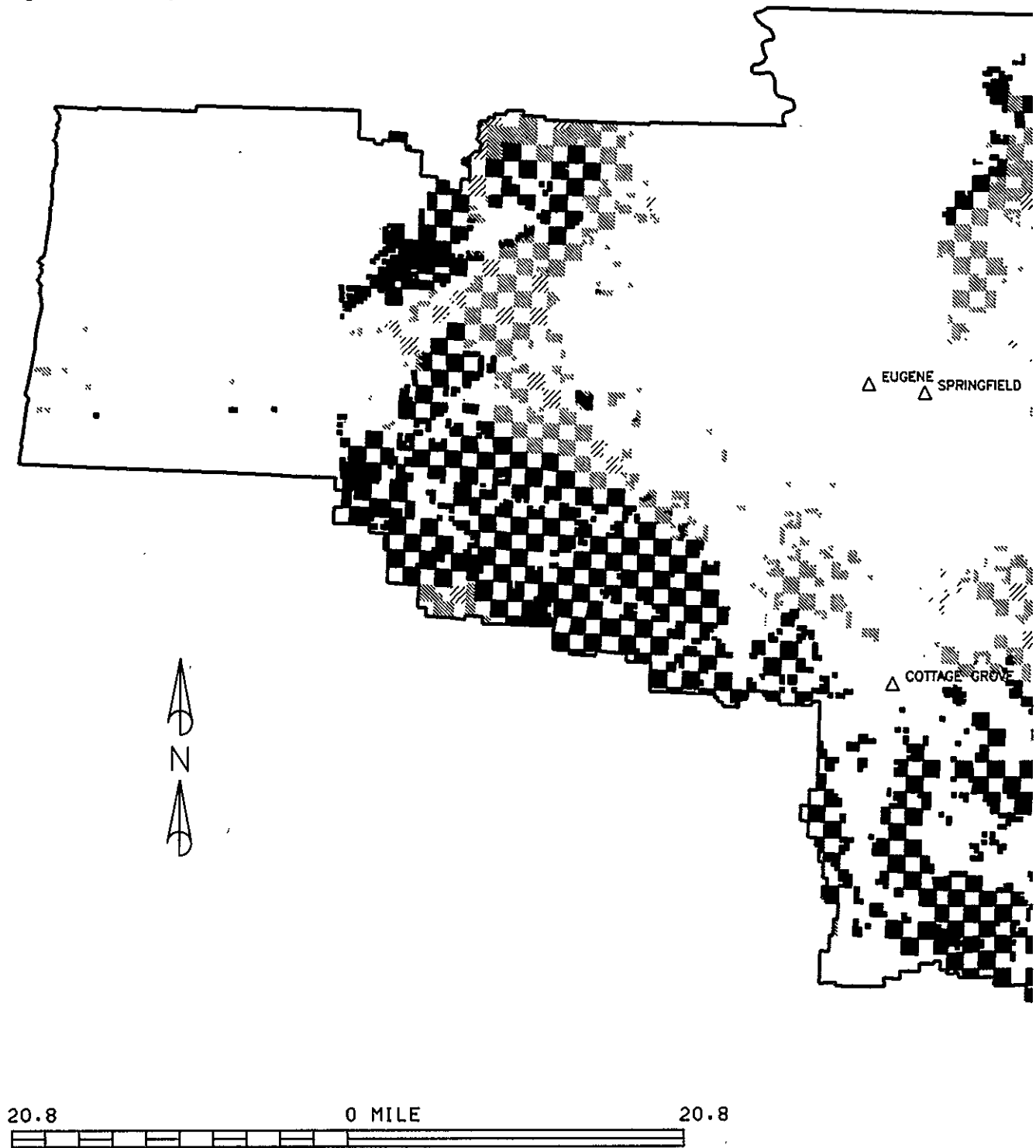
Figure B1-2. (continued)



SALEM DISTRICT REVISED DRAFT PREFERRED ALTERNATIVE

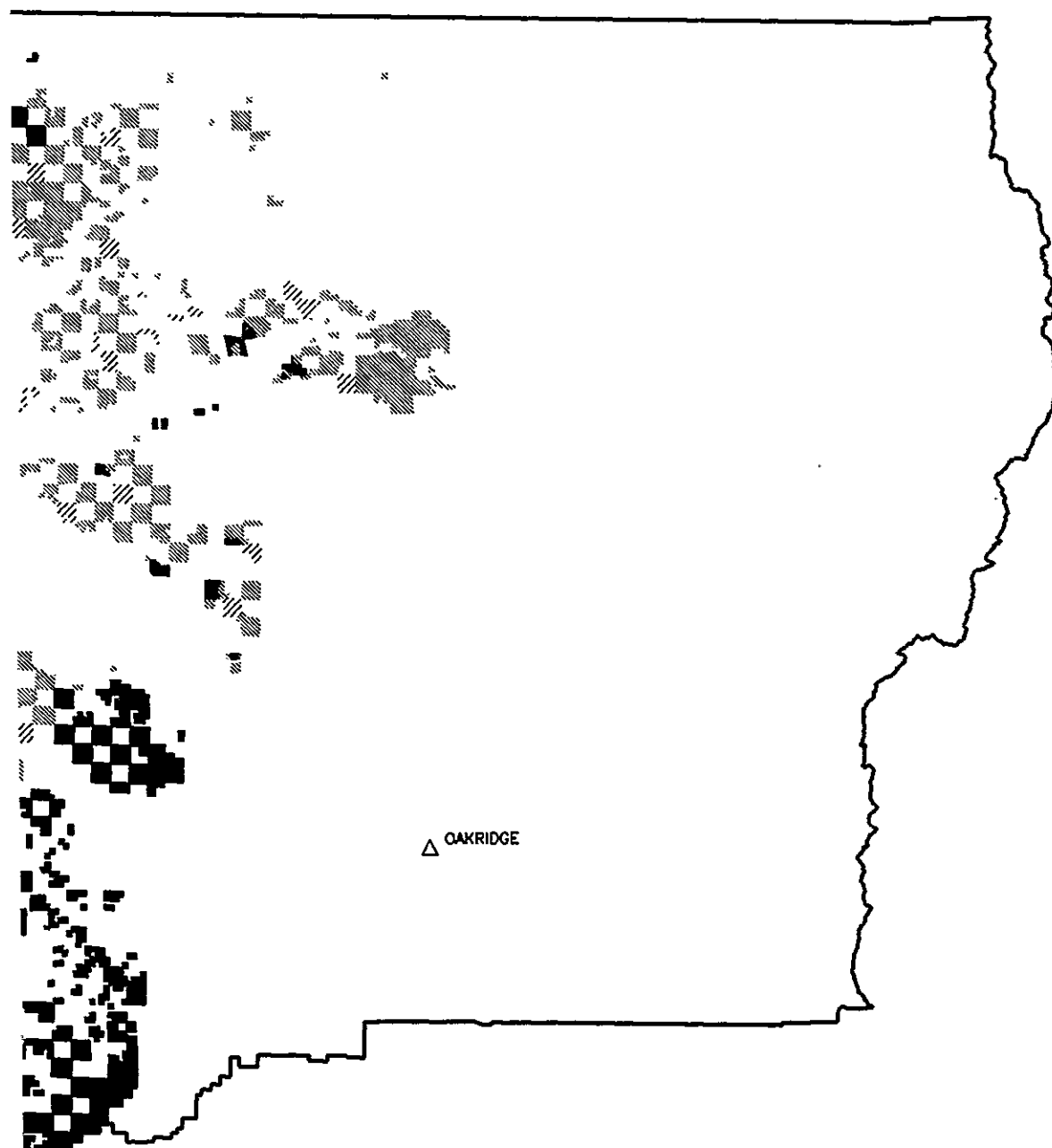
JUNE 1993

Figure B1-3. Eugene District Revised Draft Preferred Alternative



## EUGENE DISTRICT REVISED DRAFT

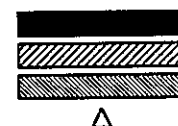
Figure B1-3. (continued)



NOTE: Conservation Areas are comprised of BLM Deferred & Non Deferred Old Growth Emphasis Areas, Recovery Plan Managed Pair Areas, Reserved Pair Areas, and Residual Habitat Areas.

ALL LANDS DISPLAYED ARE BLM ADMINISTERED ONLY

CONSERVATION AREAS  
CONNECTIVITY BLOCKS  
GENERAL FOREST MGT AREAS  
MAJOR CITIES



**PREFERRED ALTERNATIVE**

JUNE 1993



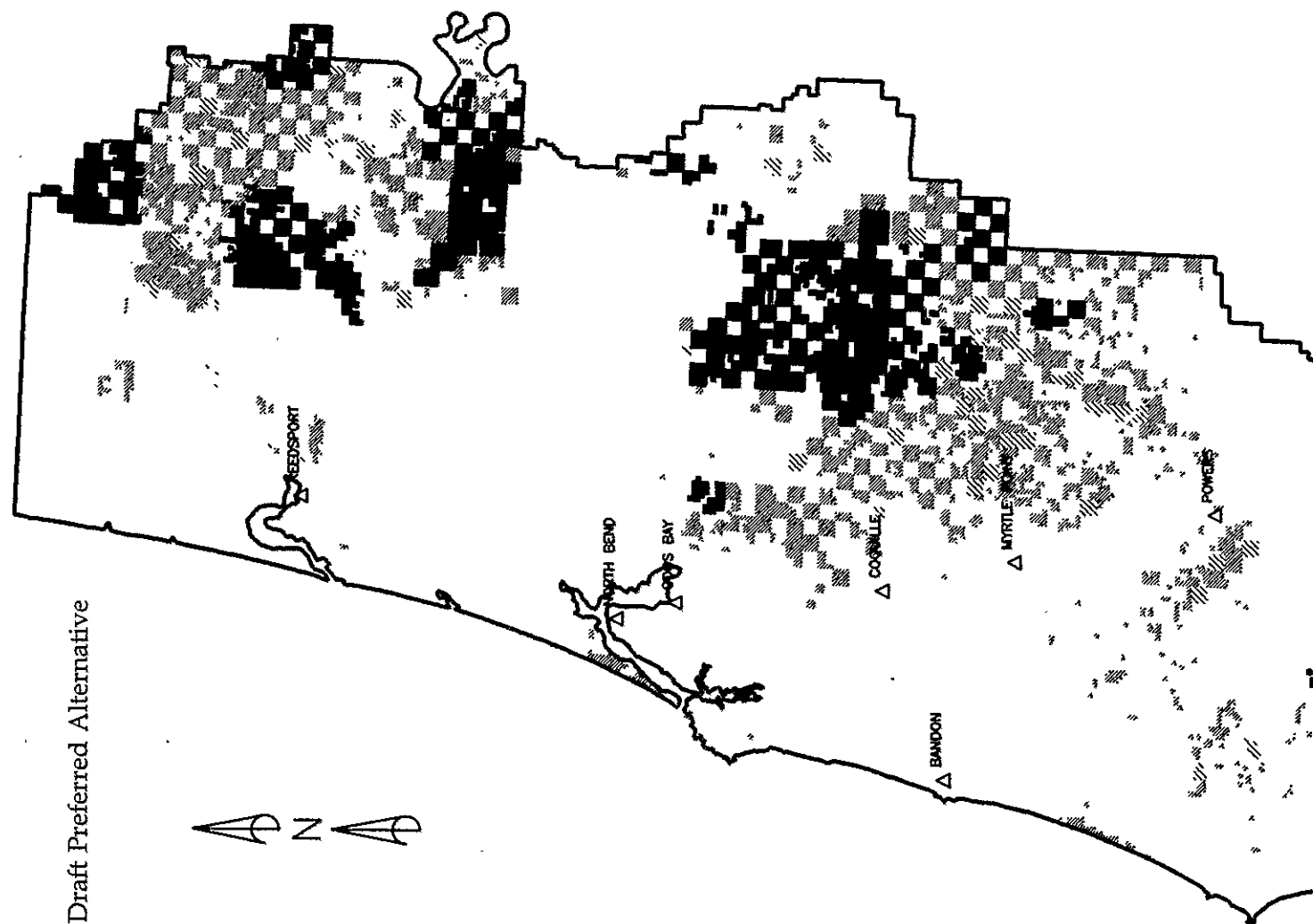


Figure B1-4. Coos Bay District Revised Draft Preferred Alternative

JUNE 1993

COOS BAY DISTRICT REVISED DRAFT PREFERRED ALTERNATIVE

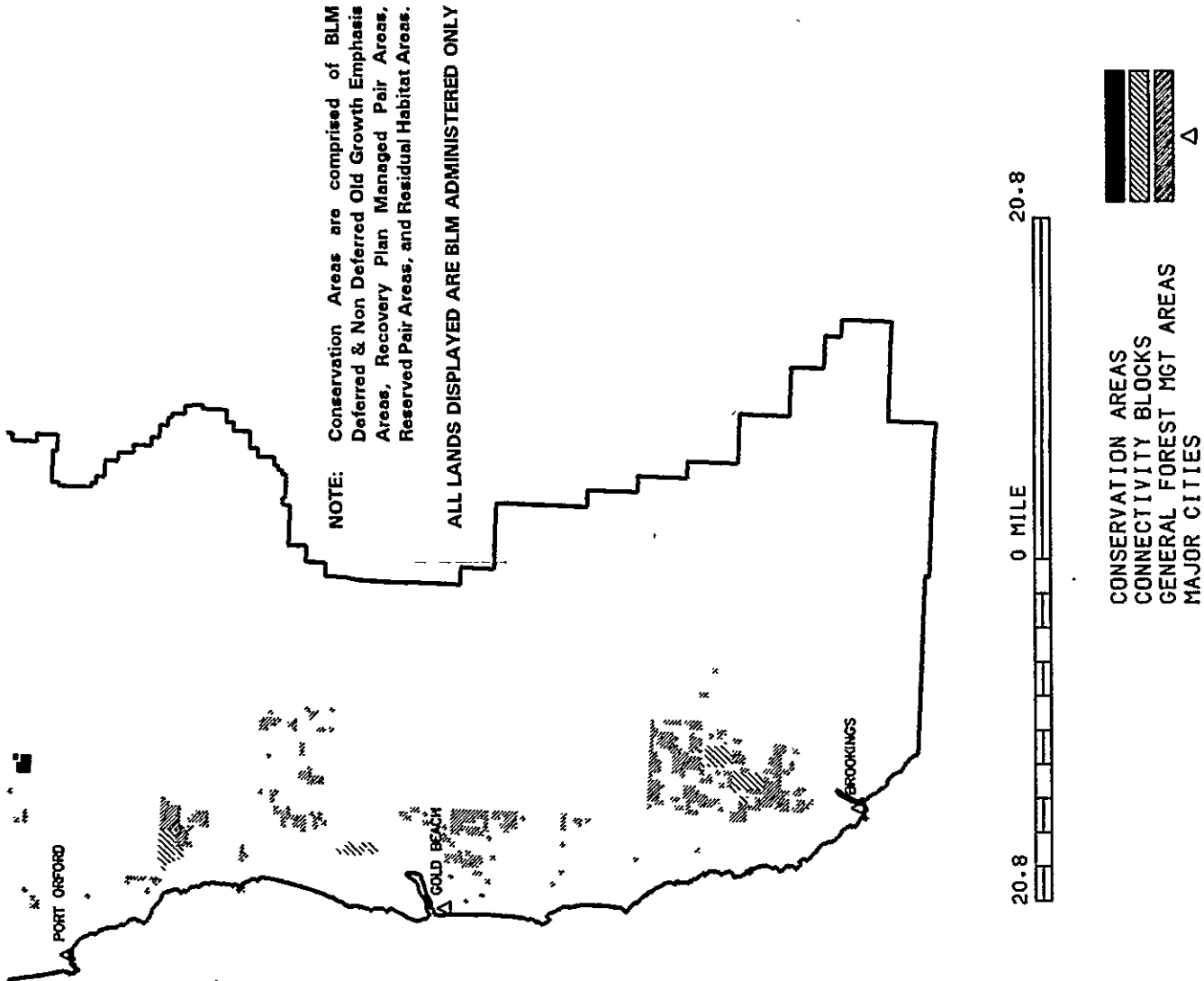
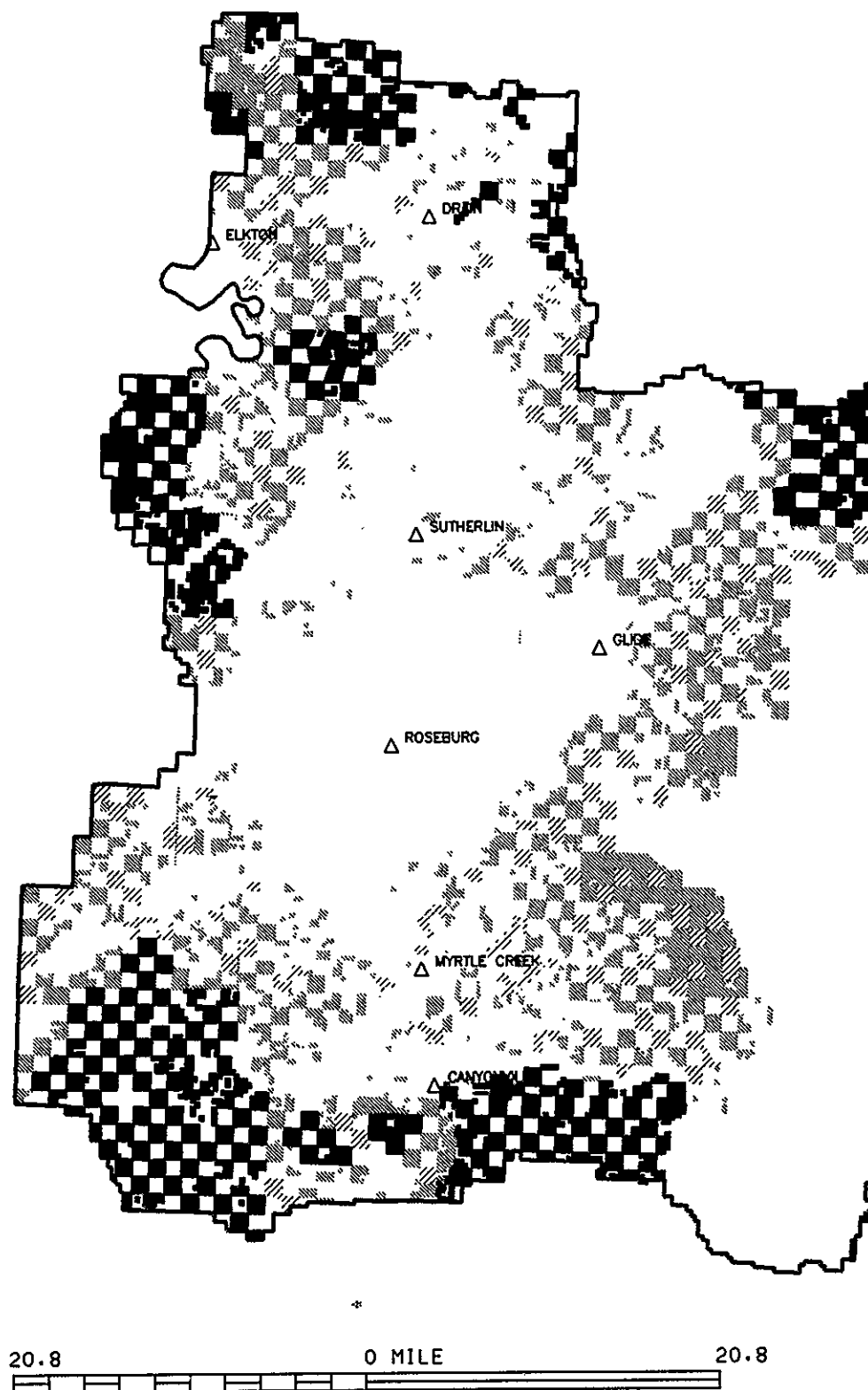


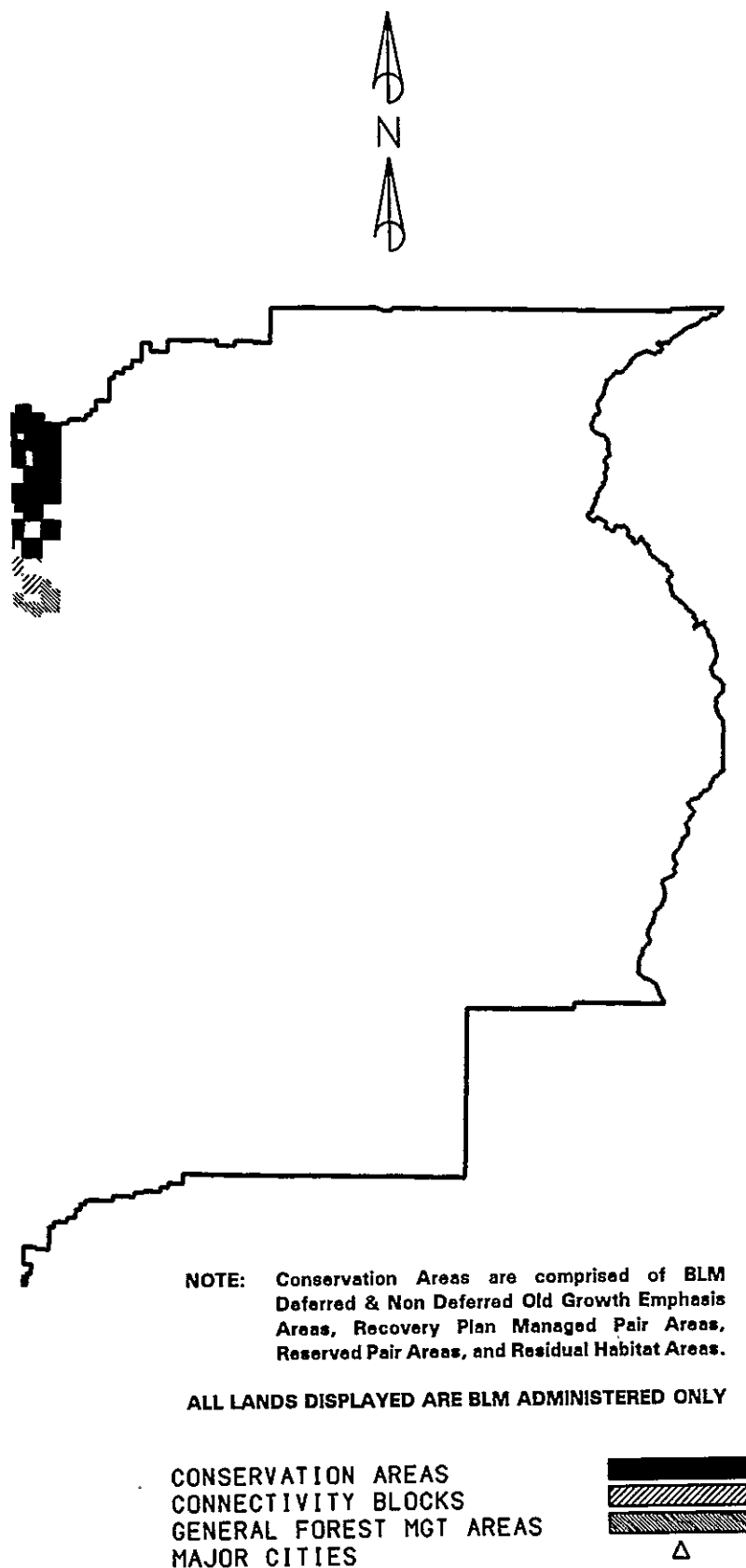
Figure B1-4. (continued)

Figure B1-5. Roseburg District Revised Draft Preferred Alternative



## ROSEBURG DISTRICT REVISED DRAFT

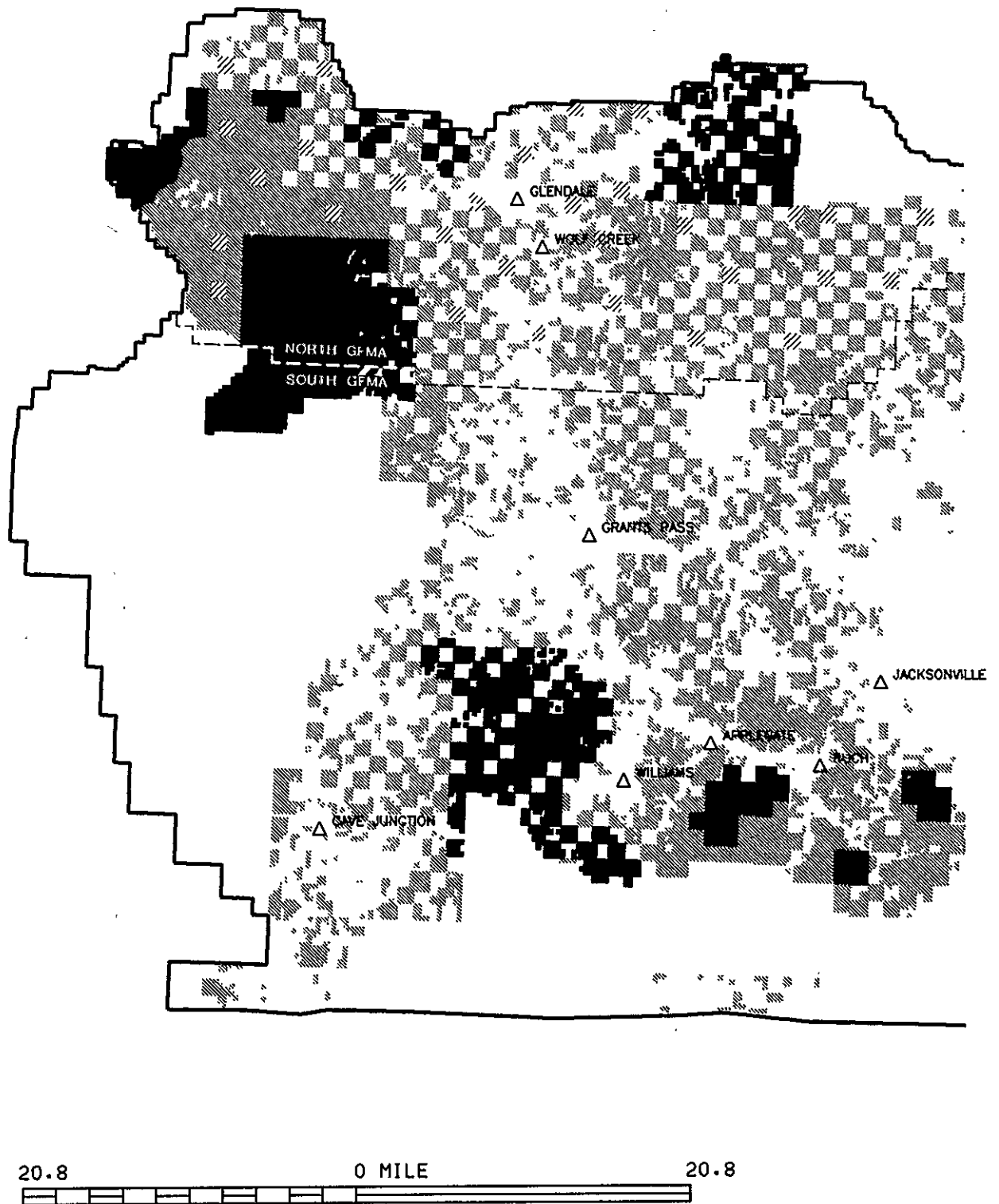
Figure B1-5. (continued)



**PREFERRED ALTERNATIVE**

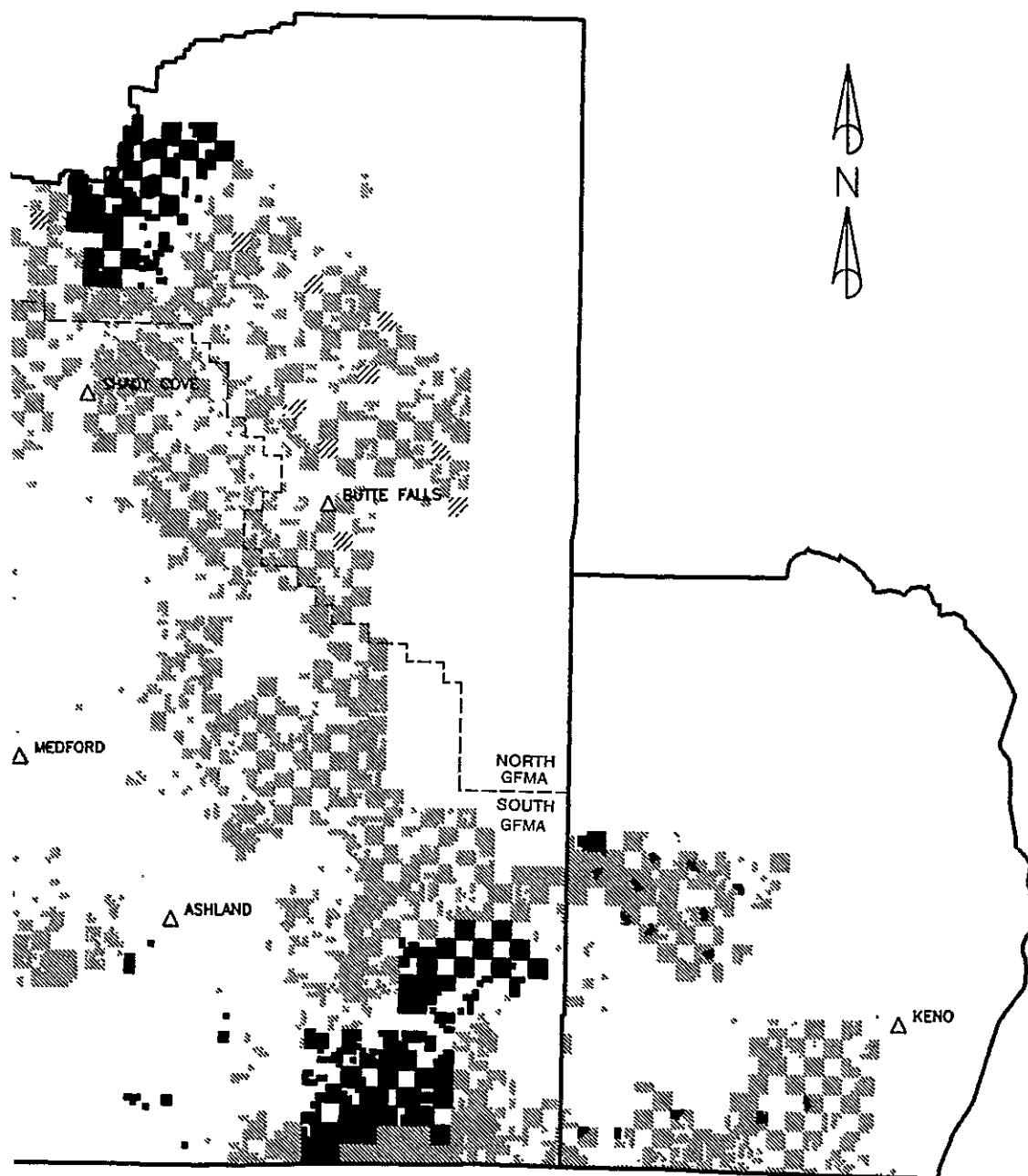
JUNE 1993

Figure B1-6. Medford/ Lakeview District Revised Draft Preferred Alternative



## MEDFORD/LAKEVIEW DISTRICT REVISED

Figure B1-6. (continued)



NOTE: Conservation Areas are comprised of BLM Deferred & Non Deferred Old Growth Emphasis Areas, Recovery Plan Managed Pair Areas, Reserved Pair Areas, and Residual Habitat Areas.

ALL LANDS DISPLAYED ARE BLM ADMINISTERED ONLY

CONSERVATION AREAS  
CONNECTIVITY BLOCKS  
GENERAL FOREST MGT AREAS  
MAJOR CITIES



**DRAFT PREFERRED ALTERNATIVE**

JUNE 1993



# Appendix B2

## Ecological Principles for Management of Late-Successional Forests

This section of Appendix B is adapted from the FEMAT Report to provide additional information on the objectives and assumptions regarding management to protect and enhance habitat for late-successional and old-growth related species. It clarifies the intent of the standards and guidelines in order to provide guidance for situations not specifically covered by the standards and guidelines. A similar discussion of the aquatic/riparian system is found in the Aquatic Conservation Strategy, Appendix B6. This section applies to all alternatives.

### General Ecological Basis For Forest Management

Late-successional forests are those forest seral stages that include mature and old-growth age classes (Thomas et al. 1993). One goal of the alternatives is to maintain late-successional and old-growth species habitat and ecosystems on federal lands. The alternatives differ in the means and the likelihood of achieving this goal. Another goal of forest management on federal lands is to maintain biological diversity associated with native species and ecosystems in accordance with laws and regulations. Forest ecosystems are quite variable throughout the range of the northern spotted owl. Therefore, site-specific knowledge of ecosystems will be incorporated into watershed-level analysis and integrated into province-level plans.

In Late-Successional Reserves, standards and guidelines are designed to maintain late-successional forest ecosystems and protect them from loss due to large scale fire, insect and disease epidemics, and major human impacts. The intent is to maintain natural ecosystem processes such as gap dynamics, natural regeneration, pathogenic fungal activity, insect herbivory, and low intensity fire. In some alternatives, standards and guidelines encourage the use of silvicultural practices to accelerate the development of overstocked young plantations into stands with late-successional and old-growth forest characteristics, and to reduce the risk to Late-Successional Reserves from severe impacts resulting from large-scale disturbances and unacceptable loss of habitat.

The matrix is an integral part of the management direction included in all alternatives. Production of timber and other commodities is an important objective for the matrix. However, forests in the matrix function as connectivity between Late-Successional Reserves and provide habitat for a variety of organisms associated with both late-successional and younger forests. Standards and guidelines for the matrix are designed to provide for 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. The matrix will also add ecological diversity by providing early-successional habitat.

### STRUCTURE AND COMPOSITION

The structure and composition of late-successional and old-growth forest ecosystems have been detailed in numerous publications (e.g., Franklin et al. 1981; Spies and Franklin 1988, 1991). Franklin



et al. (1981) identified four major structural attributes of old-growth Douglas-fir forests: live old-growth trees, standing dead trees (snags), fallen trees or logs on the forest floor, and logs in streams. Additional important elements typically include multiple canopy layers, smaller understory trees, canopy gaps, and patchy understory (Spies et al. 1990). Structural characteristics of late-successional and old-growth forests vary with vegetation type, disturbance regime, and developmental stage. For example, in many Douglas-fir stands in western Oregon and Washington, the mature phase of stand development begins around 80 years and is characterized by relatively large live and dead trees (Spies and Franklin, in press), although multiple canopy layers may not yet be well developed. In some forest types subject to frequent, low intensity fire, such as ponderosa pine, the late-successional and old-growth stages are typically characterized by relatively open understories and relatively few large fallen trees (in comparison to more moist Douglas-fir/western hemlock types). Standards and guidelines designed to promote the desired conditions vary among physiographic provinces because characteristics of the natural structure and composition of late-successional and old-growth forests also vary among the provinces.

## ECOLOGICAL PROCESSES

Ecological processes include those natural changes that are essential for the development and maintenance of late-successional and old-growth forest ecosystems. Although the processes that created the current late-successional and old-growth ecosystems are not completely understood, they include: (1) tree growth and maturation, (2) death and decay of large trees, (3) low-to-moderate intensity disturbances (e.g., fire, wind, insects, and diseases) that create canopy openings or gaps in the various strata of vegetation, (4) establishment of trees beneath the maturing overstory trees either in gaps or under the canopy, and (5) closing of canopy gaps by lateral canopy growth or growth of understory trees. These processes result in forests moving through different stages of late-successional and old-growth conditions that may span 80 to 1,200 years for forests dominated by long-lived species.

Several authors have described these stages (Bormann and Likens 1979; Oliver 1981; Peet and Christensen 1987), and Spies and Franklin (in press) have expanded these descriptions to include the protracted nature of stand development in forests dominated by long-lived trees such as Douglas-fir. Following stand-replacement disturbance, these stages can be described as: (1) establishment, (2) thinning, (3) maturation, (4) transition, and (5) shifting-gap.

The maturation stage (3) is characterized by a slowed rate of height growth and crown expansion. Heavy limbs begin to form; gaps between crowns become larger and more stable, or expand from insect and pathogen mortality. Large dead and fallen trees begin to accumulate, and the understory may be characterized by seedlings and saplings of shade-tolerant tree species. In Douglas-fir stands west of the Cascade Range, this stage typically begins between 80 and 140 years, depending on site conditions and stand history.

During the transition stage (4), the original component of overstory trees approaches its maximum height and diameter, and growth is slow. Tree crowns become more open, irregular in shape and contain heavy limbs. Broken, dead, and decaying portions of tree crowns are common. Old trees become relatively resistant to low-to-moderate intensity fire and, depending on species, crown bases are high above the understory and bark is relatively thick. During this stage, understory trees form multiple canopy layers. Coarse woody debris accumulates to relatively high levels, and low-to-moderate intensity disturbances from insects, diseases, wind, and fire create patchy openings and accumulations of standing dead trees. These disturbances also frequently promote establishment or

advancement of understory trees that eventually fill the holes in the canopy. In Douglas-fir stands west of the Cascade Range, this stage begins between 150 to 250 years, and may last for an additional 300 to 600 years depending on site conditions and species.

The shifting-gap stages begins when the last of the original component of overstory old-growth trees dies and all trees in the canopy have established following smaller gap-type disturbances of various types. Forests in the last two stages of development (4 and 5) actually contain all of the stand developmental stages in a relatively fine-grained mosaic of smaller stands. The later three stages (3, 4, and 5) embody the late-successional and old-growth conditions that are the focus of this SEIS.

Some of the stand development processes, such as tree growth and mortality, and understory establishment, can be accelerated through silvicultural manipulations. Most of the alternatives provide for the acceleration of these processes in younger stands. Other processes such as tree crown maturation, bark thickening, and tree bole decay are not readily accelerated through silviculture. Because of limitations in knowledge of late-successional and old-growth forest processes and lack of silvicultural experience in old stands, it is not certain that old-growth ecosystems can be completely replicated.

Most of the current late-successional and old-growth stands developed from natural regeneration following wildfire events that occurred during the last 500 to 600 years. These fires covered large areas—frequently many thousands of acres. Although these fires were large, they burned in patches of variable intensity and severity, and left many areas of unburned or lightly burned forest. The natural regime of patchy fires that leave an abundance of large dead trees and lesser amounts of scattered live trees, as individuals and in patches, is the basis for silvicultural methods such as retention of green trees as individuals and in patches.

In some cases, however, natural reburns occurred, resulting in relatively little carryover of live trees as a legacy from the old-growth condition. Where considerable live and dead material was left following fires, young stands contained many old-growth structures and presumably old-growth associated organisms, including organisms associated with coarse woody debris on the forest floor.

Large fires and relatively long fire return intervals in the moist northern and western physiographic provinces resulted in periods during which landscapes contained large areas of relatively unbroken forest cover. In the warmer, drier physiographic provinces (i.e., the Washington and Oregon Eastern Cascades, the California Cascades, and the Oregon and California Klamath Provinces), fire is more frequent, less intense, and is an integral part of the internal dynamics of a typical stand (tens to hundreds of acres). In the drier provinces, fire control and timber harvest have decreased the abundance of some types of old growth, such as ponderosa pine, that are dependent on frequent, low intensity fires. Other types of late-successional forest that are less fire resistant or are less desirable for harvest have become more widely distributed. In these areas, the potential for stand-replacement wildfires has increased, resulting in a higher risk to the stability of current stands reserved for late-successional species.

At a landscape scale and over long periods, stand-replacing wildfires have an important role in resetting successional processes and developing new areas of late-successional forests to replace those lost through succession or disturbance. Silvicultural practices designed to imitate natural processes may be able to reset succession to achieve stand and landscape level goals. This type of silviculture may meet a variety of ecosystem objectives. However, experience in applying silviculture for late-successional objectives is limited. Until more experience and knowledge about active management to

produce late-successional ecosystems is gained, sustaining late-successional ecosystems in the landscape will be best accomplished through retention of existing areas of late-successional forest. Given the relatively low remaining proportion of late-successional ecosystem in the landscape at the present time, these older forests should be protected from fire and other stand resetting disturbances.

## ECOSYSTEM FUNCTIONS

Late-successional ecosystems perform several ecological functions that appear to be lacking, or less well developed, in younger natural forests and managed plantations. These functions include buffering microclimates during seasonal climatic extremes (Chen et al. 1993), producing food for those consumer organisms that occupy late-successional forests (Huff et al. 1991, Ure and Maser 1982), storing carbon (Harmon et al. 1990), providing nutrient and hydrological cycling (Franklin and Spies 1991), and providing sources of arthropod predators and organisms beneficial to other ecosystems or successional stages (Schowalter 1989). Old-growth ecosystems appear to have high retention of nutrients (Sollins et al. 1980) and low soil erosion potential (Swanson et al. 1982), although differences in these functions between stand developmental stages may not be large when canopy closure has occurred. Tall, deep canopies of late-successional forests can also intercept more moisture from clouds and fog than young plantations (Harr 1982).

## LATE-SUCCESSIONAL RESERVES

All alternatives include reserves designed to maintain and enhance late-successional forests as a network of existing old-growth forest ecosystems, although their size, distribution, and management varies. These reserves represent a network of existing old-growth forests that are retained in their natural condition with natural processes, such as fire, allowed to function to the extent possible. The reserves are designed to serve a number of purposes. First, they provide a distribution, quantity, and quality of old-growth forest habitat sufficient to avoid foreclosure of future management options. Second, they provide habitat for populations of species that are associated with late-successional forests. Third, they will help ensure that late-successional species diversity will be conserved.

Late-successional forest communities are the result of a unique interaction of disturbance, regeneration, succession, and climate that can never be recreated in their entirety through management. The structure, species composition, and function of these forests are in their entirety not fully understood. However, silvicultural restoration can accelerate the development of some of the structural and compositional features of such forests. Because they will regenerate by different processes during a different time period than existing late-successional forests, silviculturally created stands may look and function differently from current old-growth stands that developed over the last 1,000 years. Consequently, conservation of a network of natural old-growth stands maintains biodiversity into the future.

Desired late-successional and old-growth characteristics that will be created as younger stands change through successional development include: (1) multispecies and multilayered assemblages of trees, (2) moderate-to-high accumulations of large logs and snags, (3) moderate-to-high canopy closure, (4) moderate-to-high numbers of trees with physical imperfections such as cavities, broken tops, and large deformed limbs, and (5) moderate-to-high accumulations of fungi, lichens, and bryophytes. Although they may not be duplicates of existing old-growth forests, these stands could provide adequate habitat for many species in the long term.

## THE ROLE OF SILVICULTURE

Silviculture is the art and science of managing forest stands to provide or maintain structures, species composition, and growth rates that contribute to forest management goals. Silvicultural practices under the selected alternative will vary considerably because of the broad variety of forest species and ecosystems within the range of the northern spotted owl. The ecosystems range from coastal temperate rain forests where fire occurs infrequently, but where wind may have a major impact, to forests on dry interior sites where disturbance by natural fire and insects is common. Within specific locales, the silvicultural practices will be strongly influenced by such factors as nearby residential areas, local wildlife habitat requirements, and fire management constraints.

Silvicultural systems proposed for Late-Successional Reserves have two principal objectives: (1) development of old-growth forest characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition; and (2) prevention of large-scale disturbances by fire, wind, insects, and diseases that would destroy or limit the ability of the reserves to sustain viable forest species populations (Tappeiner et al. 1992). Small-scale disturbances by these agents are natural processes, and will be allowed to continue.

Matrix objectives for silviculture should include: (1) production of commercial yields of wood, including those species such as Pacific yew and western red cedar that require extended rotations, (2) retention of moderate levels of ecologically valuable old-growth components such as snags, logs, and relatively large green trees, and (3) increasing ecological diversity by providing early-successional habitat.

## STAND MANAGEMENT

Forests within Late-Successional Reserves are composed of managed stands from 2 to over 80 years old, as well as unmanaged, late-successional, and old-growth stands. The younger stands were usually established following fire or timber harvest. Some of these stands will develop old-growth characteristics without silvicultural intervention. However, current stocking and structure of some of these stands were established to produce high yields of timber, not to provide for old-growth-like forests. Consequently, silviculture can accelerate the development of young stands into multilayered stands with large trees and diverse plant species, and structures that may, in turn, maintain or enhance species diversity. Tappeiner et al. (1992) discussed management of forest stands for northern spotted owl habitat, including examples of silvicultural systems and treatments that resemble natural forest disturbances.

Stand management in Late-Successional Reserves is proposed to focus on stands that have been regenerated following timber harvest or stands that have been thinned. These include stands that will acquire late-successional characteristics more rapidly with treatment, or are prone to fire, insects, diseases, wind, or other disturbances that would jeopardize the reserve. Depending on stand conditions, treatments could include, but not be limited to: (1) thinning or managing the overstory to produce large trees; release advanced regeneration of conifers, hardwoods, or other plants; or reduce risk from fire, insects, diseases, or other environmental variables, (2) underplanting and limited understory vegetation control to begin development of multistory stands, (3) killing trees to make snags and coarse woody debris, (4) reforestation, and (5) use of prescribed fire.

Stands in the matrix can be managed for timber and other commodity production, and to perform an important role in maintaining biodiversity. Silvicultural treatments of forest stands in the matrix can provide for retention of old-growth ecosystem components such as large green trees, snags and down logs, and depending on site and forest type, can provide for a diversity of species. Retention of green trees following timber harvest in the matrix provides a legacy that bridges past and future forests. Retaining green trees serves several important functions including snag recruitment, promoting multistoried canopies, and providing shade and suitable habitat for many organisms in the matrix.

Retaining of green trees of various sizes, ages, and species, in well-distributed patches as well as dispersed individuals, will promote species diversity. These trees may also act as refugia or centers of dispersal for many organisms including plants, fungi, lichens (Esseen et al. 1992), small vertebrates, and arthropods. Patches of trees may provide protection for special microsites such as seeps, wetlands, or rocky outcrops. Trees retained within the Riparian Reserves can contribute to overall retention objectives, but will generally not be sufficiently dispersed across the landscape to fully satisfy these objectives. Diversity of tree structure should be considered when selecting trees for retention. Complex canopy structure and especially leaning boles are beneficial for some lichens (Esseen et al. 1992). Trees that are asymmetrical provide a diversity of habitat substrates, and often have more lichen and moss epiphytes on large lateral limbs than symmetrical trees. Location of green trees is also important (e.g., ridgelines are optimal locations for lichen dispersal).

Coarse woody debris is essential for many species of vascular plants, fungi, liverworts, mosses, lichens, arthropods, salamanders, reptiles and small mammals. Because of drier microclimates, logs in the matrix may be occupied by species different from those found on coarse woody debris in late-successional forests. However, these logs may provide transitional islands for the maintenance and eventual recovery of some late-successional organisms in the matrix.

In the matrix, snags support populations of cavity nesters. Snags could be created in matrix stands if they are lacking, but there is uncertainty concerning the efficacy of killing trees to provide snags.

Adequate numbers of large snags and green trees are especially critical for bats because these trees are used for maternity roosts, temporary night roosts, day roosts, and hibernacula. Large snags and green trees should be well distributed throughout the matrix because bats compete with primary excavators and other species that use cavities. Day and night roosts are often located at different sites, and migrating bats may roost under bark in small groups. Thermal stability within a roost site is important for bats, and large snags and green trees provide that stability. Individual bat colonies may use several roosts during a season as temperature and weather conditions change. Large, down logs with loose bark may also be used by some bats for roosting.

Local information should be used to refine requirements for quantity, size, spacing, and distribution of snags and down logs. Guides for the retention of snags and down logs must be responsive to safety considerations during logging and other forest operations.

Thinning prescriptions should encourage development of diverse stands with large trees and a variety of species in the overstory and understory. Prescriptions should vary within and among stands.

## **MANAGEMENT OF DISTURBANCE RISKS**

Natural disturbance is an important process within late-successional forest ecosystems, but humans have altered disturbance regimes. Management may be required to reintroduce natural disturbance, such as fire, or to minimize socially unacceptable impacts. Fire suppression has resulted in significant

increases in accumulated fuels within some forests, particularly in the Washington and Oregon Eastern Cascades Provinces, the California Cascades Province, and the Oregon and California Klamath Provinces (Agee 1990; Deeming 1990; Kauffman 1990). At the same time, these forests may have become much more vulnerable to insects and diseases (Mitchell 1990; Mutch et al. 1993, Wickman 1992).

In Late-Successional Reserves in the Washington Western Cascades and coastal areas of Oregon and Washington, manipulation of natural stands to reduce fire hazard is generally not necessary due to a lower occurrence of fire. However, fuel management may be desirable in plantations.

In Late-Successional Reserves in the Eastern Cascades or Klamath Provinces, silviculture aimed at reducing the risk of stand-replacing fires may be appropriate. Treatments may include thinning and underburning. Due to fire suppression, some forests have become quite dense and multistoried, primarily from the invasion of shade-tolerant species (Tappeiner et al. 1992). Density reduction in mid-level canopy layers by thinning may reduce the probability of crown fires.

Underburning can be used to reduce fuel loading and vertical fuel continuity. Wildfires in stands that are managed using underburning are generally less severe, and fire suppression is aided. To increase effectiveness, underburning should be implemented over large areas (Agee and Edmonds 1992). Such activities in older stands in westside provinces may be warranted when levels of fire risk are high. Compartmentalized landscape units of reduced fuel allow safe access for fire suppression crews and provide strategic locations for efficient and effective fire suppression. Stands are manipulated to reduce continuity of canopies, boles are pruned on residual trees, and significant quantities of understory fuels are removed (Agee and Edmonds 1992). Many of these treatments may reduce the quality of habitat for late-successional organisms. Thus, managers need to seek a balanced approach that reduces risk of fire while protecting large areas of fire-prone late-successional forest.

Silvicultural systems within the matrix contribute to management of the Late-Successional Reserves. Fire and fuels management in the matrix can reduce the risk of fire and other large-scale disturbances that would jeopardize the reserves. Harvesting trees immediately adjacent to Late-Successional Reserves may result in increased wind damage along boundaries. In such cases, "feathering" stands within harvest units may be appropriate to reduce this risk. Local expertise will be essential in designing meaningful strategies for wind protection (Agee and Edmonds 1992).

## MANAGEMENT AFTER NATURAL DISTURBANCE

Fire, wind, insects, and diseases have greatly influenced the development of Pacific Northwest forests (Agee 1990, 1991; Agee and Edmonds 1992; Kauffman 1990). Fine-scale disturbances, generally by insects or diseases, cause deaths of single trees or small groups of trees which result in small patches of early-successional vegetation embedded in a larger portion of older forest. Coarse-scale disturbances, such as fire and wind, result in more extensive areas of early-seral vegetation. Many native forest organisms have adapted to these cycles and scales of disturbance and regrowth.

Most alternatives have provisions for management following natural disturbances in Late-Successional Reserves. Direct silvicultural management may be appropriate following disturbances such as extensive, high-severity fires. Smaller scale disturbances, such as those caused by insects, diseases, and wind, create small gaps in the overstory that characterize the transition and shifting-gap stages of old-growth forest development (Spies and Franklin 1989; Spies et al. 1990).

Tree mortality is an important and natural process within a forest ecosystem. Diseased and damaged trees and logs are key structural components of late-successional and old-growth forests (Franklin and Spies 1991; Spies and Franklin 1991). Salvage of dead trees affects the development of future stands and habitat quality for a number of organisms. Snag removal may result in long-term influences on forest stands because large snags are not produced in natural stands until trees become large and begin to die from natural mortality. Snags are used extensively by cavity-nesting birds and mammals such as woodpeckers, nuthatches, chickadees, squirrels, red tree voles, and American marten (Carey et al. 1991; Gilbert and Allwine 1991a,b; Lundquist and Mariani 1991; Thomas et al. 1993). Removal of snags following disturbance can reduce the carrying capacity for these species for many years.

Coarse woody debris is a necessary component of forest ecosystems. This wood provides habitat for a broad array of vertebrates, invertebrates, fungi, mosses, vascular plants, and micro-organisms. Arthropods, salamanders, reptiles, and small mammals live in or under logs; woodpeckers forage on them; and vascular plants and fungi grow on rotting logs (Harmon 1986, Thomas et al. 1993). Provision for retention of snags and logs normally should be made, at least until the new stand begins to contribute coarse woody debris (USDI unpub.).

Many natural disturbances do not result in complete mortality of stands. For example, recent fires in the Oregon Western Cascades Province killed 25 to 50 percent of trees within the areas burned, leaving 50 to 75 percent of the stands intact (USDA FS 1988, 1989, 1992b). The surviving trees are important elements of the new stand. They provide structural diversity and a potential source of additional large snags during the development of new stands. Furthermore, trees injured by disturbance may develop cavities, deformed crowns, and limbs that are habitat components for a variety of wildlife species.

In the matrix, objectives for post-disturbance management will generally differ from those for Late-Successional Reserves. Economic benefits of timber production will receive greater consideration. For example, the commercial salvage of dead trees will be less constrained, and replanting disturbed areas will be a high priority. However, because the matrix provides habitat and connectivity for many organisms, post-disturbance management must achieve a balance between economic and ecosystem objectives.

# Appendix B3

## Adaptive Management Areas

Applicable to Alternative 9 only, the following section, which is adapted from the FEMAT Report, describes the overall objectives for Adaptive Management Areas as well as more specific objectives for each particular area. Because a primary objective of these areas is innovation, more specific standards and guidelines for management are not provided.

### Introduction

Adaptive Management Areas are landscape units designated to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives. Ten areas ranging from about 92,000 to nearly 500,000 acres of federal lands have been identified. The areas are well distributed in the physiographic provinces. Most are associated with subregions impacted socially and economically by reduced timber harvest from the federal lands. The areas provide a diversity of biological challenges, intermixed land ownerships, natural resource objectives, and social contexts. In the Applegate Adaptive Management Area in Oregon, grassroots community-based activities have already begun.

The Adaptive Management Areas are specifically designated in Alternative 9, but the concept could be applied within any of the alternatives. Specific boundaries of the areas would have to be modified consistent with particular alternatives, and biological, economic, and social assessments would have to be revised to be consistent with those allocations.

The overall objective for Adaptive Management Areas is to learn how to manage on an ecosystem basis in terms of both technical and social challenges, and in a manner consistent with applicable laws. It is hoped that localized, idiosyncratic approaches that may achieve the conservation objectives of the selected alternative can be pursued. These approaches rely on the experience and ingenuity of resource managers and communities rather than traditionally derived and tightly prescriptive approaches that are generally applied in management of forests.

The Adaptive Management Areas are intended to contribute substantially to the achievement of objectives for Alternative 9. This includes provision of well-distributed late-successional habitat outside of reserves, retention of key structural elements of late-successional forests on lands subjected to regeneration harvest, and restoration and protection of riparian zones as well as provision of a stable timber supply.

The Adaptive Management Area concept incorporates the three adaptive management models/objectives discussed in the FEMAT Report—technical, administrative, and cultural/social.

Key features of the Adaptive Management Areas:

- The areas are well-distributed geographically, represent a mix of technical and social challenges and are of sufficient size to provide for landscape-level management approaches.



- The areas provide for development and demonstration of monitoring protocols and new approaches to land management that integrate economic and ecological objectives based on credible development programs and watershed and landscape analysis.
- Opportunities exist for education, including technical training, to qualify local community residents for employment in monitoring and other management programs.
- Innovation in community involvement is encouraged, including approaches to implementation of initial management strategies and perhaps, over the longer term, development of new forest policies.
- Innovation is expected in developing adequate and stable funding sources for monitoring, research, retraining, restoration and other activities.
- Innovation in integration of multi-ownership watersheds is encouraged among federal agencies and is likewise encouraged among state and federal agencies, and private landowners.
- Innovation in agency organization and personnel policies might include individual certification requirements, and modification of recruitment and promotion procedures to encourage local longevity among the federal workforce.

## **Selection of the Adaptive Management Areas**

Adaptive Management Areas were selected to provide opportunities for innovation, to provide examples in major physiographic provinces, and to provide a range of technical challenges, from an emphasis on restoration of late-successional forest conditions and riparian zones to integration of commercial timber harvest with ecological objectives.

The Adaptive Management Areas have been geographically located to minimize risk to achieving the conservation objectives of Alternative 9. The designation of Adaptive Management Areas was intended to provide a mixture of public and private lands. In locating the Adaptive Management Areas, the proximity of communities that were subject to adverse economic impact resulting from reduced federal timber harvest was considered. The social and economic analysis of the Forest Ecosystem Management Assessment Team was a major source of information that helped guide these decisions.

The Adaptive Management Areas incorporate a mix of ownerships and administrative responsibilities. Six areas include lands administered by the Forest Service and Bureau of Land Management. In two areas (Northern Coast Range and Olympic) there are significant opportunities for the states to participate in a major cooperative adaptive management effort. The majority of areas also have interspersed privately owned forest lands that could be incorporated into an overall plan if landowners so desired.

Establishment of the Adaptive Management Areas is not intended to discourage the development of innovative social and technical approaches to forest resource issues in other locales. They are intended to provide a geographic focus for innovation and experimentation with the intent that such experience will be widely shared. The array of areas provides a balance between having a system of areas that is:

(1) so large and diffuse that it lacks focus and adequate resources; and has extensive management constraints because of its size and overall impact on regional conservation strategies; and (2) too small to allow for meaningful ecological and social experimentation.

## Technical Objectives

Two Adaptive Management Areas have scientific and technical innovation and experimentation as objectives. The guiding principle is to allow freedom in forest management approaches to encourage innovation in achieving the goals of the selected alternative. This challenge includes active involvement by the land management and regulatory agencies early in the planning process.

The primary technical objectives of the Adaptive Management Areas are development, demonstration, implementation, and evaluation of monitoring programs and innovative management practices that integrate ecological and economic values. Experiments, including some of large scale, are likely. Demonstrations and pilot projects alone, while perhaps significant, useful, and encouraged in some circumstances, may not be sufficient to achieve the objectives.

Monitoring is essential to the success of any selected alternative and to an adaptive management program. Hence, development and demonstration of monitoring and training of the workforce are technical challenges and should be emphasized.

Technical topics requiring demonstration or investigation are a priority for Adaptive Management Areas and cover a wide spectrum, from the welfare of organisms to ecosystems to landscapes. Included are development, demonstration, and testing of techniques for:

- Creation and maintenance of a variety of forest structural conditions including late-successional forest conditions and desired riparian habitat conditions.
- Integration of timber production with maintenance or restoration of fisheries habitat and water quality.
- degraded by past management activities and natural events.
- Integration of the habitat needs of wildlife (particularly of sensitive and threatened species) with timber management.
- Development of logging and transportation systems with low impact on soil stability and water quality.
- Design and testing of effects of forest management activities at the landscape level.
- Restoration and maintenance of forest health using controlled fire and silvicultural approaches.

Each Adaptive Management Area will have an interdisciplinary technical advisory panel, including specialists from outside government agencies, that will provide advice and support to managers and local communities involved with this effort.

## Social Objectives

The primary social objective of Adaptive Management Areas is the provision of flexible experimentation with policies and management. These areas should provide opportunities for land managing and regulatory agencies, other government entities, nongovernmental organizations, local groups, landowners, communities, and citizens to work together to develop innovative management approaches. Broadly, Adaptive Management Areas are intended to be prototypes of how forest communities might be sustained.

Innovative approaches include social learning and adaptation, which depend upon local communities having sufficient political capacity, economic resources, and technical expertise to be full participants in ecosystem management. Similarly, management will need to be coordinated and characterized by collaboration across political jurisdictions and diverse ownerships. This will require mediating across interests and disciplines, strengthening local political capability, and enhancing access to technical expertise. Adaptive management is, by definition, information dependent. Setting objectives, developing management guidelines, educating and training a workforce, organizing interactive planning and management institutions, and monitoring accomplishments all require reliable, current inventories. New information technologies can be used to provide such information, but a well-trained workforce necessary to collect and assimilate required information is largely lacking. Local persons might be ideally suited to this task if appropriately trained.

## Agency Approaches and Management Review

Federal agencies are expected to use Adaptive Management Areas to explore alternative ways of doing business internally, and with each other, other organizations, local and state government, and private landowners. In effect, the areas should be used to "learn to manage" as well as to "manage to learn."

Agencies are expected to develop plans (jointly, where multiple agencies are involved) for the Adaptive Management Areas. Development of a broad plan that identifies general objectives and roles, and provides flexibility should be the goal. Such a plan could be used in competing for financial resources, garnering political support, providing a shared vision, and identifying experiences to be tracked.

If the Adaptive Management Areas are to make timely contributions to the objectives of the selected alternative and to the communities, it is absolutely critical that initiation of activities not be delayed by requirements for comprehensive plans or consensus documents beyond those required to meet existing legal requirements for activities. Development of such documents can proceed simultaneously with other activities; the only area in which detailed planning must precede any activities is the Snoqualmie Pass Adaptive Management Area. Current plans and draft plan preferred alternatives, as modified by the directions established in the selected alternative, can provide the starting point for activities. Initial involvement of user groups and communities would emphasize how the strategy and plans should be implemented.

Initial direction and continuing review should be provided by the Regional Interagency Executive Committee. It is important that the interagency coordination involve both the regulatory and management agencies, and that the regulatory agencies participate in planning and regular review processes.

## Adaptive Management Area Implementation Guidelines

**Role of Agencies** - The agencies will facilitate collaborative efforts, partnerships, mutual learning and innovation. They will provide staff work to the process of managing the Adaptive Management Areas. This could include providing meeting places, meeting facilitation, and expert analysis. Agency scientists are expected to provide scientific design of monitoring and experiments, though the decision is reserved for the federal land manager.

Although the agencies have a facilitation role, the land management agencies retain the authority and responsibility to make decisions and the regulatory agencies retain the authority and responsibility to regulate. Nothing in these guidelines is intended to change those authorities or responsibilities.

**Local Communities** - Specific community roles with public agencies and subject matter experts (such as the technical advisory panels) will include helping find innovative ways to set objectives, develop plans, implement projects, and monitor accomplishments. For example, Subtitle G of the Farm Bill gives criteria to identify "natural resource dependent communities" which may be used if appropriate when identifying local communities.

**Participation in Adaptive Management Areas** - Although the emphasis is on the participation of people who are actively involved with that geographic location, nothing in these guidelines should be construed to suggest that the interests of people living outside "local communities" should not be considered in making agency decisions. Participation will be self identifying, to the extent possible. Experiments to address how this might happen are encouraged.

**Project Development and Implementation** - Specific project planning must:

- Involve the public early
- Coordinate with overall activities within the province
- Begin some projects as soon as practicable to respond to and facilitate public interest and involvement
- Begin some projects prior to completing an entire watershed analysis
- Begin watershed analysis as soon as possible
- Develop early plans and projects with the best available information
- Identify needs for improved inventory
- Proceed simultaneously with activities and Adaptive Management Area planning
- Assign priority status to watershed restoration projects that can be completed quickly
- Begin projects in nonsensitive sections of the Adaptive Management Area

**Plans** - All Adaptive Management Areas will have a plan. An individual public, interagency approach to planning will be developed for each Adaptive Management Area. The plan should address or provide:

- A shared vision of the Adaptive Management Area, (e.g., the kind of knowledge the participants hope to gain). Identification of the desired future conditions may be developed in collaboration with communities, depending on the area.
- Learning should include social and political knowledge, not just biological and physical information.

- A strategy to guide implementation, restoration, monitoring and experimental activities.
- A short-term (3 to 5 year) timber sale plan and long-term yield projections.
- Education of participants.
- List of communities influenced by the Adaptive Management Area projects and outputs.
- An inventory of community strategies, and resources and partners being used.
- Coordination with overall activities within the province.
- A funding strategy.
- Integration of the community strategies and technical objectives.

**Area Assessment** - The plans need to be based on information about historical, current and desired future conditions of the biophysical, social, and economic aspects of the area. The plans will rely largely on existing information. The area assessment will be a concise working document. The following is provided as a suggested framework:

**Biophysical:** Consider disturbance history, terrestrial and aquatic conditions, sensitive plant and animal species and/or habitat, capability of the system to produce a variety of forest products. A description of the desired future condition or a range of acceptable conditions for the biophysical system is needed. For example, what functions are important to maintain at the landscape level? What structure, species, age classes, and/or arrangement will maintain those functions? Consider both coarse and fine detail over time. What does the community want the Adaptive Management Area to be like in the future? What actions are needed to create that desired future condition?

**Social:** Consider historical and extant communities, their use patterns, uses of the land, issues, resources, and opportunities. In some areas, other demographic data will be helpful as well. What networks for communications are at work? How can the agencies better interact with these? What collaborative process will work best for the communities of interest to effectively participate in managing the Adaptive Management Area? What does the community want to look like in the future? Desired future social condition can be considered in terms of composition, structure, and/or functions over time.

**Economic:** A description of current economic conditions might include an inventory of local employment, resource workers, skills, and access to technology. Desired future conditions could describe the future employment opportunities (e.g., what forest work will be needed in the future?) and skills needed to seize those opportunities. As the desired future condition of the ecosystem is better understood, the future forest work will also be more clear. Identification of needed knowledge, skills, abilities, and technology for the future may be useful in developing training programs as well as business or marketing assistance.

**Monitoring and Research** - The Monitoring and Evaluation Plan (see Appendix I) and watershed analysis present the framework and some required actions for each Adaptive Management Area. Additional efforts and specificity may be developed for each Adaptive Management Area.

The learning opportunity provided by Adaptive Management Areas will be enhanced if clear, measurable goals and objectives are set, monitored, and conveyed into the planning of projects or into the appropriate component of the Adaptive Management Area plan or Forest or District Plan. Shared synthesis of monitoring results will help provide a multiple-perspective assessment on whether social and ecosystem goals are being met, help identify problems to avoid in subsequent projects, and help gain consensus on what data gaps exist and what changes to the monitoring and research programs are needed.

**Review** - Monitoring and research, with careful experimental design, will be conducted in Adaptive Management Areas. Research in forest ecology and management as well as social, biological, and earth sciences may be conducted. Each Adaptive Management Area will have an interdisciplinary technical advisory panel that will provide advice to managers and the local communities involved with this effort. The technical advisory panels will provide advice and information on the appropriateness of the project.

Direction and review are provided by the Regional Interagency Executive Committee, through the Regional Ecosystem Office. This review will help assure that plans and projects developed for the various Adaptive Management Areas will be both scientifically and ecologically credible. It will assure that new, innovative approaches are used, that the laws and the goals of the plan are met, and that validation monitoring is incorporated.

The Regional Ecosystem Office will facilitate and coordinate the implementation of the Adaptive Management Area program. Federal agencies are expected to use the Adaptive Management Areas to explore new ways of working internally and externally.

**Legal** - All activities must comply with existing laws such as ESA, NEPA, NFMA, FLPMA, FACA, National Historic Preservation Act, Clean Water Act, Clean Air Act, and treaty rights. Management and regulatory agencies should work together to determine ways to expedite management while ensuring compliance, to improve cooperation through planning and on-the-ground consultation, and to avoid confrontation.

**Other Issues** - Some issues are beyond the authority of the agencies or the Regional Interagency Executive Committee. These include:

- Use of receipts from timber sales and other products derived from Adaptive Management Areas to develop programs and projects within the areas.
- Employment targets for local people for special jobs like planning, training, and monitoring.
- Special land management or stewardship contracts.
- Restricted local use of wood and other products derived from Adaptive Management Areas.

## Timber Supply

One reason for locating Adaptive Management Areas adjacent to communities experiencing adverse economic impacts is to provide opportunity for social and economic benefits to these areas. Adaptive Management Areas are expected to produce timber as part of their program of activities consistent with their specific direction under the selected alternative. The rates and methods of harvest will be determined on an area-by-area basis. Each area management team is expected to develop a strategy for ecosystem management as part of the Adaptive Management Area plan to guide implementation, restoration, monitoring, and experimental activities involving timber sales. The strategy should contain a short-term (3 to 5 year) timber sale component and an assessment of long-term outputs of timber.

## Education

Each Adaptive Management Area was located adjacent to one or more communities with economies and culture long associated with utilization of forest resources. As a result, the people have a "sense of

place” and desire for involvement. Many of these local workers already possess timber/forest-related skills and knowledge, as well as that sense of place, which in combination make them natural participants in ecosystem-based management and monitoring. Here adaptive management can bring indigenous knowledge together with formal studies, the local communities and the land management agencies in a mix that may provide creative common-sense approaches to complicated problems.

Technical and scientific training of a local workforce should be an educational priority of the Adaptive Management Area Program. Formal schooling and field apprenticeship might provide the workforce needed to help implement ecosystem management, particularly in the area of monitoring. This program might be based on collaborations among local community colleges, state universities, and the agencies.

## Descriptions of the Adaptive Management Areas

Adaptive Management Areas are shown on the Alternative 9 map that accompanies this Final SEIS. Adaptive Management Areas would contribute to accomplishing the objectives of the alternative, such as protection or enhancement of riparian habitat and provision for well-distributed late-successional forest habitat. Detailed prescriptions for achieving such objectives are not provided, however, in order to permit managers to develop and test alternative approaches applicable to their areas and in a manner consistent with existing environmental and other laws. Late-Successional Reserves within Adaptive Management Areas will be managed according to the standards and guidelines for such reserves except as provided elsewhere in this section. One hundred acres of the best northern spotted owl habitat will be retained as close to the nest site or owl activity center as possible for all known spotted owl activity centers in Adaptive Management Areas. Management of these areas will comply with the standards and guidelines for Late-Successional Reserves, and management around these areas will be designed to reduce risk of natural disturbances (see Appendix B11, Standards and Guidelines Resulting From Additional Species Analysis and Changes to Alternative 9).

Riparian protection in Adaptive Management Areas should be comparable to that prescribed for other federal land areas. For example, Key Watersheds with aquatic conservation emphasis within Adaptive Management Areas must have a full watershed analysis and initial Riparian Reserves comparable to those for Tier 1 Key Watersheds. Riparian objectives (in terms of ecological functions) in other portions of Adaptive Management Areas should have expectations comparable to Tier 2 Key Watersheds where applicable. However, flexibility is provided to achieve these conditions, if desired, in a manner different from that prescribed for other areas and to conduct bonafide research projects within riparian zones.

In summary, management activities in all the Adaptive Management Areas will be conducted to achieve the objectives described in the selected alternative. Standards and guidelines for Congressionally Reserved Areas or Late-Successional Reserves must be followed when they occur within Adaptive Management Areas, except that the Adaptive Management Area plans for the Finney and Northern Coast Adaptive Management Areas may change the Late-Successional Reserve designations in those areas. Flexibility is provided to meet objectives for Riparian Reserves and Key Watersheds. Full watershed analysis will be conducted prior to new management activities in identified Key Watersheds within Adaptive Management Areas. Standards and guidelines of current plans and draft plan preferred alternatives need to be considered during planning and implementation of activities within Adaptive Management Areas, and they may be modified in

Adaptive Management Area plans based on site-specific analysis. Otherwise, standards and guidelines are to be developed to meet the objectives of the Adaptive Management Area and the overall strategy. Coordination with the Regional Ecosystem Office is required.

<b>Name:</b>	<b>Applegate Adaptive Management Area, Oregon</b>
<b>Size:</b>	277,500 acres
<b>Ownership:</b>	Medford District Bureau of Land Management; Rogue River and Siskiyou National Forests; potentially state and private lands.
<b>Associated Communities:</b>	Grants Pass and Medford, Oregon; Jackson and Josephine Counties, Oregon; and Siskiyou County, California.
<b>Emphasis:</b>	Development and testing of forest management practices, including partial cutting, prescribed burning, and low impact approaches to forest harvest (e.g., aerial systems) that provide for a broad range of forest values, including late-successional forest and high quality riparian habitat. Late-Successional Reserves are included in the Adaptive Management Area boundaries.
<b>Name:</b>	<b>Blue River Adaptive Management Area, Oregon</b>
<b>Size:</b>	155,700 acres
<b>Ownership:</b>	Willamette National Forest; Eugene District Bureau of Land Management; potentially state and private lands.
<b>Associated Communities:</b>	Eugene, Springfield, and Sweet Home, Oregon.
<b>Emphasis:</b>	Intensive research on ecosystem and landscape processes and its application to forest management in experiments and demonstrations at the stand and watershed level; approaches for integrating forest and stream management objectives and on implications of natural disturbance regimes; and management of young and mature stands to accelerate development of late-successional conditions, a specific management objective for the forests within the Moose Lake block as well as in other portions of the Adaptive Management Area to be selected. Current status of the H. J. Andrews Experimental Forest as an Experimental Forest (i.e., maintenance of control areas and full flexibility to conduct experiments, is retained). One Late-Successional Reserve is included in the area.
<b>Name:</b>	<b>Cispus Adaptive Management Area, Washington</b>
<b>Size:</b>	143,900 acres
<b>Ownership:</b>	Gifford Pinchot National Forest; potentially state and private lands.
<b>Associated Communities:</b>	Randle, Morton, and Packwood, Washington; Lewis and Skamania Counties, Washington.
<b>Emphasis:</b>	Development and testing of innovative approaches at stand, landscape, and watershed level to integration of timber production with maintenance of late-successional forests, healthy riparian zones, and high quality recreational values.



**Name:** **Finney Adaptive Management Area, Washington**

**Size:** 98,400 acres

**Ownership:** Mt. Baker-Snoqualmie National Forest; potentially state and private lands.

**Associated Communities:** Darrington, Washington; Skagit and Snohomish Counties, Washington.

**Emphasis:** Restoration of late-successional and riparian habitat components. Because most late-successional forests have already been harvested, requirements for marbled murrelet include: (1) surveying for and protecting all occupied murrelet sites (see Alternative 1); (2) retaining LS/OG1s, LS/OG2s, and owl additions (from Johnson et al. 1991) as Late-Successional Reserves within the Adaptive Management Areas. These reserves should be managed as stipulated for such reserves under Alternative 9. However, because much of the Adaptive Management Area is Late-Successional Reserve, primarily designated for a single species about which information is still being developed, the designation and/or standards and guidelines for Late-Successional Reserves may be reconsidered in the Adaptive Management Area plan. Relaxation of the Late-Successional Reserve status is not necessarily assumed; proposals will require careful analysis to assure consistency with the Endangered Species Act and National Forest Management Act requirements, new marbled murrelet information, and overall objectives of the selected alternative. Sites occupied by spotted owls (pairs or territorial singles) will be protected by establishing Late-Successional Reserves using procedures to delineate Reserved Pair Areas under the Final Draft Spotted Owl Recovery Plan (USDI unpub., see Appendix B5, Recovery Plan Standards and Guidelines).

**Name:** **Goosenest Adaptive Management Area, California**

**Size:** 172,900 acres

**Ownership:** Klamath National Forest; potentially private lands.

**Associated Communities:** Yreka, Montague, Dorris, and Hornbrook, California; Siskiyou County, California.

**Emphasis:** Development of ecosystem management approaches, including use of prescribed burning and other silvicultural techniques, for management of pine forests, including objectives related to forest health, production and maintenance of late-successional forest and riparian habitat, and commercial timber production.

**Name:** **Hayfork Adaptive Management Area, California**

**Size:** 488,500 acres

**Ownership:** Shasta-Trinity and Six Rivers National Forests and Yreka District Bureau of Land Management; potentially private and state lands.

**Associated Communities:** Hayfork, California; Trinity and Humboldt Counties, California.

**Emphasis:** Development, testing, and application of forest management practices, including partial cutting, prescribed burning, and low-impact approaches

to forest harvest, which provide for a broad range of forest values, including commercial timber production and provision of late-successional and high quality riparian habitat. Maintain identified Late-Successional Reserves; conduct full watershed analysis in critical watersheds.

**Name:** Little River Adaptive Management Area, Oregon

**Size:** 91,800 acres

**Ownership:** Umpqua National Forest and Roseburg District Bureau of Land Management; potentially private and state lands.

**Associated Communities:** Roseburg and Myrtle Creek, Oregon; Douglas County, Oregon.

**Emphasis:** Development and testing of approaches to integration of intensive timber production with restoration and maintenance of high quality riparian habitat

**Name:** Northern Coast Range Adaptive Management Area, Oregon

**Size:** 250,000 acres

**Ownership:** Siuslaw National Forest and Salem District Bureau of Land Management; with potential participation by the Oregon Department of Forestry and private landowners.

**Associated Communities:** Tillamook, Willamina, and Grand Ronde, Oregon; Polk, Yamhill, Tillamook, and Washington Counties, Oregon.

**Emphasis:** Management for restoration and maintenance of late-successional forest habitat, consistent with marbled murrelet guidelines noted below. Conduct watershed analysis of the Nestucca River drainage. Subsequently, the Oregon Department of Forestry will be invited to collaborate in development of a comprehensive strategy for conservation of the fisheries and other elements of biological diversity in the northern Oregon Coast Ranges. Because most late-successional forests have already been harvested, requirements for marbled murrelet include: (1) surveying for and protecting all occupied murrelet sites (see Alternative 1); (2) retaining LS/OG1s, LS/OG2s, and owl additions (from Johnson et al. 1991) as Late-Successional Reserves within the Adaptive Management Areas. These reserves should be managed as stipulated for such reserves under Alternative 9. However, because much of the Adaptive Management Area is Late-Successional Reserve, primarily designated for a single species about which information is still being developed, the designation and/or standards and guidelines for Late-Successional Reserves may be reconsidered in the Adaptive Management Area plan. Relaxation of the Late-Successional Reserve status is not necessarily assumed; proposals will require careful analysis to assure consistency with the Endangered Species Act and National Forest Management Act requirements, new marbled murrelet information, and overall objectives of the selected alternative. In the interim, the maximum age for thinning within Late-Successional Reserves in this Adaptive Management Area is

110 years. Northern spotted owl sites will be protected by establishing Reserved Pair Areas under the Final Draft Spotted Owl Recovery Plan (USDI unpub., see Appendix B5, Recovery Plan Standards and Guidelines).

**Name:** Olympic Adaptive Management Area, Washington

**Size:** 150,400 acres

**Ownership:** Olympic National Forest and potentially Washington Department of Natural Resources, Indian Reservations, and private lands.

**Associated Communities:** Jefferson, Clallam, Grays Harbor, and Mason Counties, Washington.

**Emphasis:** Create a partnership with the Olympic State Experimental Forest established by Washington Department of Natural Resources. Develop and test innovative approaches at the stand and landscape level for integration of ecological and economic objectives, including restoration of structural complexity to simplified forests and streams and development of more diverse managed forests through appropriate silvicultural approaches such as long rotations and partial retention. All occupied marbled murrelet sites will be surveyed for and protected. LS/OG 1 and LS/OG 2 is to be managed as Late-Successional reserve except in the Quinault Special Management Area. The Quinault Special Management Area included within this Adaptive Management Area will continue to be managed in accordance with Public Law 100-638 which designated the area.

**Name:** Snoqualmie Pass Adaptive Management Area, Washington

**Size:** 212,700 acres

**Ownership:** Wenatchee and Mt. Baker-Snoqualmie National Forests; Plum Creek Timber Company and other private landowners; state.

**Associated Communities:** Cle Elum and Roslyn, Washington; Kittitas and King Counties, Washington.

**Emphasis:** Development and implementation, with the participation of the U.S. Fish and Wildlife Service, of a scientifically credible, comprehensive plan for providing late-successional forest on the "checkerboard" lands. This plan should recognize the area as a critical connective link in north-south movement of organisms in the Cascade Range.

# Appendix B4

## Protection Buffers

Protection buffers are additional standards and guidelines for specific rare and locally endemic species, and other specific species in the upland forest matrix, from the Scientific Analysis Team Report (Thomas et al. 1993).

The Forest Service's Scientific Analysis Team (SAT) examined the effects of Forest Plans and the Interagency Scientific Committee (ISC) Conservation Strategy on the amount and distribution of habitat to support the viability of species other than the northern spotted owl associated with late-successional forests on lands administered by the Forest Service. The Scientific Analysis Team determined that these plans would not provide and manage habitat to achieve at least a medium-high likelihood of supporting a stable population of all such species and proposed a series of mitigation steps to be applied to Forest Plans. Those mitigation recommendations were reexamined by the Forest Ecosystem Management Assessment Team and incorporated, as appropriate, into the action alternatives. Two of the mitigation steps recommended by the Scientific Analysis Team provided specific standards and guidelines for survey and protection of rare and locally endemic species, and for other species in the upland forests. These standards and guidelines would be applied wherever the species occurs outside of designated areas. The Assessment Team applied these, as written by the Scientific Analysis Team, to Alternatives 1, 3, 4, 5, and, with the exception of those pertaining to American marten, Alternative 9. The standards and guidelines apply to the lands administered by the Forest Service and BLM.

Some of the mitigation steps would create additional Late-Successional Reserves, some would create additional Managed Late-Successional Areas, and others would add additional matrix standards and guidelines. The following table identifies mitigation steps as described in the SAT Report that create

**Table B4-1.** Mitigation steps from the Scientific Analysis Team Report (Thomas et al. 1993) that apply to Alternatives 1, 3, 4, 5, and (excepting American marten) Alternative 9 in this SEIS. Numbers and letters refer to the specific mitigation steps described in the following pages of text.

	Late-Successional Reserves	Managed Late-Successional Areas	Matrix Standards and Guidelines
<b>SAT, Step 5</b>			
Nonvascular plants	1a, b, e, f	1c, d, g, h	
Invertebrates	(No protection areas identified for specific species)		
Amphibians	3c	3a, b	
<b>SAT, Step 6</b>			
Amphibians		1	
Birds	2b		2a
Mammals	3a (except Alt. 9)		3b

Late-Successional Reserves and Managed Late-Successional Areas, and that add additional matrix standards and guidelines.

These recommendations, from Thomas et al. (1993) pages 291-299, are as follows:

#### **SAT MITIGATION STEP 5: Standards and Guidelines for Rare and Locally Endemic Species**

The following rare and locally endemic species are likely to be assured viability if they occur within Habitat Conservation Areas. However, there might be occupied locations outside these areas that will be important to protect as well. [The Scientific Analysis Team] therefore recommend[s] that protocols for surveys be developed that will ensure a high likelihood of locating these occupied sites. Prior to ground-disturbing activities, surveys using the protocol must be conducted within the known or suspected ranges and within the habitat types or vegetation communities occupied by the species. When located, the occupied sites need to be protected as indicated below.

##### **(1) Nonvascular Plants:**

(a) *Ptilidium californicum* (Liverwort) - This species is rare and has a very limited distribution in old white fir forests with fallen trees. It occurs on trunks of trees at about 5000-foot elevation. Mitigation options include finding locations and maintaining stands of overmature white fir at about 5000-foot elevation for inoculum and dispersal along corridors; and studying specific distribution patterns. Protect known occupied locations if distribution patterns are disjunct and highly localized, by deferring timber harvest and avoiding removal of fallen trees and logs.

(b) *Uloa meglospora* (Moss) - This species occurs in northern California and southwest Oregon. It is best developed (locally abundant) in very old stands of tanoak, Douglas-fir, and other conifer species further north, but is generally scarce throughout its range. The species is poorly known ecologically. Mitigation activities include conducting basic ecological studies, and surveying for presence, particularly in Oregon. Protect known occupied sites if distribution patterns are disjunct and highly localized. Defer timber harvest or other activities which would not maintain desired habitat characteristics and population levels.

(c) *Brotherella roellii* (Moss) - This very rare species is endemic to the Washington Cascades north of Snoqualmie Pass. It occupies rotting logs in low to mid-elevation old-growth stands having dense shade, closed canopies, and high humidity. Mitigation options include locating specific populations and protection of large decay class 3, 4, and 5 logs and >70 percent canopy closure. Defer management activities conflicting with maintaining suitable habitat characteristics and known populations levels.

(d) *Buxbaumia piperi*, *B. viridis*, *Rhizomnium nudum*, *Schistostega pennata*, and *Tetraphis geniculata* (Mosses) - Most of these species are fairly rare (the exception is *B. piperi*). They occur on rotten logs and some organic soil, and are shade-dependent, occurring in old-growth forests. *S. pennata* occurs only in mature western red-cedar forests in the Olympic National Forest and in [the] Washington Cascades. Mitigation activities include surveying to determine presence and distribution; and, where located, maintaining decay class 3, 4, and 5 logs and >70 percent closed-canopy forest habitats for shade. Shelterwood and thinning prescriptions for timber harvest will cause their demise, as logs dry out.

(e) *Aleuria rhenana* (Fungus) - This mushroom is widely distributed but rare and little known throughout its range, known from one collection from Mt. Rainier National Park. It is a conifer litter decomposer. Mitigation activities include conducting ecological studies and surveys to determine localities. Protect known populations if surveys continue to indicate that the population is rare. Defer ground-disturbing activities.

(f) *Otidea leporina*, *O. onotica*, and *O. smithii* (Fungi) - These mushrooms occur in conifer duff, and are widespread in distribution but uncommon. They are dependent on older-age forests. Specific mitigation options include protecting older forests from ground disturbance where the species are located.

(g) *Polyozellus multiplex* (Fungus) - Ecologically, this mushroom was considered by the nonvascular expert panel in the same species group as *Albatrellus caeryliopus* and others, listed [earlier in the SAT Report] under species aided by marbled murrelet mitigation measures. However, *P. multiplex* occurs in higher elevation[s] of the Cascades in silver fir and mixed conifer (and is thus outside the range of marbled murrelet mitigations). It can be locally abundant and is a mycorrhizal species important to forest health. Like its group associates, it is a good indicator of old-growth forests. Mitigation activities for this species include conducting surveys to define its distribution, and studies to assess its habitat requirements.

(h) *Sarcosoma mexicana* (Fungus) - This mushroom occurs in deep conifer litter layers in older forests. It is uncommon to rare and is found in the Oregon and Washington Coast Range into British Columbia. Mitigation activities include surveying for locations and protecting deep litter layers of older forests where found. Defer prescribed burning of understory or other activities which would not retain a deep litter layer.

For all of the plants listed in this mitigation step, and for those listed in the next step, [the Scientific Analysis Team] recommend[s] that Regional ecologists or botanists should: (1) maintain a spatially explicit data base of all known sites in National Forests, and (2) develop species or area management plans, to be implemented under the guidance of the regional botany programs.

## (2) Invertebrates:

Although lack of information prevented analyzing mitigation needs for specific invertebrate species, Olson (1992) underscored the need for surveys for species that are rare or locally endemic. Within the range of the northern spotted owl, invertebrates are noted for their high frequency of endemism (species found nowhere else) and restricted ranges (Lattin 1993). Centers of invertebrate biodiversity include, in particular, the Olympic Peninsula and its south coast, the southern Oregon Cascades, the Klamath Physiographic Province, several isolated volcanic peaks including Mt. Hood and the Three Sisters in the Oregon Cascades, and the coastal forests of Oregon and California (Lattin 1993). In addition, some species are poor dispersers or rely on special habitats including decaying wood or aquatic environments (Lattin and Moldenke 1992).

Frest and Johannes (1991) identified endemic species complexes of terrestrial mollusks (bivalves and snails) in the west coast states, particularly limited to the areas from the Cascades crest to the coast. As summarized by Anthony et al. (1992:348-349) [USDI 1992],

"Within the owl's range, there are three distinct land snail provinces. The Oregon province extends from coastal British Columbia just into extreme northern California; the Washington province extends east from the Cascades crest; and the California province is coastal from northern California.

"There are sizable endemic species clusters in the land snail genera *Monadenia*, *Trilobopsis*, *Megomphix*, *Haplotrema*, *Vespericola* and *Hemphillia*. Physical factors limiting their distribution include geologic history, substrate (some are restricted to limestone, e.g., the candidate *Monadenia troglodytes*, endemic to the Siskiyou Mountains and the area around Mt. Shasta), moisture requirements, and cover. In general, land snails in this region require relatively undisturbed cover. Most thrive in lowland forests and the areas around springs. Many species seem to be associated specifically with lowland old-growth forests, and most are extremely limited in distribution. The malone jumping slug, *Hemphillia malonei*, occurs only on the slopes of Mt. Hood. The genus *Megomphix* is known only from sites in the Puget Sound region and in the Willapa Hills, of southwest Washington. In recent years, only one site has been found to support *Megomphix hemphilli*."

Frest and Johannes (1991) also identified complexes of endemic freshwater mollusks, although the aquatic complexes are not part of [the Scientific Analysis Team's] current analysis.

Anthony et al. (1992:355-356) also discussed the occurrence and distribution of arthropods in old-growth forests of the Pacific Northwest:

"First, many species are flightless, which means that their dispersal capabilities are limited. Second, the flightless condition is believed to reflect habitat stability and permanence over a long time period. Some old forest associates have highly disjunct distributions and are found chiefly in undisturbed forests. They share similar distribution patterns on the west side of the Cascade Mountains from British Columbia south to southern Oregon and northern California (i.e., they are endemic to the Pacific Northwest). Many of the species native to this region have not been described or named. The number of known species probably represents less than half of the estimated species" (Lattin, J. pers. comm.).

Mitigation guidelines for Riparian Habitat Conservation Areas and marbled murrelets would aid in conserving species in biodiversity centers and other areas, as "Habitat Conservation Areas established for owls probably will not capture the full extent of invertebrate species richness. The protection of suitable owl habitat in intervening areas as proposed in Alternative D of the Final Environmental Impact Statement [USDA FS 1992a] will help preserve more species distributed over the landscape, but the effectiveness of this provision will be dependent upon the number, size, and isolation of the selected habitat fragments" (Olson 1992:4-5).

Olson (1992) also noted that small fragments of primary forest might serve as reserves for populations of old-growth invertebrates. "In regions with a high proportion of species with restricted ranges, such as the Olympic Peninsula, the coastal forest of Washington, Oregon, and California, and the Klamath Province, increased emphasis on preserving small fragments of [old-growth forest] habitat may be warranted" (Olson 1992:15). Such fragments would be provided under a combination of the Riparian Habitat Conservation Areas and marbled murrelet guidelines. Elsewhere, some species of invertebrates can be provided for by retaining canopy coverage, providing log and slash piles, and maintaining a moist forest floor environment (Lattin and Moldenke 1992).

Understanding the true effectiveness of conserving the invertebrate fauna with mitigation measures proposed in [the Scientific Analysis Team's] report awaits further surveys, inventories, and studies (Lattin 1993). Olson (1992:12) proposed using a survey protocol for rapidly identifying biologically unique areas, and in taking advantage of "natural experiments" to investigate the relationships of invertebrate populations to different growth stages and variously fragmented forest patches and landscapes. He presented an excellent research agenda for such studies (too lengthy to repeat [in the Scientific Analysis Team Report]), which included testing and use of invertebrate species as environmental indicators. This agenda should be pursued.

### (3) Amphibians:

**(a) Larch Mountain Salamander** - Because of the narrow distribution of this species, mostly within the Columbia River Gorge, primary emphasis should be to survey and protect all known sites. Sites must be identified based on fall surveys conducted using a standardized protocol. Known sites are included within boundaries of conservation areas and under these guidelines, are not to be disturbed. Surveys are needed at additional sites in the forest matrix along the Columbia River Gorge. Key habitat is mossy talus protected by overstory canopy. Avoiding any ground-disturbing activity that would disrupt the talus layer where this species occurs is the primary means of protection. Once sites are identified, maintain 40 percent canopy closure of trees within the site and within a buffer of at least the height of one site-potential tree or 100 feet horizontal distance, whichever is greater, surrounding the site. Larger buffer widths are appropriate upslope from protected sites on steep slopes. Partial harvest may be possible if canopy closure can be retained; in such cases logging must be conducted using helicopters or high-lead cable systems to avoid disturbance of the talus layer.

**(b) Siskiyou Mountain Salamander** - this species occurs within an extremely narrow range on the Rogue River, Siskiyou, and Klamath National Forests. Its range does not fall within any Habitat Conservation Areas in Oregon. Additional surveys conducted using a standardized protocol must be undertaken to delineate range and identify subpopulations. All populations must be protected by delineating an occupied site and avoiding disturbance of talus throughout the site, especially on moist, north-facing slopes, particularly in Oregon where Habitat Conservation Areas do not incorporate species' range. Because this species seems to require cool, moist conditions, a buffer of at least the height of one site-potential tree or 100 feet horizontal distance, whichever is greater, surrounding the site, must be retained around the outer periphery of known sites. Overstory trees must not be removed within the boundary of this buffer.

**(c) Shasta Salamander** - This species is very narrowly distributed, occurring only in localized populations on the Shasta-Trinity National Forest. Only a small part of its range is included within a Habitat Conservation Area under Alternative B [Forest Plans plus ISC Conservation Strategy in the FEIS, USDA FS 1992a]. It occurs in association with limestone outcrops, protected by an overstory canopy. All known and future localities must be delineated and protected from timber harvest, mining, quarry activity, and road building within the delineated site, and a buffer of at least the height of one site-potential tree or 100 feet horizontal distance, whichever is greater, should surround the outcrop. Additional surveys, conducted using a standardized protocol, must be undertaken to identify and delineate all occupied sites within the species' potential range.



## **SAT MITIGATION STEP 6: Additional Standards and Guidelines for Other Species in the Upland Forest Matrix**

As with the above sets of species under Mitigation Step 5, the following species whose viability is considered to be at risk under Alternative B [Forest Plans plus ISC Conservation Strategy in USDA FS 1992a] of the Final Environmental Impact Statement are likely to be assured viability if they occur within Habitat Conservation Areas of Alternative B of the Final Environmental Impact Statement, Riparian Habitat Conservation Areas, or areas covered under the marbled murrelet guidelines. However, if they are located outside of such areas, additional mitigation measures would be needed to avoid increasing risk to viability. These measures are discussed, by species, below.

### **(1) Amphibians:**

**Del Norte Salamander** - This species occurs in talus slopes protected by overstory canopy that maintains cool, moist conditions on the ground. The species is a slope-valley inhabitant, and sometimes occurs in high numbers near riparian areas. Riparian Habitat Conservation Areas, in combination with Habitat Conservation Areas and other reserves, will offer some protection to the species but significant numbers also occur in upland areas. Additional mitigation options in this upland matrix include identifying locations (talus areas inhabited by the species) by using a standardized survey protocol, then protecting the location from ground-disturbing activities. Designate a buffer of at least the height of one site-potential tree or 100-foot horizontal distance, whichever is greater, surrounding the location. Within the site and its surrounding buffer, maintain 40 percent canopy closure and avoid any activities that would directly disrupt the surface talus layer. Partial harvest within the buffer may be possible if 40 percent canopy closure can be maintained; in such cases, tree harvest must be conducted using helicopters or high lead cable systems to avoid compaction or other disturbance of talus.

### **(2) Birds:**

**(a) White-headed Woodpecker, Black-backed Woodpecker, Pygmy Nuthatch, and Flammulated Owl** - These species will not be sufficiently aided by application of mitigation measures for riparian habitat protection or for marbled murrelets alone. They all occur on the periphery of the range of the northern spotted owl on the east slope of the Cascade Range in Washington or Oregon. Additionally, [the] white-headed woodpecker and flammulated owl occur in the Klamath Province in northwestern California and southwestern Oregon. The viability of all four species within the range of the northern spotted owl was rated as a medium risk on National Forests, although they each are much more widely distributed elsewhere.

Apply the following mitigation guidelines to ensure that the distribution and numbers of all four species do not severely decline on National Forests within the range of the northern spotted owl. These guidelines apply to the forest matrix outside designated habitat for the northern spotted owl and Riparian Habitat Conservation Areas. Maintain adequate numbers of large snags and green tree replacements for future snags within the four species' ranges in appropriate forest types. Where feasible, green tree replacements for future snags can be left in groups to reduce blowdown. Specifically, [the Scientific Analysis Team] recommend[s] that no snags over 20 inches dbh be marked for cutting. [The Scientific Analysis Team] recognize[s], however, that safety considerations may prevent always retaining all snags. Use of standardized definitions of hazard trees is required. For the longer term, provide for sufficient numbers of green trees to provide for the full (100 percent) population potential of each species.

As depicted by Neitro et al. (1985), the 100 percent population potential for white-headed woodpeckers is 0.60 conifer snags (ponderosa pine or Douglas-fir) per acre in forest habitats; these snags must be at least 15 inches dbh (or largest available if 15 inch dbh snags are not available) and in soft decay stages (see Neitro et al. 1985 for specifics), and must be provided in stands of ponderosa pine and mixed pine-Douglas-fir. The 100 percent population potential for black-backed woodpeckers is 0.12 conifer snags per acre in forest habitats; these snags must be at least 17 inches dbh (or largest available if 17 inch dbh snags are not available) and in hard decay stages, and must be provided in stands of mixed conifer and lodgepole pine in higher elevations of the Cascade Range. Provision of snags for other cavity-nesting species, including primary cavity-nesters, must be added to the requirements for these two woodpecker species. Site-specific analyses, and application of a snag recruitment model (specifically, the Forest Service's Snag Recruitment Simulator) taking into account tree species, diameters, falling rates, and decay rates, will be required to determine appropriate tree and snag species mixes and densities. If snag requirements cannot be met, then harvest must not take place.

As identified by the expert panel, black-backed woodpeckers also require beetle infested trees for foraging; some such trees should be provided in appropriated habitat, and sanitation harvest of all such trees would be detrimental to the species. More information is needed on habitat use, seasonal occurrence, and use of forest age classes and burns, for the black-backed woodpecker.

Pygmy nuthatches use habitat very similar to those of white-headed woodpeckers. Pygmy nuthatches require large trees, typically ponderosa pine within the range of the northern spotted owl, for roosting. Provision of snags for white-headed woodpeckers is assumed to provide for the needs of pygmy nuthatch, as no species-specific guidelines for the species have been developed. Additional information on ecology of pygmy nuthatch within the range of the northern spotted owl is needed to develop more precise guidelines.

Flammulated owls are secondary cavity-nesters and use cavities, in snags and live trees, created by woodpeckers or, less often, that occur naturally. [The Scientific Analysis Team] assume[s] that standards and guidelines for snags and green tree replacements for woodpeckers and other primary cavity-nesting species, as provided by existing National Forest Land and Resource Management Plans and for the woodpeckers in this species group, would provide for flammulated owls.

[Note: The snag recommendations above are based on the model of Neitro et al. (1985). In that model, snag requirements for individual species were treated as additive in developing snag requirements for the overall community of cavity excavators. As noted above, "provision of snags for other cavity-nesting species, including primary cavity nesters, must be added to the requirements for these two woodpecker species" (black-backed and white headed woodpeckers).

Snag requirements are developed by the National Forests and BLM Districts for specific forest cover types, and these may be further broken down by geographic location. The intent is to tailor the requirements to those species that are actually expected to occur in an area. To determine if the protection buffer requirements should be added to existing Forest or BLM District Plan requirements, the basis for those existing requirements should be analyzed to determine if they include the species identified by SAT at the specified level of percent population potential. If they do not, then the SAT requirements must be added to the existing Forest and BLM District Plan requirements.]

**(b) Great Gray Owl** - Within the range of the northern spotted owl, the great gray owl is most common in lodgepole pine forests adjacent to meadows. However, it is also found in other coniferous forest types. In some locations, such as on the Willamette National Forest west of the Cascades Crest, at least some shelterwood harvesting seems to be beneficial for the species by opening up otherwise closed canopy cover for foraging. In doing so, consequences to species such as northern goshawk and American marten must be evaluated. Specific mitigation measures for great gray owl, within the range of the northern spotted owl, include the following: provide a no-harvest buffer of 300 feet around meadows and natural openings and establish 1/4-mile protection zones around known nest sites. Within one year, develop and implement a standardized protocol for surveys; survey for nest locations using the protocol. Protect all future discovered nest sites as previously described.

### **(3) Mammals:**

**(a) American Marten and Fisher** - The level of habitat conservation provided by the combination of Alternative B [Forest Plans plus ISC Conservation Strategy] of the Final Environmental Impact Statement [USDA FS 1992a], Riparian Habitat Conservation Areas, and marbled murrelet mitigation guidelines are generally sufficient so that additional standards and guidelines are not required to prevent the extirpation of American martens and fishers within the range of the northern spotted owl. However, [the Scientific Analysis Team] do[es] recommend two additional actions for specific areas to help ensure future viability of these species.

First, the National Forests in California must finalize and implement their draft habitat capability model for fisher and American marten. Implementation of this model would likely [produce] information that will further reduce risks to viability in those National Forests. Forests in Oregon and Washington must retain existing management requirement areas for American marten for the same reason. However, adequacy of these practices must be reevaluated through the ongoing conservation assessment process or through special review. Monitoring and adaptive management are especially important for these species.

Second, populations of fishers are extremely low in northern Oregon and Washington. Harvest of American martens is permitted in these states, and accidental take of fishers cannot be avoided using kill-trap methods. To reduce risk of further loss of fishers, [the Scientific Analysis Team] recommend[s] closure of all National Forests (within the overlapping ranges of American marten, fisher, and northern spotted owls) to kill-trapping of American martens until the rate of accidental take of fishers is determined to be insignificant. [The Scientific Analysis Team] recommend[s] formation of an interagency group comprised of state furbearer biologists and Forest Service wildlife biologists to undertake this evaluation for both states.

**(b) Lynx** - Lynx are rare within the range of the northern spotted owl, occurring primarily in the Okanogan area of Washington. The lynx is currently listed by the Fish and Wildlife Service as a Category 2 candidate (a species for which additional information is needed to propose listing as threatened or endangered). A petition was filed to list the lynx as endangered within the northern Cascades of Washington, based on small population size, population isolation, and lack of adequate prey base (snowshoe hare). However, the Fish and Wildlife Service ruled that available information does not warrant listing the lynx in Washington (USDI FWS 1992).

Three primary habitat components for lynx are (1) foraging habitat (15-35 year old lodgepole pine) to support snowshoe hare and provide hunting cover, (2) denning sites (patches of >200-year old spruce and fir, generally <5 acres), and (3) dispersal/travel cover (variable in vegetation composition and structure). The major limiting factor is abundance of snowshoe hare, which in turn is limited by availability of winter habitat (primarily early-successional lodgepole pine with trees at least 6 feet tall). Past excessive trapping of lynx and incidental mortality of lynx from hunting of other species have depressed populations and may have been detrimental to local lynx populations in Washington (Wash. Dept. of Wildlife 1991). Roads provide access to hunters and trappers and thus road density may be related to lynx mortality.

Alternative B as described in the Final Environmental Impact Statement [USDA FS 1992a], as well as existing higher elevation reserves, will provide denning habitat within protected forest stands in juxtaposition with early successional vegetation in the forest matrix. Connectivity between many of the denning patches will be provided by the network of buffers along streams under the Riparian Habitat Conservation Areas.

In addition, [the Scientific Analysis Team] propose[s] development of site-specific timber harvest, roading, and fire management plans in known lynx range. These plans should be developed in consultation with state wildlife agencies and should address: (1) minimizing road construction, closing unused roads, and maintaining roads to the minimum standard possible; (2) using prescribed fire to maintain forage for snowshoe hare in juxtaposition with hunting cover; (3) designating areas as closed to kill trapping of any furbearer to avoid incidental lynx mortality to maintain population refugia for lynx in key areas; (4) planning for kill trapping closure on a wider basis if data indicate a declining lynx population as a result of incidental trapping mortality; and (5) developing and implementing a credible survey and monitoring strategy to determine the distribution of lynx throughout its potential range.



# Appendix B5

## Recovery Plan Standards and Guidelines

These guidelines are adapted from the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.). Some or all of these guidelines are applied in Alternatives 2 through 10. See the individual alternative descriptions in Chapter 2 for specific application of these guidelines.

### GUIDELINES FOR SILVICULTURAL ACTIVITIES AND SALVAGE IN LATE-SUCCESSIONAL RESERVES AND MANAGED LATE-SUCCESSIONAL AREAS

#### Guidelines for Silviculture

The primary objective of silvicultural activities in Late-Successional Reserves is to improve habitat in younger stands. Consequently, activities are encouraged if empirical information and modeling indicate that the development of late-successional habitat conditions will be accelerated.

Interdisciplinary teams of wildlife biologists, silviculturists, and other specialists are encouraged to develop prescriptions that meet these criteria. General guidelines for silvicultural activities follow.

1. To safeguard the conservation benefits of Late-Successional Reserves, silvicultural activities should be directed at young stands where stocking, structure, or composition are expected to prevent or significantly retard development of late-successional conditions. This will generally include stands that: are composed of trees less than 10 to 12 inches dbh, show no significant development of a multiple-canopy tree structure, and were regenerated following harvest activity. There will be exceptions to these guidelines, and judgments on stands to be managed will vary according to forest type and stand history. Activities in other types of stands that do not meet the general guidelines can be considered, particularly where those stands are heavily stocked and not being used by spotted owls or other late-successional associates. Examples may include stands that were planted following catastrophic fires or stands previously dominated by conifers that converted to hardwoods following harvest. Stands that have desired late-successional structure or that will soon develop it should not be treated unless such treatment is necessary to accomplish risk-reduction objectives (as described below).
2. Prescriptions to be used for each stand should be well thought out and documented. They will be designed to produce stand structure and components associated with late-successional conditions. These components include large trees, snags, logs, and dense, multistoried canopies. Prescriptions should show the treatments to be applied and the anticipated effects on the stand over time. They should also include a discussion of the actions, coordination efforts, and review that will be necessary for successful implementation. This discussion should draw on previous efforts made to implement similar prescriptions. Finally, the prescriptions should identify key stand attributes or accomplishments that should be monitored. For example, if snags are to be created, or regeneration established, the accomplishment of these actions and their results should be monitored.
3. Silvicultural activities must maintain or reduce risk of large-scale natural disturbance. For example, activities should not be implemented if they significantly increase the risk of windthrow in a stand.

4. To promote late-successional structure in stands to be thinned, prescriptions will provide for leaving some trees as snags and others as down wood. Those trees not needed for habitat development may be removed for commercial or fuel hazard reasons.
5. Key attributes of late-successional forests are their diversity and variability on individual sites and from site to site. To promote diversity and variability, a wide range of silvicultural practices should be applied, as opposed to reliance on a limited variety of techniques.
6. Activities that comply with these guidelines should provide positive conservation benefits. Actual implementation experience, however, is not extensive. A modest rate of implementation is prudent and will provide the opportunity to assess and refine activities. Acreage to be manipulated by silvicultural activities should generally be limited to 5 percent of the total area in any Late-Successional Reserve in the initial 5-year period of implementation, unless the need for larger-scale actions explicitly are justified.
7. Some habitat modification activities in Late-Successional Reserves will generate enough revenue to pay for themselves. Others will not and need to be supported by appropriated funds. It is not appropriate to conduct only those activities that generate a commercial return and ignore the needs of stands that cannot be treated commercially.

### **Guidelines to Reduce Risks of Large-Scale Disturbance**

Large-scale disturbances are natural events, such as fire, that can eliminate owl habitat on hundreds or thousands of acres. Certain risk management activities, if properly planned and implemented, may reduce the probability of these major stand-replacing events. There is considerable risk of such events in Late-Successional Reserves in the Washington and Oregon Eastern Cascades, and California Cascades Provinces and a lesser risk in the Oregon and California Klamath Provinces. Elevated risk levels are attributed to changes in the characteristics and distribution of the mixed-conifer forests resulting from past fire protection. These forests occur in drier environments, have had repeated insect infestations, and are susceptible to major fires. Risk reduction efforts are encouraged where they are consistent with the overall recommendations in this section of Appendix B5.

Silvicultural activities aimed at reducing risk shall focus on younger stands in Late-Successional Reserves. The objective will be to accelerate development of late-successional conditions while making the future stand less susceptible to natural disturbances. Salvage activities should focus on the reduction of catastrophic insect, disease, and fire threats. Treatments should be designed to provide effective fuel breaks wherever possible. However, the scale of salvage and other treatments should not generally result in degeneration of currently suitable owl habitat or other late-successional conditions.

In some Late-Successional Reserves in these provinces, management that goes beyond these guidelines may be considered. Levels of risk in those Late-Successional Reserves are particularly high and may require additional measures. Consequently, management activities designed to reduce risk levels are encouraged in those Late-Successional Reserves even if a portion of the activities must take place in currently late-successional habitat. 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. Such activities in older stands may also be undertaken in Late-Successional Reserves in other

provinces if levels of fire risk are particularly high. These activities are subject to review by the Regional Ecosystem Office. The Regional Ecosystem Office may develop criteria that would exempt some activities from review.

## Guidelines for Salvage

Salvage is defined as the removal of trees from an area following a stand-replacing event caused by wind, fires, insect infestations, volcanic eruptions, or diseases. Salvage guidelines are intended to prevent negative effects on late-successional habitat, while permitting some commercial wood volume removal. In some cases, salvage operations may actually facilitate habitat recovery. For example, excessive amounts of coarse woody debris may interfere with stand regeneration activities following some disturbances. In other cases, salvage may help reduce the risk of future stand-replacing disturbances. While priority should be given to salvage in areas where it will have a positive effect on late-successional forest habitat, salvage operations should not diminish habitat suitability now or in the future.

Tree mortality is a natural process in a forest ecosystem. Diseased and damaged trees are key structural components of late-successional forests. Accordingly, management planning for Late-Successional Reserves must acknowledge the considerable value of retaining dead and dying trees in the forest as well as the benefits from salvage activities.

In all cases, planning for salvage should focus on long-range objectives, which are based on desired future condition of the forest. Since Late-Successional Reserves have been established to provide high quality habitat for species associated with late-successional forest conditions, management following a stand-replacing event should be designed to accelerate or not impede the development of those conditions. The rate of development of this habitat will vary among provinces and forest types and will be influenced by a complex interaction of stand-level factors that include site productivity, population dynamics of live trees and snags, and decay rates of coarse woody debris. Because there is much to learn about the development of species associated with these forests and their habitat, it seems prudent to only allow removal of conservative quantities of salvage material from Late-Successional Reserves and retain management opportunities until the process is better understood.

The following guidelines are general. Specific guidelines should be developed for each physiographic province, and possibly for different forest types within provinces.

1. The potential for benefit to species associated with late-successional forest conditions from salvage is greatest when stand-replacing events are involved. Salvage in disturbed sites of less than one acre (some alternatives specify 10 or 100 acres) is not appropriate because small forest openings are an important component of old-growth forests. In addition, salvage should occur only in stands where disturbance has reduced canopy closure to less than 40 percent, because stands with more closure are likely to provide some value for species associated with these forests.
2. Surviving trees will provide a significant residual of larger trees in the developing stand. In addition, defects caused by fire in residual trees may accelerate development of structural characteristics suitable for associated species. Also, those damaged trees that eventually die will provide additional snags. Consequently, all standing live trees should be retained, including those injured (e.g., scorched) but likely to survive. Inspection of the cambium layer can provide an indication of potential tree mortality.



3. Snags provide a variety of habitat benefits for a variety of wildlife species associated with late-successional forests. Accordingly, following stand-replacing disturbance, management should focus on retaining snags that are likely to persist until late-successional conditions have developed and the new stand is again producing large snags. Late-successional conditions are not associated with stands less than 80 years old.
4. Following a stand-replacing disturbance, management should retain adequate coarse woody debris quantities in the new stand so that in the future it will still contain amounts similar to naturally regenerated stands. The analysis that determines the amount of coarse woody debris to leave must account for the full period of time before the new stand begins to contribute coarse woody debris. As in the case of snags, province-level specifications must be provided for this guideline. Since coarse woody debris decay rates, forest dynamics, and site productivity undoubtedly will vary among provinces and forest types; the specifications also will vary.

Watershed-level or province-level plans will establish appropriate levels of coarse woody debris and decay rates to be used. Levels will be "typical" and will not require retention of all material where it is highly concentrated, or too small to contribute to coarse woody debris over the long timeframes discussed. This standard and guideline represents one item to be considered and may indeed result in no salvage following windthrow in low density stands. As for other management activities, it is expected that salvage standards and guidelines will be refined through the implementation process and adaptive management.

5. Some salvage that does not meet the preceding guidelines will be allowed when salvage is essential to reduce the future risk of fire or insect damage to late-successional forest conditions. This circumstance is most likely to occur in the eastern Oregon Cascades, eastern Washington Cascades, and California Cascades Provinces, and somewhat less likely to occur in the Oregon Klamath and California Klamath Provinces. It is important to understand that some risk associated with fire and insects is acceptable because they are natural forces influencing late-successional forest development. Consequently, salvage to reduce such risks should focus only on those areas where there is high risk of large scale disturbance.
6. Removal of snags and logs may be necessary to reduce hazards to humans along roads and trails, and in or adjacent to campgrounds. Where materials must be removed from the site, as in a campground, a salvage sale is appropriate. In other areas, such as along roads, leaving material on site should be considered. Also, material will be left where available coarse woody debris is inadequate.
7. Where green trees, snags, and logs are present following disturbance, the green tree and snag guidelines will be applied first, and completely satisfied where possible. The biomass left in snags can be credited toward the amount of coarse woody debris biomass needed to achieve management objectives.
8. These basic guidelines may not be applicable after disturbances in younger stands since remnant coarse woody debris may be relatively small. In these cases, diameter and biomass retention guidelines should be developed consistent with the intention of regenerating late-successional forest conditions.

9. Logs present on the forest floor before a disturbance event provide habitat benefits that are likely to continue. It seldom will be appropriate to remove them. Where these logs are in an advanced state of decay, they will not be credited toward objectives for coarse woody debris retention developed after a disturbance event. Advanced state of decay should be defined as logs not expected to persist to the time when the new stand begins producing coarse woody debris.
10. The coarse woody debris retained should approximate the species composition of the original stand to help replicate preexisting suitable habitat conditions.
11. Some deviation from these general guidelines may be allowed to provide reasonable access to salvage sites and feasible logging operations. Such deviation should occur on as small a portion of the area as possible, and should not result in violation of the basic intent that late-successional forest habitat or the development of such habitat in the future should not be impaired throughout the area. While exceptions to the guidelines may be allowed to provide access and operability, some salvage opportunities will undoubtedly be foregone because of access, feasibility, and safety concerns.

### **Delineation and Management of Reserved Pair Areas**

1. For each Reserved Pair Area, delineate an area surrounding the owl activity center with an acreage at least equal to the median home range size for pairs in that province. Use data from the spotted owl study area that is most similar to the site being considered (Table B5-1). This area will be delineated to encompass as much suitable habitat as possible, and the habitat will be as close to the owl activity center as possible. Reserve all suitable habitat in that area from timber harvest. If the habitat acreage does not at least equal the median amount found for owl pairs in the province, additional habitat must be provided from the next best habitat available in the home range area, or by expanding the area to incorporate additional suitable habitat. Use logical physical boundaries to facilitate management of the area. Late-Successional Reserve management standards and guidelines for salvage and other multiple-use activities would generally apply in the suitable habitat portion of the Reserved Pair Area.
2. In the Reserved Pair Areas, allow for management of currently unsuitable areas consistent with Late-Successional Reserve management standards and guidelines for silviculture and salvage. Management of other multiple-use activities in the unsuitable habitat should follow guidance from agency planning documents, which may allow some activities that would not be consistent with Late-Successional Reserve management standards and guidelines.

### **Delineation and Management of Managed Pair Areas**

1. For each Managed Pair Area, delineate an area surrounding the owl activity center with an acreage at least equal to the median home range size for pairs. The size of this area will be determined from median home range data for the province (Table B5-1). Use data from the spotted owl study area that is most similar to the site being considered. The delineated area should be configured so that it contains an amount of suitable habitat that approximates at least the median amount observed in pair home ranges for the province (Table B5-2).

*Appendix B*

2. Suitable habitat should be maintained through time using various management techniques. The objective will be to always maintain an amount of suitable habitat equal to median amounts observed in pair home ranges in the province. The location of this acreage may change through time as management is rotated through the area. Some uncertainty will be accepted in management to provide habitat in these areas.
3. Silviculture, salvage, and other multiple-use activities for these areas always should be guided by the objective of maintaining adequate amounts of suitable habitat.

**Table B5-1.** Annual home range areas (in acres) of northern spotted owl pairs in different states, physiographic provinces, and study areas<sup>1</sup>

State Physiographic Province Study Area	Number of Pairs	Forest Type <sup>2</sup>	Range			Sources <sup>3</sup>
			Median	Min.	Max.	
California						
Klamath Province						
Ukonom	9	MC	3,314	2,056	7,823	1
Mad River	12	MC	2,975	1,803	4,685	1
Willow Creek	2	MC	1,692	1,258	2,126	2
Oregon						
Klamath Province						
South Umpqua	3	MC	1,411	1,035	1,504	3
Cow Creek	6	MC	4,106	2,499	7,494	3
Chetco	4	ME	5,614	5,327	6,197	1
Coast Range Province						
Tyee	5	DF/HEM	3,387	1,880	8,272	3
Peterson	4	DF/HEM	6,318	3,483	10,189	3
Eugene BLM	4	DF/HEM	6,390	3,715	8,180	4
Other <sup>4</sup>	4	DF/HEM	4,183	2,849	9,748	5
Kellogg <sup>5</sup>	5	MC	4,072	1,618	6,281	3
Western Cascades Province	11	DF/HEM	2,955	1,443	9,758	6, 7
Washington						
Western Cascades Province	11	DF/HEM	6,657	2,969	17,942	8, 9, 10
Olympic Peninsula Province	10	HEM/DF	14,271	4,497	27,309	9, 11
Eastern Cascades Province	7	MC	7,124	3,694	15,587	11

Note: this table follows Thomas et al. (1990) with changes based on Forsman (pers. comm., as cited in USDI unpub.) and Hays (pers. comm., as cited in USDI unpub.).

<sup>1</sup> Pair home ranges were calculated by delineating 100 percent MCP (minimum convex polygons): total = exclusive area of male and exclusive area of female and the area of overlap shared by the two sexes.

<sup>2</sup> MC = mixed conifer, ME = mixed conifer/evergreen, DF/HEM = Douglas-fir, western hemlock, HEM/DF = mostly western hemlock with Douglas-fir intermixed.

<sup>3</sup> 1 = Paton et al. (1990), 2 = Solis (1983), 3 = Carey (pers. comm., as cited in USDI unpub.), 4 = Thraillkill (pers. comm., as cited in USDI unpub.) and Meslow (pers. comm., as cited in USDI unpub.), 5 = Carey et al. (1990), 6 = Forsman and Meslow (1985), 7 = Miller (pers. comm., as cited in USDI unpub.), 8 = Allen et al. (1989), 9 = Hays et al. (1989), 10 = Hamer (pers. comm., as cited in USDI unpub.), 11 = Forsman (pers. comm., as cited in USDI unpub.).

<sup>4</sup> Includes four sites in the Oregon Coast Range Province near Roseburg.

<sup>5</sup> This is a relatively dry area bordering the Umpqua River valley, characterized by mixed-conifer forest more typical of the Oregon Klamath Province than the Oregon Coast Range Province.

Source: USDI unpub. p. 27.

**Table B5-2.** Amounts of old-growth and mature forest (in acres) in annual pair home ranges of spotted owls, by state, physiographic province, and study area

State	Physiographic Province Study Area	Number of Pairs	Forest Type <sup>1</sup>	Range			Sources <sup>2</sup>
				Median	Min.	Max.	
California							
	Klamath Province						
	Ukonom	9	MC	2,484	1,030	5,654	1, 2
	Mad River	12	MC	1,365	835	1,953	1, 2
	Willow Creek	2	MC	800	367	1,233	3
Oregon							
	Klamath Province						
	South Umpqua	3	MC	615	563	768	4
	Cow Creek	6	MC	1,549	1,450	1,983	4
	Chetco <sup>3</sup>	4	ME	-	-	-	1
	Coast Range Province						
	Tyee	5	DF/HEM	2,031	1,645	3,984	4
	Peterson	4	DF/HEM	2,609	1,284	3,196	4
	Eugene BLM	4	DF/HEM	1,783	799	3,580	5
	Other <sup>4</sup>	4	DF/HEM	2,375	1,795	2,625	6
	Kellogg <sup>5</sup>	5	MC	1,018	697	1,983	4
	Western Cascades Province	9	DF/HEM	1,796	1,050	3,786	7, 8
Washington							
	Western Cascades Province	11	DF/HEM	3,281	1,715	8,998	9, 10, 11
	Olympic Peninsula Province	7	HEM/DF	4,579	2,787	8,448	12
	Eastern Cascades Province	7	MC	-	-	-	12

Note: this table follows Thomas et al. (1990) with changes based on Forsman (pers. comm., as cited in USDI unpub.) and Hays (pers. comm., as cited in USDI unpub.)

<sup>1</sup> MC - mixed conifer, ME = mixed conifer/evergreen, DF/HEM = Douglas-fir, western hemlock, HEM/DF = mostly western hemlock with Douglas-fir intermixed

<sup>2</sup> 1 = Paton et al. (1990), 2 = Paton (pers. comm., as cited in USDI unpub.), 3 = Solis, (1983), 4 = Carey (pers. comm., as cited in USDI unpub.), 5 = Thrailkill (pers. comm., as cited in USDI unpub.) and Meslow (pers. comm., as cited in USDI unpub.), 6 = Carey et al. (1990), 7 = Forsman and Meslow (1985), 8 = Miller (pers. comm., as cited in USDI unpub.), 9 = Allen et al. (1989), 10 = Hays et al. (1989), 11 = Hamer (pers. comm., as cited in USDI unpub.), 12 = Forsman (pers. comm., as cited in USDI unpub.)

<sup>3</sup> Studies provided data for annual home range size; amounts of old-growth and mature forest not yet available

<sup>4</sup> Includes four sites in the Oregon Coast Range Province near Roseburg

<sup>5</sup> This is a relatively dry area bordering the Umpqua River valley, characterized by mixed-conifer forest more typical of the Oregon Klamath Province than the Oregon Coast Range Province

Source: USDI unpub. p. 28.

# Appendix B6

## Aquatic Conservation Strategy

The Aquatic Conservation Strategy was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on all public lands (Karr 1991, Karr et al. 1986, Naiman et al. 1992). The strategy would protect anadromous (i.e., salmon and steelhead) habitat on public lands including those managed by the Forest Service, Bureau of Land Management, and National Park Service, within the range of Pacific Ocean anadromy. It is a refinement of the approach outlined in Appendix 5-K of the Scientific Analysis Team Report (Thomas et al. 1993). The descriptions of the strategy, its components, objectives, and applicable standards and guidelines are adapted from the Forest Ecosystem Management Assessment Team's (FEMAT) Report, Chapter V, Aquatic Ecosystem Assessment.

The Aquatic Conservation Strategy was designed to provide a scientific basis for protecting aquatic ecosystems and enables planning for sustainable resource management. It is a regionwide strategy seeking to retain, restore, and protect those processes and landforms that contribute habitat elements to streams and promote high quality habitat conditions for fish and other aquatic and riparian-dependent organisms. The foundation of the conservation strategy is a refinement of the approach outlined in Thomas et al. (1993).

An effective conservation strategy must protect aquatic ecosystem functions and processes, organized at a watershed scale, while recognizing that land ownership patterns rarely coincide with the distinct topographic boundaries of watersheds. Any conservation strategy that attempts to protect all components of the aquatic ecosystem ranging from unstable and potentially unstable areas in the uplands to mainstem riparian forests must be extensive and comprehensive. Decision criteria for protection, monitoring and restoration must be included.

At the heart of this approach is the recognition that fish and other aquatic organisms evolved within a dynamic environment that has been constantly influenced and changed by geomorphic and ecologic disturbances. Stewardship of aquatic resources has the highest likelihood of protecting biological diversity and productivity when land use activities do not substantially alter the natural disturbance regime to which these organisms are adapted (Swanson et al. 1993).

This conservation strategy employs several tactics to approach the goal of maintaining the "natural" disturbance regime. Land use activities need to be limited or excluded in those parts of the watershed prone to instability. The distribution of land use activities, such as timber harvest or roads, must minimize increases in peak streamflows. Headwater riparian areas need to be protected, so that when debris slides and flows occur they contain coarse woody debris and boulders necessary for creating habitat farther downstream. Riparian areas along larger channels need protection to limit bank erosion, ensure an adequate and continuous supply of coarse woody debris to channels, and provide shade and microclimate protection. Watersheds currently containing the best habitat, or those having the greatest potential for recovery, should receive increased protection and receive highest priority for restoration programs.

Current scientific understanding of fish habitat relationships is inadequate to allow definition of specific habitat requirements for fish throughout their life cycle at the watershed level. Some general habitat needs of fish are well known, such as deep resting pools, cover, certain temperature ranges, food supply, and clean gravel for spawning (Bjornn and Reiser 1991). However, the Assessment Team did not specify how these habitats and conditions should be distributed through time and space to provide for the needs of fish. In natural watersheds, different species and age classes interact with multiple habitat elements in

complex ways. This interaction occurs within a landscape where the quality and distribution of habitat elements change with time in relation to natural and management-related disturbances in streams and riparian areas.

The Assessment Team believed that any species-specific strategy aimed at defining explicit standards for habitat elements would be insufficient for protecting even the targeted species. To succeed, any aquatic conservation strategy must strive to maintain and restore ecosystem health at watershed and landscape scales. Thus, this is the approach of the Aquatic Conservation Strategy. This approach seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds. The Assessment Team emphasized, however, that it will require time for this strategy to work. Because the approach is based on natural disturbance processes, it may take decades, possibly more than a century, to accomplish all of its objectives. Some improvements in aquatic ecosystems, however, can be expected in 10 to 20 years. The Assessment Team believed that if this approach is conscientiously implemented, it will protect habitat for fish and other riparian-dependent species resources and restore currently-degraded habitats.

Actual effects, determination of ranges of natural variability, and suggested watershed specific management options will be examined through watershed analysis.

## **Aquatic Conservation Strategy Objectives**

Federal lands within the range of the northern spotted owl will be managed to:

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.
2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically-unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.
3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.
4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.
5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.
6. Maintain and restore instream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.
7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.
9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

Implementing the Aquatic Conservation Strategy requires applying the standards and guidelines identified in this appendix within the context of the overall Aquatic Conservation Strategy objectives. Under the Aquatic Conservation Strategy, proposed and existing project review and implementation of management actions must be based on the restoration and maintenance criterion established by the Aquatic Conservation Strategy.

The existing conditions and physical and biological processes operating within a watershed will be the baseline from which project proposals will be considered. Province, river basin, and individual watershed analyses will provide the baseline information and define the range of natural variability. The range of natural variability thus implicitly defines the context of the “natural” disturbance regime from which decisions will be made. Decision makers will use the information developed during these analyses to decide if proposed or existing projects and management actions meet Aquatic Conservation Strategy objectives. This is a different way of framing management decisions than used in the past. In the past, proposed projects were considered from the context of what effect (positive and negative) a proposed project would have on individual resources and not necessarily from a watershed perspective. Mitigation was frequently used to attempt to neutralize the effect on riparian dependent resources. Thus, management actions were implemented under the assumption that the mitigation prescription would achieve the desired results and compensate for the negative effects due to the project or management action. The risk to the aquatic and riparian habitat was placed on the outcome of the mitigation. Under the Aquatic Conservation Strategy, a project cannot have a negative effect in the long term on riparian-dependent resources. Mitigation or planned restoration, such as placement of in-channel structures, should not be used as a substitute for preventing habitat degradation. The risk to the aquatic and riparian habitat has been shifted because each project or management action must maintain or restore the physical and biological processes required by riparian-dependent resources within watersheds.

The standards and guidelines are designed to focus the review of proposed and existing projects to determine their compatibility with the Aquatic Conservation Strategy objectives. The standards and guidelines focus on “meeting” and “not preventing attainment” of Aquatic Conservation Strategy objectives. The intent is to ensure that a decision maker must find that the proposed management activity is consistent with the Aquatic Conservation Strategy objectives. The decision maker will use the results of watershed analysis to make the finding. In order to make the finding that a project or management action “meets” or “does not prevent attainment” of the Aquatic Conservation Strategy objectives. To determine compatibility with the objectives, the analysis must include a description of the existing condition, a description of the range of natural variability of the important physical and biological components of a given watershed, and how the proposed project or management action maintains the existing condition or moves it within the range of natural variability. Management actions that do not maintain the existing condition or lead to improved conditions in the long term would not “meet” the intent of the Aquatic Conservation Strategy and should not be implemented.

A hypothetical example regarding applying the Aquatic Conservation Strategy would help illustrate the intent of the strategy. Ski areas frequently have clearings that cross intermittent and ephemeral streams. These exposed areas could be sources of sediment to the intermittent and ephemeral streams as well as potential fish-bearing streams downstream. The frequent clearings in the upper watersheds would also affect the hydrology of the watershed where the ski area occurs. These conditions are generally not typical of upper watershed ephemeral and intermittent streams and would most likely be out of the typical range of natural variability for hydrology, riparian vegetation, water quality and the sediment regime. The persistence of these conditions results from the long-term maintenance of the openings and leads to chronic negative effects to the watershed.



Thus, the long-term maintenance of the existing condition would not meet the intent of the Aquatic Conservation Strategy.

Management options to improve conditions vary from modifying operations to closure and removal of that part of the ski area. Modifying operations includes establishing vegetation that reduces erosion and sediment delivery to the channels and eliminating use during periods when exposed wet soil is most easily disturbed and compacted, relocating the openings to reduce the lineal extent of openings along the streams, eliminating summer use that compacts soil and destroys vegetation, and eliminating the openings that cross the streams. All of the above options would meet the intent of the Aquatic Conservation Strategy. The appropriate management option depends on the condition of the rest of the watershed, relationship of the openings to the functions and processes operating in the watershed, determination of beneficial uses of a given watershed, and management actions that restore much of the processes within their range of natural variability. If no alternatives exist to improve conditions, then the appropriate management option is to close and restore that part of the ski area.

Components of the Aquatic Conservation Strategy are:

1. **Riparian Reserves:** Lands along streams and unstable and potentially unstable areas where special standards and guidelines direct land use.
2. **Key Watersheds:** A system of large refugia comprising watersheds that are crucial to at-risk fish species and stocks and provide high quality water.
3. **Watershed Analysis:** Procedures for conducting analysis that evaluates geomorphic and ecologic processes operating in specific watersheds. This analysis should enable watershed planning that achieves Aquatic Conservation Strategy objectives. Watershed Analysis provides the basis for monitoring and restoration programs and the foundation from which Riparian Reserves can be delineated.
4. **Watershed Restoration:** A comprehensive, long-term program of watershed restoration to restore watershed health and aquatic ecosystems including the habitats supporting fish and other aquatic and riparian-dependent organisms.

These components are designed to operate together to maintain and restore the productivity and resilience of riparian and aquatic ecosystems. Table B6-1 provides further clarification of the role of each component in the Aquatic Conservation Strategy.

Late-Successional Reserves are also an important component of the Aquatic Conservation Strategy. The standards and guidelines under which Late-Successional Reserves are managed provide increased protection for all stream types. Since these reserves possess late-successional characteristics, they offer core areas of high quality stream habitat that will act as refugia and centers from which degraded areas can be recolonized as they recover. Streams in these reserves may be particularly important for endemic or locally distributed fish species and stocks.

## 1) RIPARIAN RESERVES

Riparian Reserves are portions of watersheds where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply. Standards and guidelines prohibit or regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives. Riparian Reserves include those portions of a watershed directly coupled to streams and rivers, i.e., the portions of a watershed required for maintaining hydrologic, geomorphic, and ecologic processes that directly affect standing and flowing water bodies, such lakes and ponds, wetlands, streams, stream processes, and fish habitats. Riparian Reserves include areas designated in current plans and draft plan preferred alternatives as riparian management areas or streamside management zones and primary source areas for wood and sediment, such as unstable and potentially unstable areas in headwater areas and along streams. Riparian Reserves occur at the

Table B6-1. Summary of Aquatic Conservation Strategy

Component	Role in Conservation Strategy
Riparian Reserves	<ul style="list-style-type: none"> <li>• Portions of the landscape where riparian-dependent and stream resources receive primary emphasis.</li> <li>• Designated for all permanently-flowing streams, lakes, wetlands greater than one acre, and intermittent streams.</li> <li>• Includes the body of water, inner gorge, all riparian vegetation, 100-year floodplain, landslides and landslide prone areas.</li> <li>• Interim widths will be at least some fraction of a site-potential tree height or a prescribed slope distance (see Table V-5, p. V-37, in the FEMAT Report).</li> <li>• Standards and Guidelines prohibit programmed timber harvest, and manage roads, grazing, mining and recreation to achieve objectives of the Aquatic Conservation Strategy.</li> </ul>
Key Watersheds	<ul style="list-style-type: none"> <li>• Tier 1 - Selected for directly contributing to anadromous salmonid and bull trout conservation.</li> <li>• Tier 2 - May not contain at-risk fish stocks but were selected as sources of high quality water.</li> <li>• Inside roadless areas - no new roads will be built.</li> <li>• Outside roadless areas - at a minimum there will be no net increase in roads in Key Watersheds.</li> <li>• Highest priority in restoration programs.</li> </ul>
Watershed Analysis	<ul style="list-style-type: none"> <li>• A systematic procedure to characterize watersheds. The information will be used for developing management prescriptions and monitoring programs, setting and refining Riparian Reserve boundaries, and developing restoration strategies.</li> <li>• Required in Key Watersheds prior to management activities.</li> <li>• Required in all roadless areas prior to management activities.</li> <li>• Recommended in all other watersheds.</li> <li>• Required as the primary analytical basis for changing Riparian Reserves in all watersheds.</li> </ul>
Watershed Restoration	<ul style="list-style-type: none"> <li>• Focus on removing and upgrading roads.</li> <li>• Silvicultural treatments may be used to restore large conifers in Riparian Reserve.</li> <li>• Restore channel complexity. Instream structures should only be used in the short term and not as a mitigation for inadequate management of the land.</li> </ul>

margins of standing and flowing water, intermittent stream channels and ephemeral ponds, and wetlands. Riparian Reserves generally parallel the stream network but also include other areas necessary for maintaining hydrologic, geomorphic, and ecologic processes.

Under the Aquatic Conservation Strategy, Riparian Reserves are used to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The Riparian Reserves will also serve as connectivity corridors between the Late-Successional Reserves.

The Assessment Team developed three Riparian Reserve scenarios that prescribe the Riparian Reserve widths to be used until the agencies complete watershed analyses (Table B6-2). The three scenarios have similar prescriptions for: (1) fish-bearing streams, (2) constructed ponds and reservoirs and wetlands greater than 1 acre, and (3) lakes and natural ponds. The three scenarios prescribe different widths for: (1) permanently-flowing nonfish-bearing streams, and (2) seasonally-flowing or intermittent streams and wetlands less than 1 acre.

Widths for Riparian Reserves necessary to meet Aquatic Conservation Strategy objectives for different water bodies are established based on ecologic and geomorphic factors. The prescribed widths are designed to provide a high level of fish habitat and riparian protection until watershed and site analysis can be completed. Watershed analysis will identify critical hillslope, riparian, and channel processes that must be evaluated to delineate Riparian Reserves that assure protection of riparian and aquatic functions. Riparian Reserves are delineated during implementation of site-specific projects based on analysis of the critical hillslope, riparian, and channel processes and features. Although Riparian Reserve boundaries may be adjusted on permanently-flowing streams, the Assessment Team considered the prescribed widths to approximate those necessary for attaining Aquatic Conservation Strategy objectives. Post-watershed analysis Riparian Reserve boundaries for intermittent streams are expected to be different from the existing boundaries due to the high variability of hydrologic, geomorphic and ecologic processes in a watershed affecting intermittent streams. Consequently, while the post-watershed analysis Riparian Reserve boundaries for permanently-flowing streams should approximate the boundaries prescribed in this SEIS, post-watershed analysis Riparian Reserve boundaries for intermittent streams can be quite different from the boundaries prescribed in this SEIS. The prescribed widths of Riparian Reserves apply to all watersheds until watershed analysis is completed, a site-specific analysis is conducted and described, and the rationale for final Riparian Reserve boundaries is presented.

The boundaries of Riparian Reserves depend on varying site-specific elements and characteristics, including the size of a site-potential tree. The Assessment Team defined a site-potential tree as one with the average maximum height of the tallest dominant trees (200 years or more) for a given site class.

Riparian Reserves cover the following five categories of streams or water bodies:

- *Fish-bearing streams* - Riparian Reserves consist of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees; or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest.
- *Permanently-flowing nonfish-bearing streams* - Riparian Reserves consist of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation; or depending on the Riparian Reserve scenario, extension from the edges of a stream channel to a distance equal to the height of some fraction of a site-potential tree, or a specified slope distance, whichever is greatest.

**Table B6-2.** Minimum widths of Riparian Reserves for fish-bearing, permanently flowing nonfish-bearing, and intermittent streams, expressed as whichever slope distance is greatest. In addition, Riparian Reserves must include the 100-year floodplain, inner gorge, and unstable and potentially unstable areas.

Riparian Reserve Scenario	Stream Class	Tier 1 Key Watershed	Tier 2 Key Watershed	All Other Watersheds
Riparian Reserve 1	Fish-bearing streams	Average height of two site-potential trees or 300 feet	Average height of two site-potential trees or 300 feet	Average height of two site-potential trees or 300 feet
Riparian Reserve 1	Permanently flowing nonfish-bearing streams	Average height of one site-potential tree or 150 feet	Average height of one site-potential tree or 150 feet	Average height of one site-potential tree or 150 feet
Riparian Reserve 1	Intermittent streams	Average height of one site-potential tree or 100 feet	Average height of one site-potential tree or 100 feet	Average height of one site-potential tree or 100 feet
Riparian Reserve 2	Fish-bearing streams	Average height of two site-potential trees or 300 feet	Average height of two site-potential trees or 300 feet	Average height of two site-potential trees or 300 feet
Riparian Reserve 2	Permanently flowing nonfish-bearing streams	Average height of one site-potential tree or 150 feet	Average height of one site-potential tree or 150 feet	Average height of one site-potential tree or 150 feet
Riparian Reserve 2	Intermittent streams	Average height of one site-potential tree or 100 feet	Half the average height of one site-potential tree or 50 feet	Half the average height of one site-potential tree or 50 feet
Riparian Reserve 3	Fish-bearing streams	Average height of two site-potential trees or 300 feet	Average height of two site-potential trees or 300 feet	Average height of two site-potential trees or 300 feet
Riparian Reserve 3	Permanently flowing nonfish-bearing streams	Half the average height of one site-potential tree or 75 feet	Half the average height of one site-potential tree or 75 feet	Half the average height of one site-potential tree or 75 feet
Riparian Reserve 3	Intermittent streams	One-sixth the average height of site-potential tree or 25 feet	One-sixth the average height of site-potential tree or 25 feet	One-sixth the average height of site-potential tree or 25 feet

- *Constructed ponds and reservoirs, and wetlands greater than 1 acre* - Riparian Reserves consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree; or 150 feet slope distance from the edge of the wetland greater than 1 acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest. This is the same in all Riparian Reserve scenarios.
- *Lakes and natural ponds* - Riparian Reserves consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of two site-potential trees; or 300 feet slope distance, whichever is greatest. This is the same in all Riparian Reserve scenarios.
- *Seasonally-flowing or intermittent streams, wetlands less than 1 acre, and unstable and potentially unstable areas* - This category applies to features with high variability in size and site-specific characteristics. At a minimum, the Riparian Reserve must include:

The extent of unstable and potentially unstable areas.

The stream channel and extend to the top of the inner gorge.

The stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation.

Depending on the Riparian Reserve scenario, extension from the edges of the stream channel to a distance equal to the height of some fraction of a site-potential tree, or a specified slope distance, whichever is greatest.

Including intermittent streams and wetlands within Riparian Reserves is important for successful implementation of the Aquatic Conservation Strategy. Accurate identification of these features is critical to correctly implement the strategy and protect the intermittent stream and wetland functions and processes. Identification of these features is difficult at times due to the lack of surface water or wet soils during dry periods. The following discussion provides guidance on steps to identify these features for inclusion within Riparian Reserves.

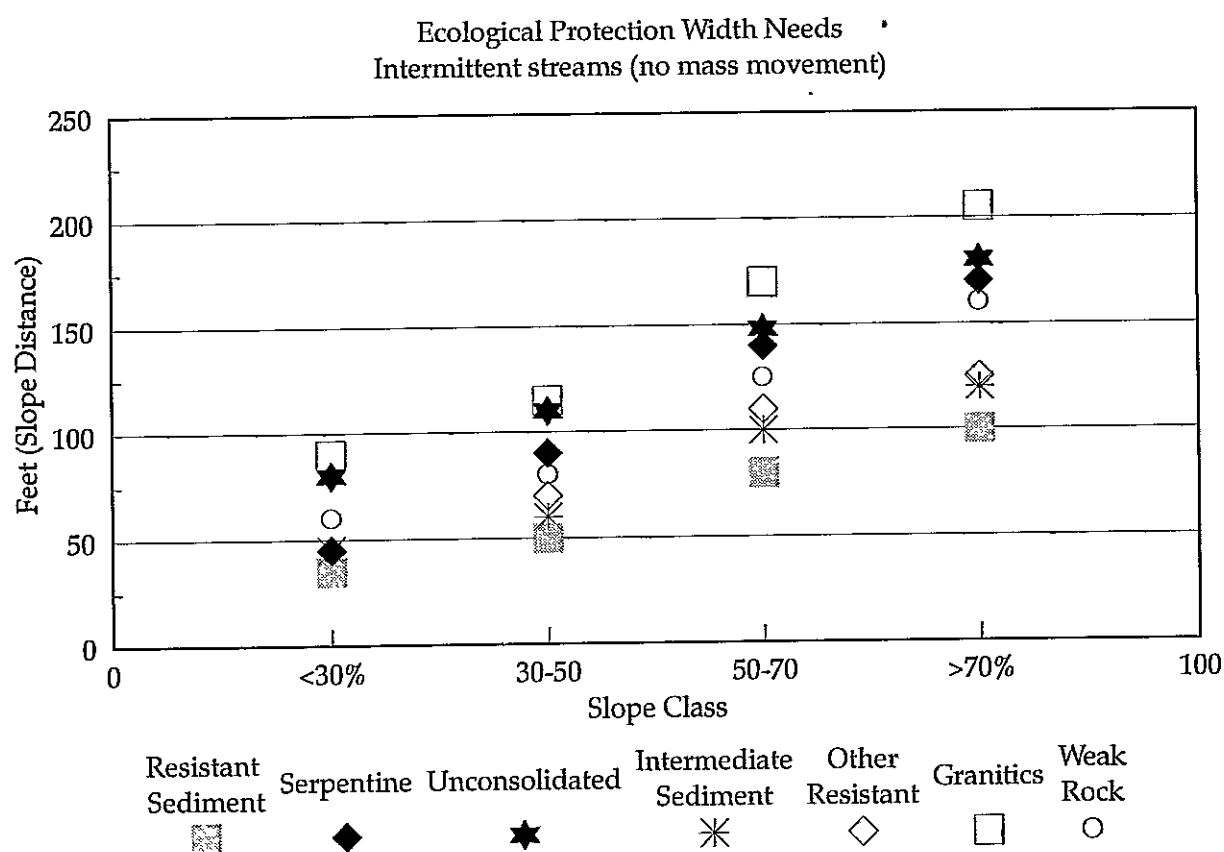
**Intermittent Streams** - Fish-bearing streams are distinguished from intermittent streams by the presence of any species of fish for any duration. Many intermittent streams may be used as spawning and rearing streams, refuge areas during flood events in larger rivers and streams, or travel routes for fish emigrating from lakes. In these instances, the standards and guidelines for fish-bearing streams would apply to those sections of the intermittent stream used by the fish. Intermittent streams are defined as any nonpermanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria.

The following discussion pertains to Riparian Reserve widths on intermittent streams and wetlands necessary to meet Aquatic Conservation Strategy objectives. Other objectives, such as Riparian Reserves providing wildlife dispersal corridors, could lead to Riparian Reserve widths different from those necessary to protect the ecological integrity of the intermittent stream or wetland. These other objectives could yield wider Riparian Reserves than those necessary to meet Aquatic Conservation Strategy objectives. There can never be instances where Riparian Reserves would be narrower than the widths necessary to meet Aquatic Conservation Strategy objectives.

The width of Riparian Reserves necessary to protect the ecological integrity of intermittent streams varies with slope and rock type. Figure B6-1 shows the estimated size of Riparian Reserves necessary to protect the ecological values of intermittent streams with different slope and rock types. These estimates were made by geomorphologists, hydrologists, and fish biologists from the Bureau of Land Management, Forest Service, and the Environmental Protection Agency. These distances are consistent with the height of one site-potential tree, as discussed above.

Watershed analysis provides the ecological and geomorphic basis for changing the size and location of Riparian Reserves.

**Figure B6-1.** Ecological protection needs for intermittent streams, by slope class and rock type. Figure shows width, measured as slope distance, needed for streamside protection for reasons other than slope stability. These widths were estimated by an interagency team of scientists based on professional judgment and experience. Protection needs included surface erosion of streamside slopes, fluvial erosion of the stream channel, soil productivity, habitat for riparian-dependent species, the ability of streams to transmit damage downstream, and the role of streams in the distribution of large wood to downstream fish-bearing waters.



**Wetlands** - The combination of hydrology, soils, and vegetative characteristics is the primary factor influencing the development of wetland habitats. There must be the presence of surface water or saturated soils to significantly reduce the oxygen content in the soils to zero, or near zero, concentrations. These low, or zero, soil oxygen conditions must persist for sufficient duration to promote development of plant communities that have a dominance of species adapted to survive and grow under zero oxygen conditions. These wetland characteristics apply when defining wetlands for regulatory jurisdiction (Dept. of the Army 1987) or for technical analysis when conducting inventories or functional assessments. Seeps and springs can be classified as streams if they have sufficient flow in a channel or as seasonal or perennial wetlands under the criteria defined in the Corps of Engineers Wetlands Manual (Dept. of the Army 1987). The standards and guidelines for wetlands, which are based on the hydrologic, physical and biologic characteristics described in the manual, apply to seeps and springs regardless of their size.

Formal definition for implementing section 404 of the Clean Water Act, adopted by the Environmental Protection Agency, is as follows:

The term wetlands means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

Detailed technical methods have been developed to assist in identification of wetlands in the field that meet the above definition. Currently, the field manual being used for implementing the Clean Water Act is the Corps of Engineers Wetlands Manual" (Dept. of the Army 1987).

For purposes of conducting the National Wetland Inventory, the Fish and Wildlife Service has broadly defined both vegetated and nonvegetated wetlands as follows:

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979).

Wetlands typically occur within and adjacent to riparian zones. It is frequently difficult to differentiate wetlands from riparian areas based on the definitions. Most typically, and particularly in forested landscapes, the riparian zone is defined by its spatial relation to adjacent streams or rivers. However, riparian zones are also commonly considered to be lands integrally related to other aquatic habitats such as lakes, reservoirs, intermittent streams, springs, seeps, and wetlands.

Such conceptual and definitional vagaries lead to spatial overlap between wetlands and riparian zones. This overlap results in only a portion of the riparian zone associated with rivers and streams being considered wetlands. The extent of that portion depends on specific hydrologic, vegetation, and soil features. The functions of the wetland portion may also be distinct from the nonwetlands. For example, wetlands may provide habitat for specialized plant species or reproductive habitat for amphibians or other organisms that would not be provided by riparian areas.

The prescribed widths for Riparian Reserves apply to all streams, lakes, ponds and wetlands on lands administered by the Forest Service and Bureau of Land Management within the range of the northern spotted owl until a watershed analysis can be completed. Watershed analysis is expected to yield the contextual information needed to define ecologically and geomorphically appropriate Riparian Reserves. Analysis of site-specific characteristics may warrant Riparian Reserves that are narrower or wider than the prescribed widths. Thus, it is possible to meet Aquatic Conservation Strategy objectives with post-watershed analysis reserve boundaries

for intermittent streams that are quite different from those conforming to the prescribed widths. Regardless of stream type, changes to Riparian Reserves must be based on scientifically sound reasoning, and be fully justified and documented.

Once the Riparian Reserve width is established, either based on existing widths or watershed analysis, then land management activities allowed in the Riparian Reserve will be directed by standards and guidelines for managing Riparian Reserves. The standards and guidelines for Riparian Reserves, described later in this appendix, prohibit or regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives.

## 2) KEY WATERSHEDS

Refugia are a cornerstone of most species conservation strategies. They are designated areas that either provide, or are expected to provide, high quality habitat. A system of Key Watersheds that serve as refugia is crucial for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species. These refugia include areas of high quality habitat as well as areas of degraded habitat. Key Watersheds with high quality conditions will serve as anchors for the potential recovery of depressed stocks. Those of lower quality habitat have a high potential for restoration and will become future sources of high quality habitat with the implementation of a comprehensive restoration program (see Watershed Restoration later in this portion of Appendix B).

The Aquatic Conservation Strategy includes two designations for Key Watersheds. Tier 1 (Aquatic Conservation Emphasis) Key Watersheds contribute directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species. They also have a high potential of being restored as part of a watershed restoration program. Tier 1 Key Watersheds consist primarily of watersheds identified previously by Johnson et al. (1991) and Thomas et al. (1993). The network of 143 Tier 1 Key Watersheds ensures that refugia are widely distributed across the landscape. While 21 Tier 2 (other) Key Watersheds may not contain at-risk fish stocks, they are important sources of high quality water. The Key Watersheds are displayed on the map accompanying this Final SEIS and delineated in Table B6-3. Many of these had been identified by Johnson et al. (1991) and Thomas et al. (1993) and their designations changed during the preparation of the FEMAT Report. See Chapter V of the FEMAT Report for more discussion.

The original identification of key watersheds in Johnson et al. (1991) was done by fish biologists and hydrologists from each of the National Forests within the range of the northern spotted owl. The criteria for Tier 1 watersheds listed above were used to identify the individual watersheds at that time. Each National Forest was asked to develop a map showing the distribution of anadromous fish or other fish species and to identify the best existing habitats. Additionally, each National Forest identified watersheds that had the greatest potential for restoration to become high quality habitat for anadromous and other fish species in the future. After each National Forest had identified key watersheds, a comprehensive map was developed. Distribution of the watersheds relative to each other, distribution within major drainage basins, and the distribution relative to private and state lands was examined. Adjustments were made where deemed necessary.

The Assessment Team did not have a set of quantitative criteria (e.g., dispersal distance and number of pairs) like those developed for the northern spotted owl. As a result, the Assessment Team relied on professional judgement to determine if the system appeared to be adequate in terms of the amount and distribution of habitat for the major stocks across the region. Reeves and Sedell (1992) give a more detailed discussion of the development of the Key Watershed network.

The Key Watershed network includes streams used by 176 of the 257 at-risk fish stocks that inhabit federal lands (Tables B6-4 and B6-5). At-risk fish stocks are stocks that are at a high-to-moderate risk of extinction (Table B6-4) (Higgins et al. 1992, Nehlsen et al. 1991, Nickelson et al. 1992, and Wash. Dept. of Fisheries 1993). Of the 82 at-risk stocks not covered by Key Watersheds, 68 occur on Forest Service-administered watersheds, 9



on BLM-administered watersheds, and 5 on National Park Service-administered watersheds. Also, 11 of the 82 are chum salmon that use streams and stream segments downstream of federal lands. Not all of the at-risk anadromous salmonid stocks are likely to qualify as species as defined by the Endangered Species Act. While the Act defines "species" to include "any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature," the National Marine Fisheries Service has further refined and interpreted the term "distinct population segment" as it applies to Pacific salmon. The National Marine Fisheries Service considers a stock to be "distinct" if it represents an evolutionarily significant unit of the biological species (Waples 1991). A stock, or group of stocks, must meet two criteria to be considered by the National Marine Fisheries Service to constitute an evolutionarily significant unit: (1) it must be substantially reproductively isolated from conspecific (of the same species) units, and (2) it must represent an important component in the evolutionary legacy of the species. The second criterion could be confirmed, for example, if the stock contains unique genetic characteristics, a unique life history trait, or displays an unusual or distinctive adaptation to its environment.

The major changes between the Assessment Team's review and the efforts reported by Johnson et al. (1991) and Thomas et al. (1993) in regards to Key Watersheds were: (1) identification of Key Watersheds, using the criteria listed above, on lands administered by the BLM; and (2) identification of Tier 2 Key Watersheds. The latter were identified because of the increasing concern about water quality raised by the Environmental Protection Agency. Studies had shown that 70 percent of streams on lands administered by the BLM, and over 50 percent of streams on lands administered by the Forest Service, were out of compliance with clean water standards (FEMAT Report, Chapter V).

Long-term management within Key Watersheds requires watershed analysis prior to further resource management activity. In the short term, watershed analyses must be completed before initiating actions within a Key Watershed, except those actions that are categorically excluded from documentation in an environmental analysis or environmental impact statement (40 CFR 1508.4). Timber harvest, including salvage, cannot occur in Key Watersheds until the agencies complete a watershed analysis. All categorically excluded projects must respect Riparian Reserve boundaries and comply with standards and guidelines. Key Watersheds that currently contain poor quality habitat are believed to have the best opportunity for successful restoration and will receive priority in any watershed restoration program.

### **Roadless Areas and Key Watersheds**

Management activities in inventoried roadless areas with unstable land will increase the risk to aquatic and riparian habitat, impair the capacity of Key Watersheds to function as intended, and limit the potential to achieve Aquatic Conservation Strategy objectives. Standards and guidelines that refer to inventoried roadless areas (or simply "roadless areas") apply only to those portions of such areas that would still qualify as roadless under the guidelines used to originally designate the areas as roadless.

To protect the remaining high quality habitats, no new roads will be constructed in inventoried roadless areas in Key Watersheds under all alternatives except Alternatives 7 and 8. The Assessment Team recommended that the agencies reduce the existing road mileage within Key Watersheds, if funding permits. Watershed analysis must be conducted in all non-Key Watersheds which contain roadless areas before any management activities can occur within those roadless areas.

The amount of existing system and nonsystem roads within Key Watersheds should be reduced. Reducing road mileage refers to decommissioning the road. Road closures with gates or barriers do not qualify as either decommissioning of a road or a reduction in road mileage. If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds. This means that for each mile of new road constructed, at least one mile of road should be decommissioned (see also FEMAT Report, Chapter V, Appendix J), and priority given to roads that pose the greatest risks to riparian and aquatic ecosystems.

### 3) WATERSHED ANALYSIS

Watershed analysis is required in Key Watersheds, non-Key Watersheds containing inventoried roadless areas and Riparian Reserves prior to determining how proposed land management activities meet Aquatic Conservation Strategy objectives. In the short term, watershed analyses must be completed before initiating actions within a Key Watershed, except those actions that are categorically excluded from documentation in an environmental analysis or environmental impact statement (40 CFR 1508.4). Timber harvest, including salvage, cannot occur in Key Watersheds until the agencies complete a watershed analysis. Ultimately however, watershed analysis should be conducted in all watersheds on federal lands as a basis for ecosystem planning and management.

As described here, watershed analysis focuses on its role in implementing the Aquatic Conservation Strategy. The broader role of watershed analysis in relation to implementing the ecosystem management objectives proposed by this SEIS is described in Chapter 2. Watershed analysis is one of the principal analyses on which decisions implementing the Aquatic Conservation Strategy will be made.

Watershed analysis has a critical role in providing for aquatic and riparian habitat protection. In planning for ecosystem management and establishing Riparian Reserves to protect and restore riparian and aquatic habitat, the overall watershed condition and its array of functions and processes need to be considered. Watershed condition includes more than just the state of the channel and riparian area. It also includes the condition of the uplands, distribution and type of seral classes of vegetation, land use history, effects of previous natural and land-use related disturbances, and distribution and abundance of species and populations throughout the watershed. These factors strongly influence the structure and functioning of aquatic and riparian habitat (Naiman et al. 1992). Effective protection strategies for riparian and aquatic habitat on federal lands must accommodate the wide variability in landscape conditions present across the Pacific Northwest. Watershed analysis plays a key role in the Aquatic Conservation Strategy, ensuring that aquatic system protection is fitted to specific landscapes.

The focus of watershed analysis will be on collection and compilation of information about the watershed that is essential for making sound management decisions. It will be an analytical process, not a decision-making process with a proposed action requiring NEPA documentation. It will serve as the basis for developing project-specific proposals, and defining monitoring and restoration needs for a watershed. The scope of some issues or resources may require broader scale analyses. The information from the watershed analyses will contribute to decision making at all levels. Project-specific NEPA planning will use information developed from watershed analysis. For example, if watershed analysis shows that restoring certain resources within a watershed could contribute to achieving landscape or ecosystem management objectives, then subsequent decisions will need to address that information.

The results of watershed analyses may include a description of the resource needs, capabilities, opportunities, the range of natural variability, and spatially-explicit information that will facilitate environmental and cumulative effects analyses for NEPA, and the processes and functions operating within the watershed. Watershed analysis will identify potentially disjunct approaches and conflicting objectives within watersheds. The information from watershed analysis will be used to determine priorities for funding, and implementing actions and projects, and to develop monitoring strategies and objectives. The participation of adjacent landowners, private citizens, interest groups, industry, different government agencies, and others in watershed analysis will be promoted.

Watershed analysis is a systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. This information will support decisions for implementing management prescriptions, including setting and refining boundaries of Riparian and other Reserves, developing restoration strategies and priorities, and revealing the most useful indicators for monitoring environmental changes. Watershed analysis is an important analytical step supporting ecosystem planning for watersheds of

approximately 20 to 200 square miles (Figure B6-2). It is a key component supporting watershed planning and analyzing the blending of social expectations with the biophysical capabilities of specific landscapes. For example, watershed analysis is the appropriate level for analyzing the effects of transportation systems on aquatic and riparian habitats within the target watershed. In contrast, issues pertaining to stocks-at-risk would generally be more applicable at the province/river basin analytical levels discussed in Chapter 2 of this SEIS, rather than the 20 to 200 square mile watershed level.

Watershed analysis consists of technically rigorous and defensible procedures designed to identify processes that are active within a watershed, how those processes are distributed in time and space, the current upland and riparian conditions of the watershed, and how all of these factors influence riparian habitat and other beneficial uses. The analysis is conducted by an interdisciplinary team consisting of geomorphologists, hydrologists, soil scientists, biologists and other specialists as needed. Information used in this analysis includes: maps of topography, stream networks, soils, vegetation, geology; sequential aerial photographs; field inventories and surveys, including landslide, channel, aquatic habitat, and riparian condition inventories; census data on species presence and abundance; disturbance and land use history; and other historical data (e.g., streamflow records, old channel surveys).

Watershed analysis is organized as a set of modules that examine biotic and abiotic processes influencing aquatic habitat and species abundance (i.e., landslides, surface erosion, peak and low streamflows, stream temperatures, road network effects, coarse woody debris dynamics, channel processes, fire, limiting factor analysis for key species, and so on). Results from these modules are integrated into a description of current upland, riparian, and channel conditions; maps of location, frequency, and magnitude of key processes; and location and abundance of key species.

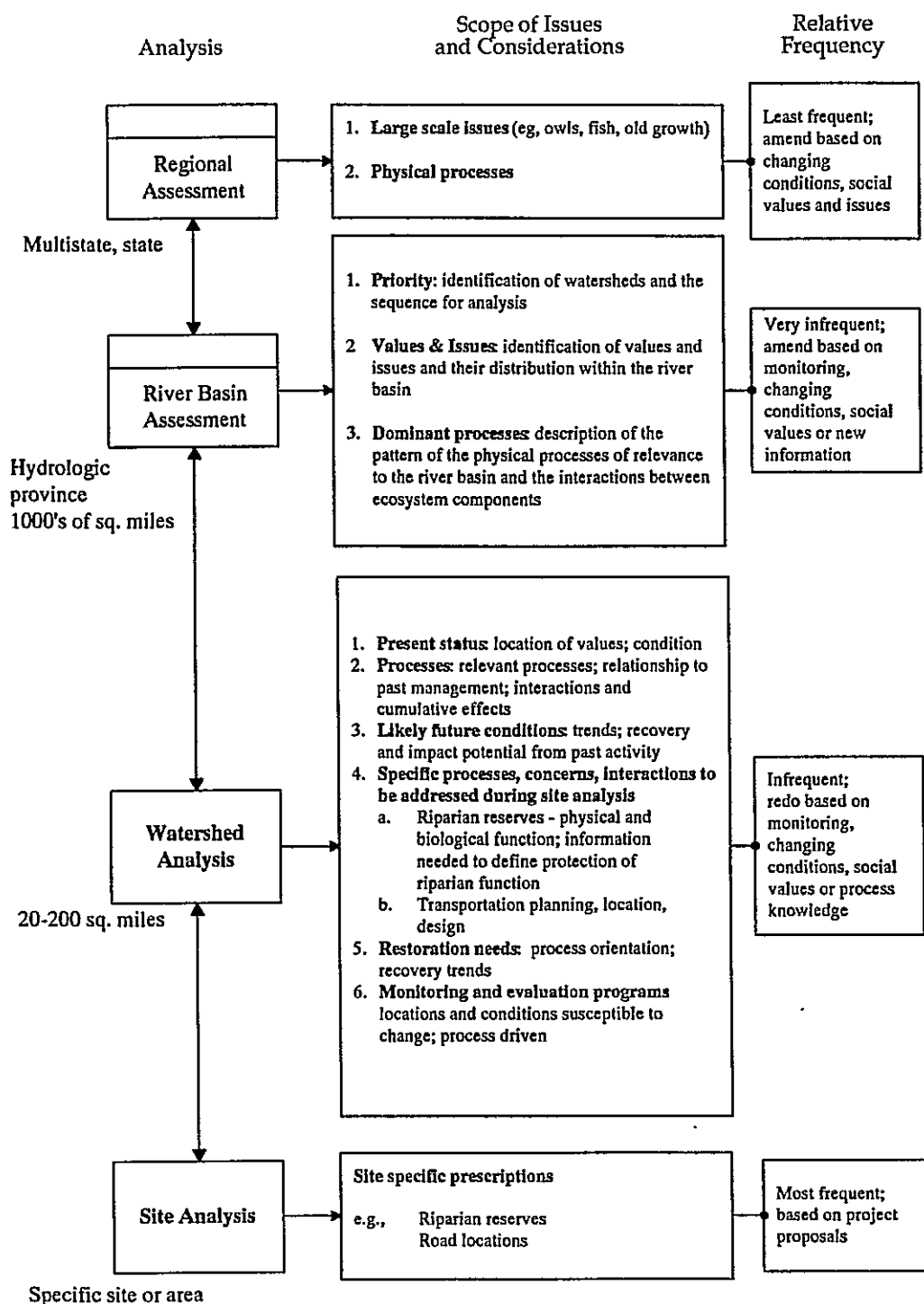
Watershed analysis provides the contextual basis at the site level for decision makers to set appropriate boundaries of Riparian Reserves, plan land use activities compatible with disturbance patterns, design road transportation networks that pose minimal risk to aquatic and riparian habitat, identify what and where restoration activities will be most effective, and establish specific parameters and activities to be monitored. More detailed site-level analyses are required to design specific projects (e.g., road siting or timber sale layout) so that riparian and aquatic habitats are protected.

Watershed analysis provides the ecological and geomorphic basis for changing the size and location of Riparian Reserves necessary to meet Aquatic Conservation Strategy objectives. The following Augusta Creek example from the Willamette National Forest illustrates approaches to adjusting Riparian Reserves based on geomorphic and hydrologic conditions alone. This is not intended to represent the only reasoning for adjusting Riparian Reserves within the range of the northern spotted owl. Design of Riparian Reserves is likely to be a hybrid of decisions based on consideration of sites of special ecological value, slope stability, wildlife dispersal corridors, endemic species considerations, and natural disturbance processes.

Figure B6-3 illustrates how slope stability and debris flow runout models may be used as part of watershed analysis for adjusting Riparian Reserves. The result is that the basin is stratified into areas that may require wider or narrower Riparian Reserves than those conforming to Riparian Reserve Scenario 1 for intermittent streams. For example, on intermittent streams in unstable areas with high potential to generate slides and debris flows, Riparian Reserves wider than those conforming to the definition may be necessary to ensure ecological integrity. Riparian Reserves in more stable areas may be less extensive, managed under upland standards and guidelines (e.g., levels of green tree retention as either single trees or in patches of a specific size), or a combination of these.

Slope stability analysis for Augusta Creek is an example in which likely impact mechanisms are identified (Figure B6-4). The distribution of areas subject to slope instability was interpreted from information contained within the Willamette National Forest Soil Resource Inventory. Slope data was mapped based on whether hillslope gradients were less than 30 degrees, between 30 and 60 degrees, and greater than 60 degrees. Geologic descriptions from the soil inventory were used to determine whether underlying bedrock was hard, moder-

Figure B6-2. Relationship between levels of analysis.



ately hard, or soft. The hillslope gradient and geologic description was then used to assign each mapped unit a hazard rating of low, moderate, or high slide potential (Figure B6-4). Predicted hazard ratings were tested and found to be in excellent agreement with the historical landslide pattern observed from aerial photographs. This analytical step ensures that field and analysis time will be used efficiently to address the most important processes and issues in the watershed.

Using the results from the slope stability analysis, watersheds were stratified into subareas to evaluate the watersheds as uniform response units for each of the processes or issues of concern. The process of determining debris flow susceptibility for Augusta Creek is an example of how a watershed might be stratified and how this stratification may be used as a basis for mapping Riparian Reserves (Figure B6-3). To determine the susceptibility of different stream reaches to debris flows, a stream network map was overlaid on the slide potential map (Figure B6-4). Areas with high slope instability were assumed to be most likely to generate debris flows. First-order channels (headward channels without tributaries) were assigned a debris flow hazard rating equal to the slide potential of the surrounding landscape (Figure B6-4). Debris flow hazard to higher order channels downstream was assumed to be a function of two factors: channel gradient (Figure B6-5) and tributary junction angle (Figure B6-6), based on work by Benda (1985) and others. Debris flow hazard was reduced on streams where channel gradient was less than 3 degrees or tributary junction angle exceeded 70 degrees, to produce a map of debris flow potential (Figure B6-7). The stratification will vary according to process or issue.

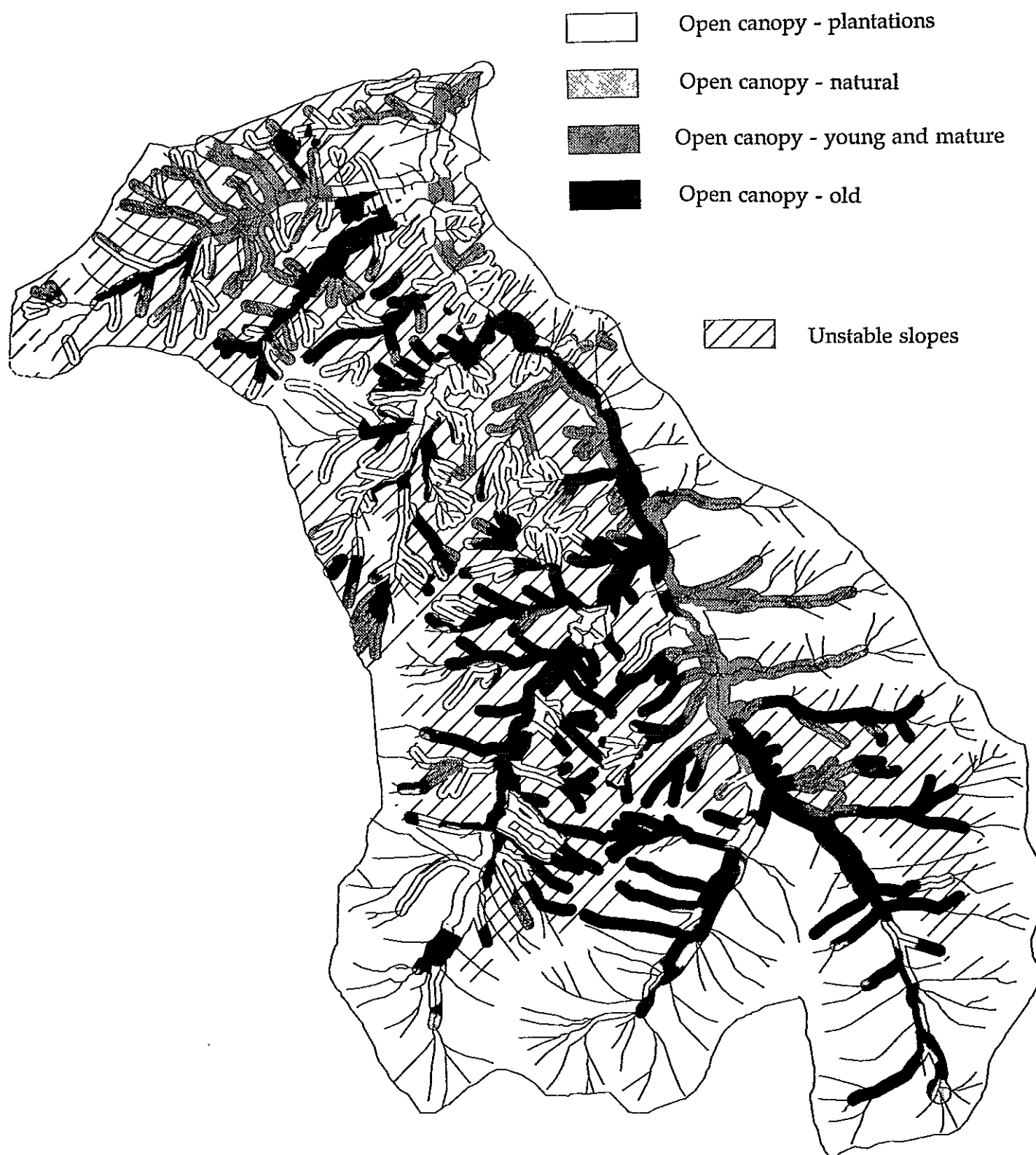
Within a given physiographic province, similar geographic and topographic features control drainage network and hillslope stability patterns. These features may exert a strong influence on the design of Riparian Reserves. For example, in the highly dissected southern Oregon Coast Range, debris flows originating in channel heads are the primary mass movement process. Large, slow-moving earthflows are dominant in the western Oregon Cascades. Earthflows qualify as unstable and potentially unstable areas and would be analyzed for inclusion within Riparian Reserves for intermittent streams. To adequately protect the aquatic system from management-induced landsliding, Riparian Reserve design may vary as a result of these differences. In the Coast Range, Riparian Reserves would tend to be in narrow bands associated with intermittent streams, relatively evenly distributed throughout the basin, while those in the Cascades may be locally extensive and centered around earthflows. Stable areas in other parts of the watershed may have reduced Riparian Reserves on intermittent streams.

Earthflows can cover extensive amounts of land within a watershed. As such, they largely influence the resulting landscape and directly affect aquatic and riparian habitat quality, structure and function. For example, streams flowing through active earthflows would tend to cut the toes of the inner gorges. Thus, the earthflow would serve as a chronic source of sediment to the channel. The effects of constructing roads or harvesting timber on the rate of sediment delivery to the channel on the earthflow would need to be considered during the design of the Riparian Reserve. Thus, the amount of a particular earthflow incorporated into a Riparian Reserve, as identified through watershed analysis, depends on the risk of management-induced disturbances and meeting Aquatic Conservation Strategy objectives. The risk will be determined based on an analysis of the projected instability of the earthflow relative to the recovery rate of aquatic and riparian ecosystems. There will be cases where entire earthflows will be incorporated into Riparian Reserves and cases where only those portions determined to directly affect the rate of achieving Aquatic Conservation Strategy objectives will be incorporated.

The efficacy of watershed analysis depends on the level of consideration given to how key processes are distributed over watersheds within a given landscape, and in many cases, distinguishing between physiographic provinces, which can vary widely in the importance of individual processes. It also depends on having a method to validate assumptions or results, having a clear logic in weighting or combining individual elements, not relying on simple indices to explain complex phenomena, and not assuming direct or linear relations between land use intensity and watershed response results.

While watershed analysis can provide essential information for designing land use activities over the entire watershed, it can also highlight uncertainties in knowledge or understanding that need to be addressed. Watershed analysis is emerging as a new standard for assessing watershed condition and land use impacts. The process described in this Final SEIS builds on more recent, comprehensive approaches, including the Water Resources Evaluation of Nonpoint Silvicultural Sources program; the watershed analysis procedure developed by the Washington State Timber, Fish and Wildlife program; and the cumulative effects methods

**Figure B6-3.** Augusta Creek basin watershed with Riparian Reserve Scenario 1 modified by slope stability considerations



**Figure B6-4.** Landslide potential with stream network, Augusta Creek basin, Willamette National Forest

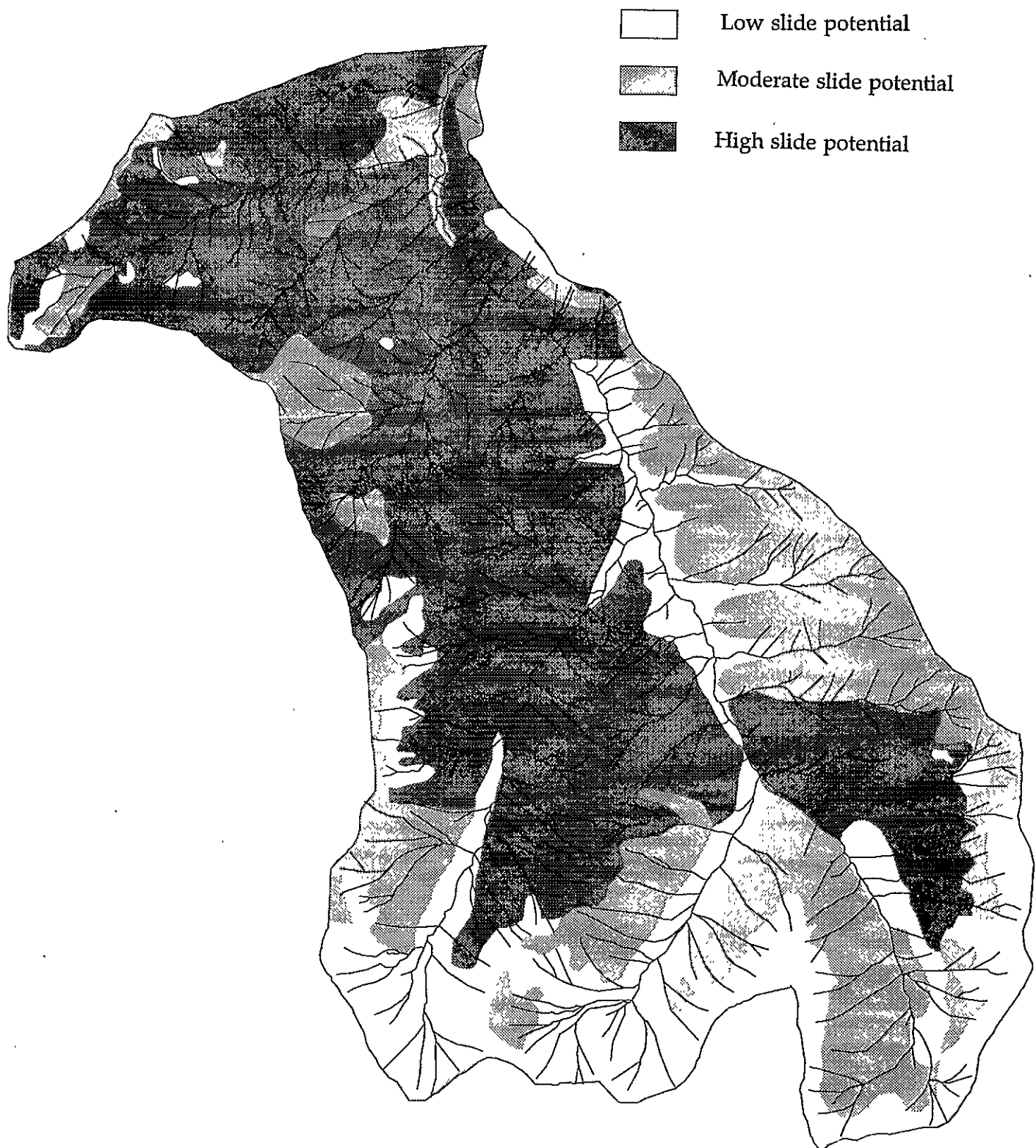


Figure B6-5. Distribution of stream reaches with channel gradients greater than and less than 3 degrees, Augusta Creek basin, Willamette National Forest

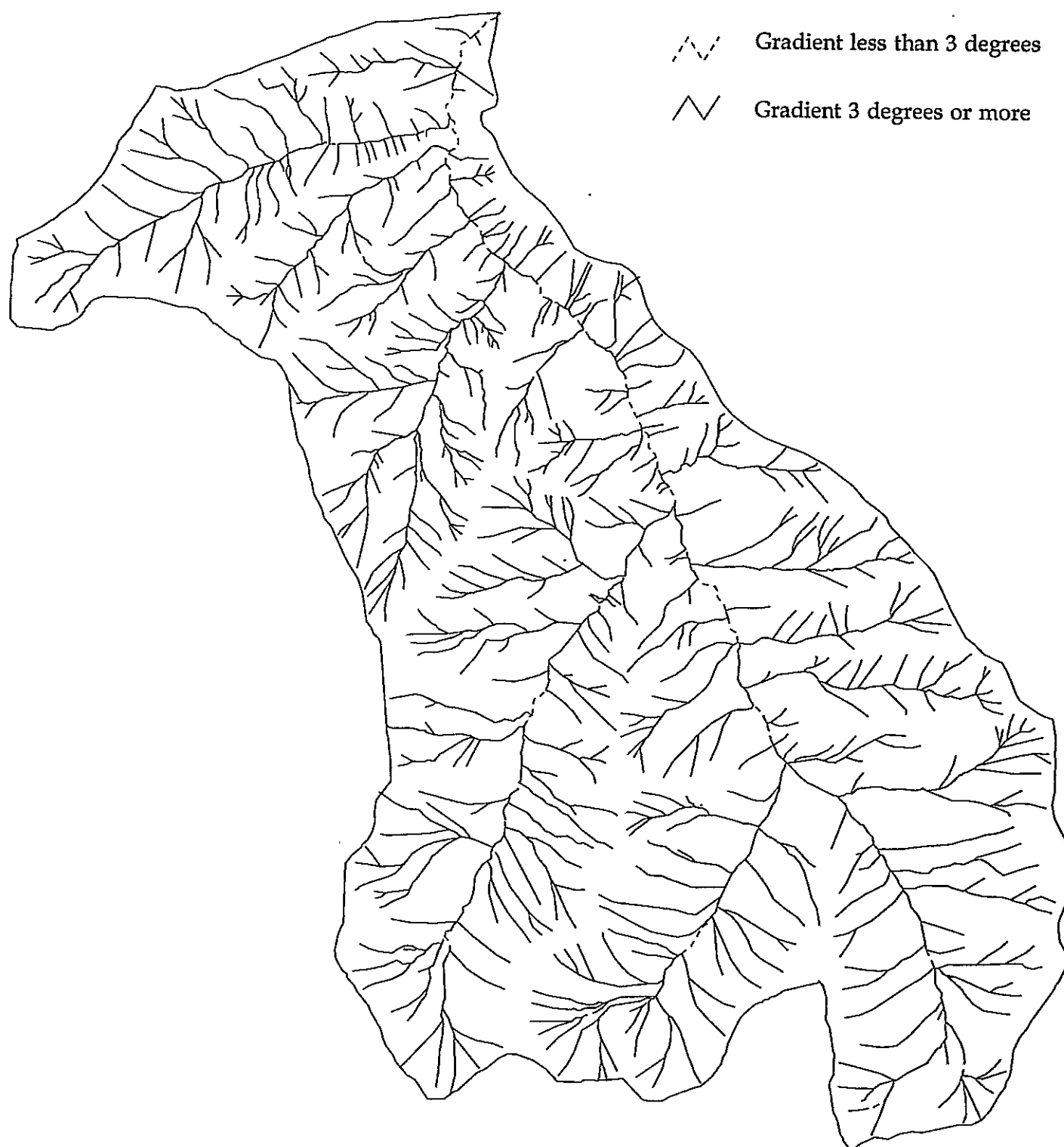




Figure B6-6. Stream network for Augusta Creek watershed, Willamette National Forest, showing high-angle tributary junctions greater than 70 degrees

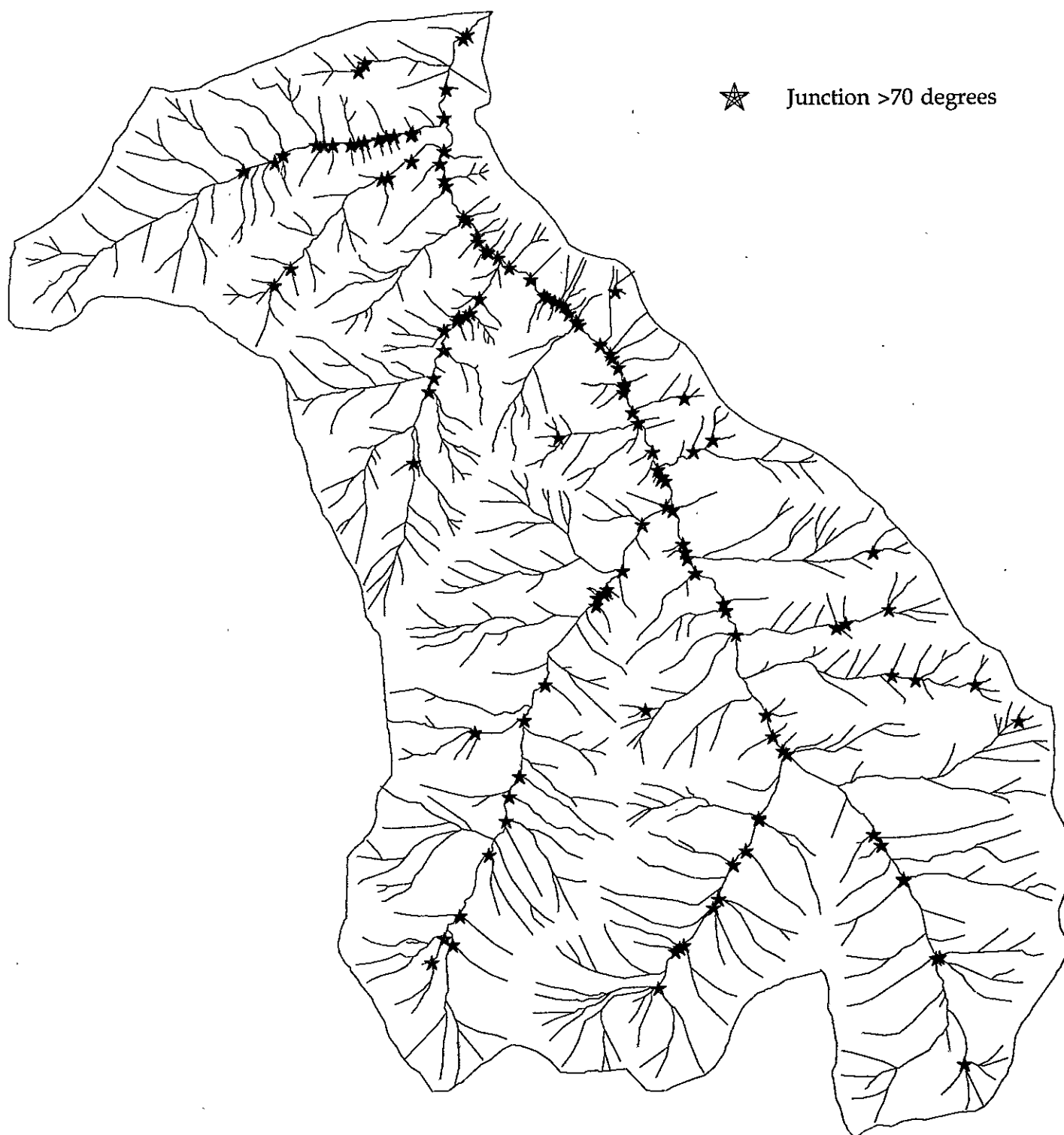


Figure B6-7. Debris flow potential for Augusta Creek basin, Willamette National Forest, based on slope stability and potential for debris flow runout from stream gradient and tributary junction analysis



**Table B6-3. Key Watersheds on lands administered by the Forest Service and BLM within the range of the northern spotted owl**

Watershed Tier	River/Key Watershed*	National Forest	BLM District
<b>Washington</b>			
<b>Puyallup River</b>			
1	W-135 White River	Mt. Baker-Snoqualmie	
<b>Snohomish River</b>			
1	W-121 Skykomish River	Mt. Baker-Snoqualmie	
<b>Snoqualmie River</b>			
2	W-222 M.Fk. Snoqualmie River	Mt. Baker-Snoqualmie	
<b>Stillaguamish River</b>			
1	W-116 Deer Creek	Mt. Baker-Snoqualmie	
1	W-117 N.Fk. Stillaguamish River	Mt. Baker-Snoqualmie	
1	W-120 S.Fk. Stillaguamish River	Mt. Baker-Snoqualmie	
<b>Skagit River</b>			
1	W-119 Sauk River	Mt. Baker-Snoqualmie	
1	W-118 Suiattle River	Mt. Baker-Snoqualmie	
<b>Nooksack River</b>			
1	W-115 S.Fk. Nooksack River	Mt. Baker-Snoqualmie	
1	W-114 N.Fk. Nooksack River	Mt. Baker-Snoqualmie	
<b>Columbia River</b>			
1	W-146 Wind River	Gifford Pinchot	
2	W-244 White Salmon River	Gifford Pinchot	
2	W-247 Little White Salmon River	Gifford Pinchot	
<b>Lewis River</b>			
1	W-148 E.Fk. Lewis River	Gifford Pinchot	
2	W-245 Siouxon Creek	Gifford Pinchot	
1	W-143 Lewis River	Gifford Pinchot	
<b>Cowlitz River</b>			
2	W-241 N.Fk. Cispus River	Gifford Pinchot	
2	W-239 Clear Fk. Cowlitz River	Gifford Pinchot	
2	W-242 Upper Cispus River Corridor (1)	Gifford Pinchot	
1	W-140 Packwood Lake & associated streams	Gifford Pinchot	
<b>Methow River</b>			
1	W-126 Twisp River	Okanogan	
1	W-125 Early Winters/Wolf Creeks	Okanogan	
1	W-124 Upper Methow River	Okanogan	
1	W-123 Chewuch River	Okanogan	
<b>Chehalis River</b>			
1	W-111 Wynoochie River	Olympic	
1	W-109 Canyon River Corridor (1)	Olympic	
1	W-110 Satsop River Corridor (1)	Olympic	
<b>Quillaute River</b>			
2	W-201 Soleduck River	Olympic	
<b>Quinault River</b>			
1	W-113 Cook Creek	Olympic	
1	W-112 McCalla Creek	Olympic	
<b>Strait of Juan deFuca</b>			
1	W-103 Dungeness River	Olympic	
1	W-102 Elwha River	Olympic	

Table B6-3. (continued)

Watershed Tier	River/Key Watershed	National Forest	BLM District
	Hood Canal		
1	W-108 Skokomish River	Olympic	
1	W-107 Lake Cushman/N.Fk. Skokomish R.	Olympic	
1	W-106 Duckabush River	Olympic	
1	W-105 Dosewallips River	Olympic	
	Quilcene River		
2	W-204 Big Quilcene River	Olympic	
	Columbia River		
	Yakima River		
1	W-136 Naches River/Little Naches River	Wenatchee	
1	W-138 Rattlesnake Creek	Wenatchee	
1	W-137 Bumping-American River	Wenatchee	
1	W-130 Cle Elum River	Wenatchee	
1	W-131 Box Canyon Creek	Wenatchee	
	Wenatchee River		
1	W-133 Ingalls Creek	Wenatchee	
1	W-134 Mission Creek	Wenatchee	
1	W-129 Icicle Creek	Wenatchee	
1	W-128 Upper Wenatchee River	Wenatchee	
	Entiat River		
1	W-127 Entiat River	Wenatchee	
	Oregon		
	Pacific Ocean		
1	O-377 Winchuck River	Siskiyou	
1	O-366 Elk River	Siskiyou	Coos Bay
	Smith River		
1	C-502 Smith River	Siskiyou, Six Rivers	
	Chetco River		
1	O-376 Emily Creek	Siskiyou	
1	O-375 N.Fk. Chetco River		Coos Bay
	Rogue River		
1	O-393 Taylor Creek	Siskiyou	Medford
1	O-370 Quosatana Creek	Siskiyou	
1	O-372 Shasta-Costa Creek	Siskiyou	
	Illinois River		
1	O-379 Cave/Grayback Creeks	Siskiyou	Medford
1	O-380 Upper Sucker Creek	Siskiyou	Medford
1	C-501 Upper E.Fk. Illinois River	Siskiyou	
1	O-371 Lawson Creek	Siskiyou	
1	O-374 Silver Creek	Siskiyou	Medford
1	O-373 Indigo Creek	Siskiyou	Medford
	Sixes River		
1	O-365 Dry Creek	Siskiyou	Coos Bay
	Coquille River		
1	O-367 S.Fk. Coquille River	Siskiyou	Coos Bay, Medford
1	O-324 Cherry Creek (N.Fk. Coquille)		Coos Bay
1	O-322 Upper N.Fk. Coquille River		Coos Bay

Table B6-3. (continued)

Watershed Tier	River/Key Watershed		National Forest	BLM District
	Coos River			
1	O-323	Tioga Creek		Coos Bay
	Lower Umpqua River			
1	O-319	Franklin Creek	Siuslaw	Coos Bay
1	O-321	Paradise Creek		Coos Bay, Roseburg
	Smith River			
1	O-318	Wassen Creek	Siuslaw	Coos Bay
1	O-317	N.Fk. Smith River	Siuslaw	Coos Bay, Eugene
1	O-320	Upper Smith River		Roseburg, Eugene, Coos Bay
	Siltcoos River (Siltcoos Lake)			
1	O-316	Upper Fiddle Creek	Siuslaw	Coos Bay
	Siuslaw River			
1	O-314	N.Fk. Siuslaw River	Siuslaw	
1	O-313	W.Fk. Indian Creek	Siuslaw	
	Sutton Creek (Mercer Lake)			
1	O-395	Bailey Creek	Siuslaw	
	Pacific Ocean			
1	O-312	Cummins/Tenmile/Rock/Big Creeks	Siuslaw	
1	O-311	Yachats River	Siuslaw	Salem
	Alsea River			
1	O-310	Drift Creek (Alsea)	Siuslaw	Salem
1	O-305	Tobe Creek		Salem
1	O-315	Upper Lobster Creek	Siuslaw	Salem, Eugene
	Beaver Creek			
1	O-394	N.Fk. Beaver Creek	Siuslaw	
	Yaquina River			
1	O-306	Mill Creek	Siuslaw	
	Siletz River/Bay			
1	O-308	Drift Creek (Siletz)	Siuslaw	Salem
1	O-309	N.Fk. Siletz River/Warnick Creek		Salem
	Nestucca River			
1	O-304	Upper Nestucca River	Siuslaw	Salem
	Tillamook Bay			
1	O-301	Kilchis River		Salem
1	O-302	Little N.Fk. Wilson River		Salem
	Trask River			
1	O-303	M.Fk. Trask River/Elkhorn Creek		Salem
	Umpqua River			
	South Umpqua River			
1	O-363	S. Umpqua River	Umpqua	Roseburg, Medford
	Cow Creek			
1	O-368	W.Fk. Cow Creek		Roseburg, Medford
1	O-369	Middle Creek		Roseburg, Medford
	North Umpqua River			
1	O-361	Calf Creek	Umpqua	
1	O-362	Copeland Creek	Umpqua	
1	O-358	Boulder Creek	Umpqua	

Table B6-3. (continued)

Watershed Tier	River/Key Watershed	National Forest	BLM District
1	O-357 Steamboat Creek	Umpqua	Roseburg, Eugene
1	O-360 Deception Creek/ Wilson Creek	Umpqua	
1	O-359 Williams Creek/Fairview Creek	Umpqua	
	Rogue River		
1	O-364 Elk Creek	Rogue River	Medford, Roseburg
1	O-384 S.Fk./N.Fk. Little Butte Creek	Rogue River	Medford, Lakeview
	Applegate River		
1	O-392 Palmer Creek	Rogue River	Medford
1	O-391 Beaver Creek	Rogue River	Medford
1	O-390 Yale Creek	Rogue River	
1	O-389 Little Applegate River	Rogue River	Medford
	Klamath River		
1	O-388 Jenny Creek		Medford, Lakeview
2	O-486 Clover Creek	Winema	Lakeview
2	O-483 Pelican Butte	Winema	
2	O-482 Cherry Creek	Winema	
1	O-381 Seven Mile Creek	Winema	
1	O-355 Evening Creek	Winema	
1	O-387 Spencer Creek	Winema	Lakeview
1	O-485 Threemile Creek	Winema	
	Columbia River		
	Willamette River		
	M.Fk. Willamette River		
1	O-349 Fern Creek	Willamette	
1	O-351 Dell Creek	Willamette	
1	O-352 Ferrin Pond	Willamette	
1	O-350 Holland Creek	Willamette	
2	O-488 N.Fk. of the M.Fk. Willamette River	Willamette	
	Santiam River		
	N. Santiam River	Willamette	
2	O-438 Upper N. Santiam River	Willamette	
1	O-337 Upper Little N. Santiam River	Willamette	Salem
	McKenzie River		
1	O-346 S.Fk. McKenzie River	Willamette	
1	O-341 Horse Creek	Willamette	
1	O-340 Upper McKenzie River	Willamette	
1	O-345 Marten Creek/Bear Creek		Eugene
	Columbia River		
1	O-328 Fifteen Mile Creek/Ramsey Creek	Mt. Hood	
1	O-326 W.Fk. Hood River	Mt. Hood	
1	O-327 Mill/Five Mile/Eight Mile Creeks	Mt. Hood	
	Clackamas River		
1	O-333 Clackamas River (Big Cliff to Clackamas R. headwaters) and Oak Grove Fk. (Clackamas River to Timothy Lake) Corridors (1)	Mt. Hood	Salem
1	O-336 Collawash River	Mt. Hood	Salem
1	O-335 Fish Creek	Mt. Hood	Salem

Table B6-3. (continued)

Watershed Tier	River/Key Watershed		National Forest	BLM District
1	O-332	Roaring River	Mt. Hood	
2	O-431	Eagle Creek	Mt. Hood	Salem
	Sandy River			
1	O-330	Salmon River	Mt. Hood	Salem
2	O-425	Bull Run River	Mt. Hood	Salem
	Deschutes River			
2	O-429	White River	Mt. Hood	
1	O-354	Big Marsh Creek	Deschutes	
1	O-353	Odell Creek	Deschutes	
2	O-447	Cultus Creek	Deschutes	
2	O-444	Tumalo Creek	Deschutes	
2	O-442	Squaw Creek	Deschutes	
1	O-339	Metolius River	Deschutes	
2	O-443	Three Creeks Meadows and Creek	Deschutes	
	California			
	Eel River			
1	C-526	Thatcher Creek	Mendocino	Ukiah
1	C-525	Black Butte Creek	Mendocino	
1	C-524	M.Fk. Eel River	Mendocino	
1	C-523	S.Fk. Eel River (Low Gap to Elder)		Ukiah
1	C-522	Cedar Creek		Ukiah
	Klamath River			
	Trinity River			
1	C-515	N.Fk. Trinity River	Shasta-Trinity	Ukiah
1	C-516	Canyon Creek	Shasta-Trinity	Ukiah
1	C-519	S.Fk. Trinity River	Shasta-Trinity	
1	C-514	New River	Shasta-Trinity	
	Eel River			
1	C-520	N.Fk. Eel River	Six Rivers	Ukiah
	Mad River			
1	C-518	Pilot Creek	Six Rivers	
	Klamath River			
1	C-512	Red Cap Creek	Six Rivers	
1	C-508	Bluff Creek	Six Rivers	
1	C-507	Blue Creek	Six Rivers	
1	C-509	Camp Creek	Six Rivers	
	Trinity River			
1	C-517	Lower S.Fk. Trinity River	Six Rivers	Ukiah
1	C-513	Horse Linto Creek	Six Rivers	
	Pacific Ocean			
1	C-502	Smith River	Six Rivers	
1	C-521	Mattole River		Ukiah

Table B6-3. (continued)

Watershed Tier	River/Key Watershed		National Forest	BLM District
	Klamath River			
1	C-511	Salmon River	Klamath	
1	C-510	Wooley Creek	Klamath	
1	C-504	Elk Creek	Klamath	
1	C-506	Dillon Creek	Klamath	
1	C-503	Clear Creek	Klamath	
1	C-505	Grider Creek	Klamath	

\* Watershed with a (1) = 1/4 mile no-harvest zone on either side of the segment of stream designated as corridor.

Table B6-4. Risk rating criteria

Risk Rating	Nehlsen et al. 1991	Higgins et al. 1992	Nickelson et al. 1992	Washington Department of Fisheries 1993 (SASSI) <sup>1</sup>
0	--	--	--	Extinct
1	High risk of extinction	High risk of extinction	Special concern	Critical
2	Moderate risk of extinction	Moderate risk of extinction	Depressed	Depressed
3	Special concern)	Special concern	--	--
4	--	--	Unknown	Unknown
5	--	--	Healthy	Healthy

<sup>1</sup> State Salmon and Steelhead Stock Inventory.



**Table B6-5. Anadromous fish stocks at risk in BLM and Forest Service administered watersheds within the range of the northern spotted owl**

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Winter Chinook								
	California							
	Sacramento (D)	ee footnote				Ukiah	Shasta-Trinity (C), Mendocino	
Spring/Summer Chinook								
	California							
	Klamath/Salmon (spr)	1	1			Ukiah	Six Rivers, Klamath, Shasta-Trinity,	C-503-517, 519
	Trinity (spr)		3			Ukiah	Six Rivers, Shasta-Trinity	C-513-517, 519
	S. Fk. Trinity (spr)		1				Six Rivers, Shasta-Trinity	C-517, 519
	Smith (spr)	1	1			Redwoods NP	Six Rivers, Siskiyou	C-502
	Oregon							
	Coquille (spr)	1		2		Coos Bay, Roseburg	Siskiyou	O-322, 324, 367
	S. Umpqua (spr)	1		2		Roseburg, Medford	Umpqua	O-363, 368, 369
	Siuslaw (spr)			4		Eugene	Siuslaw	O-313, 314
	Alsea (spr)	3		5		Salem, Eugene	Siuslaw	O-305, 310, 315
	Siletz (spr/su)	3		5		Salem	Siuslaw	O-309
	Nestucca (spr)			1		Salem	Siuslaw	O-304
	Tillamook Bay							
	Trask (spr)			1		Salem		O-303
	Wilson (spr)			1		Salem		O-302
	Kilchis (spr)			1		Salem		O-301
	Nehalem (su)	3		5		Salem		
	Columbia							
	Willamette (spr)	3				Salem, Eugene	Willamette, Mt. Hood	O-337, 340, 341, 345, 346
	Sandy (spr)	1				Salem	Mt. Hood	O-330
	Hood (spr)	1					Mt. Hood	O-326
	Washington							
	Yakima							
	Upper Yakima (spr)				2		Wenatchee	
	Naches (spr)				2		Wenatchee	W-136-138
	American (spr)				2		Wenatchee	W-137
	Wenatchee (su)				5	Spokane	Wenatchee	W-128, 129, 133, 134
	Chilwawa (spr)				2		Wenatchee	W-128
	Lt. Wenatchee (spr)				2		Wenatchee	W-128
	Nason Cr. (spr)				2		Wenatchee	
	White (spr)				2		Wenatchee	W-128
	Entiat (spr)				2	Spokane	Wenatchee	W-127
	Methow (su)	2			2	Spokane	Okanogan	W-123-126
	Methow (spr)				2	Spokane	Okanogan	W-123-126
	Twisp (spr)				2	Spokane	Okanogan	W-126
	Lost (spr)				2		Okanogan	W-124
	Chewack (spr)				2		Okanogan	W-123
	WA Coast							
	Grays Harbor/Chehalis							
	Satsop (su)				2	Olympic NP	Olympic	W-109, 110
	Wynoochee (spr)	1			5	Olympic NP	Olympic	W-111
	Quinalt (spr)				2	Olympic NP	Olympic	
	Queets (spr)				2	Olympic NP	Olympic	
	Clearwater (spr)				2			
	Quillayute (su)				4	Olympic NP	Olympic	W-201
	Quill./Bogachiel (su)				4	Olympic NP	Olympic	
	Calawah (su)				4	Olympic NP	Olympic	

Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Spring/Summer Chinook (continued)								
	Straits of Juan de Fuca							
	Elwha (spr)	1				Olympic NP	Olympic (C)	
	Dungeness (spr)	1			1	Olympic NP	Olympic	W-103
	(SASSI is for spr/su)							
	Hood Canal							
	Dosewallips (spr)	1				Olympic NP	Olympic	W-105
	Skokomish	1				Olympic NP	Olympic	W-108
	Puget Sound							
	Puyallup							
	White (spr)	2			1	Mt. Ranier NP	Mt. Baker-Snoqualmie	W-135
	White (su/fall)				4	Mt. Ranier NP	Mt. Baker-Snoqualmie	W-135
	Lake Washington							
	N Lk.Wa. tribs. (su/fall)				4			
	Cedar (su/fall)				4			
	Snohomish (su)				2		Mt. Baker-Snoqualmie	W-121
	Stillaguamish (su)				2	Spokane	Mt. Baker-Snoqualmie	W-116, 117, 120
	Stillaguamish (spr)	1				Spokane	Mt. Baker-Snoqualmie	W-116, 117, 120
	Skagit							
	Lower Sauk (su)				2		Mt. Baker-Snoqualmie	W-118, 119
	Suiattle (spr)				2		Mt. Baker-Snoqualmie	W-118
	Upper Cascade (spr)				4	N. Cascades NP	Mt. Baker-Snoqualmie	
	Nooksack							
	N. Fk. Nooksack	1			1	N. Cascades NP	Mt. Baker-Snoqualmie	W-114
	S. Fk. Nooksack	1			1		Mt. Baker-Snoqualmie	W-115
Fall Chinook								
	California							
	Mattole	1	1			Ukiah		C-521
	Russian	1				Ukiah		
	Bear		3					
	Eel		3			Ukiah	Mendocino, Six Rivers	C-522-526, 520
	Lower Eel (E)	2				Ukiah	Six Rivers	C-520
	Humboldt Bay tribs.	1	1			Ukiah		
	Mad	2	3			Ukiah	Six Rivers	C-518
	Little R.		3					
	Redwood Cr.	2	3			Ukiah, Redwood NP	Six Rivers	
	Klamath							
	Lower Klamath (F)	2	2			Ukiah	Six Rivers, Shasta-Trinity, Klamath	C-503-517, 519
	Trinity	3				Ukiah	Six Rivers, Shasta-Trinity	C-513-517, 519
	S. Fk. Trinity		3				Six Rivers, Shasta-Trinity	C-517, 519
	Scott	3	3			Ukiah	Klamath	
	Shasta	1	1			Ukiah	Shasta-Trinity, Klamath	
	Smith	2				Redwood NP	Six Rivers, Siskiyou	C-502
	Oregon							
	Winchuck	2		2			Siskiyou	O-377
	Chetco			1		Coos Bay	Siskiyou	O-375, 376
	Pistol	2		2		Coos Bay	Siskiyou	
	Hunter Cr.	1		2		Coos Bay	Siskiyou	
	Rogue							
	Lower Rogue (G)	1		2		Coos Bay	Siskiyou	O-370-374
	Illinois			2		Medford	Siskiyou	O-371, 373, 374, 379,
	Euchre Cr.	1		2		Coos Bay	Siskiyou	
	Elk			1		Coos Bay	Siskiyou	O-366

Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Fall Chinook (continued)								
	Sixes			1		Coos Bay	Siskiyou	O-365
	New R.							
	Floras Cr.			4		Coos Bay		
	Coos	3		5		Coos Bay		O-323
	Big Cr.			4			Siuslaw	O-312
	Yachats	2		4		Salem	Siuslaw	O-311
	Beaver Cr.			4		Salem	Siuslaw	O-394
	Yaquina	3		5		Salem	Siuslaw	O-306
	Drift Cr. (Siletz Bay)			4		Salem	Siuslaw	O-308
	Schooner Cr.			4		Salem	Siuslaw	
	Salmon			1		Salem	Siuslaw	
	Neskowin Cr.			4			Siuslaw	
	Nehalem							
	Salmonberry			4				
	Columbia							
	Sandy	1				Salem	Mt. Hood	O-330
	Hood	1					Mt. Hood	O-326
	L.Columbia small tribs. below Bonneville	1				Salem Spokane	Mt. Hood, Gifford Pinchot	
Washington								
	Cowlitz	1				Mt. St. Helens NVM	Gifford Pinchot (C)	
	Toutle						Gifford Pinchot	
	Green				2	Mt. St. Helens NVM	Gifford Pinchot	
	S. Fk. Toutle				2	Mt. St. Helens NVM	Gifford Pinchot	
	Washougal	1					Gifford Pinchot	
	Wind (tule)				2		Gifford Pinchot	W-146
	White Salmon (SASSI rating for tule)	1			2		Gifford Pinchot	W-244
WA Coast								
	Willapa Bay							
	North R.							
	Fall R. (early)				2			
	Grays Harbor							
	Johns/Elk/S. Bay tribs.				4			
	Copalis				4			
	Moclips				4			
	Raft				4			
	Ozette R.	1				Olympic NP		
Strait of Juan de Fuca								
	Dungeness	1				Olympic NP	Olympic	W-103
	Hoko				2			
Hood Canal								
	Dosewallips	1				Olympic NP	Olympic	W-105
	Duckabush	1				Olympic NP	Olympic	W-106
Puget Sound								
	Puyallup	3			4	Mt. Ranier NP	Mt. Baker-Snoqualmie	W-135
	Snohomish				2		Mt. Baker-Snoqualmie	W-121
	Bridal Veil Cr.				4			
	Stillaguamish				2	Spokane	Mt. Baker-Snoqualmie	W-116, 117, 120
	Skagit							
	Lower Skagit				2	Spokane	Mt. Baker-Snoqualmie	W-118, 119

Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Coho								
	California							
	Russian		1			Ukiah		
	Small CA coastal N. of S	2						
	Pudding Cr.		1					
	Gualala		1			Ukiah		
	Garcia		1					
	Navarro		3					
	Albion		3					
	Big		3					
	Noyo		3					
	Ten Mile		3					
	Bear		3					
	Little		3					
	Wilson Cr.		3			Redwood NP		
	Mattole		1			Ukiah, King Range NCA		C-521
	Eel		3			Ukiah	Mendocino, Six Rivers	C-522-526, 520
	Humboldt Bay tribs.		3			Ukiah		
	Mad		1			Ukiah	Six Rivers	C-518
	Redwood Cr.		3			Ukiah, Redwood NP	Six Rivers	
	Klamath	3				Ukiah	Six Rivers, Klamath, Shasta-Trinity	C-503-517, 519
	Lower Klamath (F)		3				Six Rivers, Klamath, Shasta-Trinity	C-503-517, 519
	Trinity		3			Ukiah	Six Rivers, Shasta-Trinity	C-513-517, 519
	Scott		1			Ukiah	Klamath	
	Oregon							
	Small OR coastal streams			2		Coos Bay, Eugene, Salem	Siskiyou, Siuslaw	O-312, 316, 395
	Winchuck	1		2			Siskiyou	O-377
	Chetco	1		2		Coos Bay	Siskiyou	O-375, 376
	Pistol	1		2		Coos Bay	Siskiyou	
	Hunter			2		Coos Bay	Siskiyou	
	Rogue	1				Coos Bay, Medford	Siskiyou, Rogue River	O-364, 370-374, 379, 380, 384 O-389-393, C-501
	Lower Rogue (G)			2		Coos Bay	Siskiyou	O-370-374
	Middle Rogue (H)			2		Medford	Siskiyou, Rogue River	O-371-374, 379, 380, 389-393 C-501
	Upper Rogue (I)			2		Medford	Rogue River	O-364, 384
	Illinois			2		Medford	Siskiyou	O-371, 373, 374, 379, O-380, C-501
	Applegate			2		Medford	Rogue River	O-389-392
	Euchre Cr.			2		Coos Bay	Siskiyou	
	Elk	1		2		Coos Bay	Siskiyou	O-366
	Sixes	1		2		Coos Bay	Siskiyou	O-365
	New R.							
	New R. tribs.			2		Coos Bay		
	Floras Cr.	1				Coos Bay		
	Coquille	2		5		Coos Bay, Roseburg	Siskiyou	O-322, 324, 367
	S. Fk. Coquille			2		Coos Bay	Siskiyou	O-367
	Coos	2		5		Coos Bay		O-323
	Millicoma			2				
	Tenmile Cr.			2			Siuslaw (Oregon Dunes NRA)	

Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Coho (continued)								
	Umpqua	2				Coos Bay, Roseburg, Medford	Siuslaw, Umpqua	O-317-321, 357-363, 368, 369
	Lower Umpqua			2		Coos Bay	Siuslaw	O-317-321
	Smith			2		Coos Bay, Roseburg, Eugene	Siuslaw	O-317, 318, 320
	N. Umpqua			1		Roseburg	Umpqua	O-357-362
	S. Umpqua			2		Roseburg, Medford	Umpqua	O-363, 368, 369
	Siuslaw	2		2		Eugene	Siuslaw	O-313, 314
	N. Fk. Siuslaw			2		Eugene	Siuslaw	O-314
	Yachats	2		2		Salem	Siuslaw	O-311
	tribs. S. of Alsea			2		Coos Bay, Eugene, Salem	Siskiyou, Siuslaw	O-312, 316, 395
	Alsea	2		5		Salem, Eugene	Siuslaw	O-305, 310, 315
	Drift Cr. (Alsea)			5		Salem	Siuslaw	O-310
	tribs. N. of Alsea			2		Salem	Siuslaw	
	Beaver Cr.	2		2		Salem	Siuslaw	O-394
	Yaquina			2		Salem	Siuslaw	O-306
	Schooner Cr.			4		Salem	Siuslaw	
	Siletz	2		2		Salem	Siuslaw	O-309
	Drift Cr. (Siletz Bay)			4		Salem	Siuslaw	O-308
	Salmon	2		2		Salem	Siuslaw	
	Nestucca	2		2		Salem	Siuslaw	O-304
	Little Nestucca			2		Salem	Siuslaw	
	tribs. S. of Tillamook Bay			2		Salem	Siuslaw	
	Tillamook Bay	2				Salem		O-301-303
	small Tillamook Bay tribs.			4		Salem		
	Trask			2		Salem		O-303
	Wilson			2		Salem		O-302
	Kilchis			2		Salem		O-301
	Miami			2				
	Tillamook			2		Salem		
	tribs. N. of Tillamook Bay			4				
	Nehalem	2				Salem		
	Lower Nehalem			2				
	N. Fk. Nehalem			1				
	Salmonberry			4				
	Upper Nehalem			2		Salem		
	Elk Cr.	2		2				
	Necanicum	2		2				
	Columbia							
	Willamette							
	Clackamas	2				Salem	Mt. Hood	O-332, 333, 335, 336, 431
	Sandy	1				Salem	Mt. Hood	O-330
	Hood	1					Mt. Hood	O-326
	L. Columbia tribs.	1				Salem, Spokane	Mt. Hood, Gifford Pinchot	W-148
	L. Columbia small tribs. at Bonneville Dam				2			
Washington								
	Grays R.				2			
	Skamokawa Cr.				2			
	Elochoman				2			
	Mill Cr.				2			
	Abernathy Cr.				2			
	Germany Cr.				2			

Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Coho (continued)								
	Cowlitz				2	Mt. St. Helens NVM	Gifford Pinchot (C)	
	Toutle				2		Gifford Pinchot	
	S. Fk. Toutle				2	Mt. St. Helens NVM	Gifford Pinchot	
	Green				2	Mt. St. Helens NVM	Gifford Pinchot	
	Coweeman				2			
	Kalama				2	Mt. St. Helens NVM	Gifford Pinchot	
	Lewis				2	Spokane, Mt. St. Helens NVM	Gifford Pinchot (C)	W-148
	E. Fk. Lewis				2	Spokane	Gifford Pinchot	W-148
	Salmon Cr.				2			
	Washougal	1			2	Spokane	Gifford Pinchot	
	WA Coast							
	Willapa Bay	1			4			
	Copalis				4			
	Moclips				4			
	Quinalt				4	Olympic NP	Olympic	
	Raft				4			
	Goodman/Mosquito Crs.				4	Olympic NP		
	Kalaloch Cr.				4	Olympic NP		
	Lake Ozette	3				Olympic NP		
	Ozette R.				4	Olympic NP		
	Sooes/Waatch				4			
	Strait of Juan de Fuca							
	Sekiu /Sail				2			
	Clallam				4			
	Pysht /Twin /Deep				2		Olympic	
	Lyre	1			4	Olympic NP	Olympic	
	Elwha	1			5	Olympic NP	Olympic (C)	
	Morse Cr.				2	Olympic NP		
	Dungeness				2	Olympic NP	Olympic	W-103
	Sequim Bay				2		Olympic	
	Discovery Bay				1		Olympic	
	Hood Canal							
	Duckabush				2	Olympic NP	Olympic	W-106
	SE Hood Canal				2			
	Dewatto				2			
	NE Hood Canal				2			
	Quilcene/Dabob Bays				2		Olympic	W-204
	Puget Sound							
	Chambers Cr.	1			5			
	Puyallup				2		Mt. Baker-Snoqualmie	W-135
	Duwamish /Green							
	Newaukum Cr.				2			
	Lake Washington							
	Lk.Wa./Sammamish tribs.				2			
	Cedar				4			
	Snohomish				2	Spokane	Mt. Baker-Snoqualmie	W-121
	Snoqualmie				5	Spokane	Mt. Baker-Snoqualmie (C)	
	Skykomish				5		Mt. Baker-Snoqualmie	W-121
	Stillaguamish				2	Spokane	Mt. Baker-Snoqualmie	W-116, 117, 120
	Deer Cr.				4		Mt. Baker-Snoqualmie	W-116
	Skagit				2	Spokane, N. Cascades NP	Mt. Baker-Snoqualmie	W-118, 119
	Baker				4	N. Cascades NP	Mt. Baker-Snoqualmie	

Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Coho (continued)								
	N. Puget Sound tribs.				4			
	Nooksack	1			4	Spokane, N. Cascades NP	Mt. Baker-Snoqualmie	W-114, 115
	Sumas/Chilliwack				4	N. Cascades NP	Mt. Baker-Snoqualmie	
Sockeye								
	Washington							
	Columbia							
	Wenatchee	3			5	Spokane	Wenatchee	W-128, 129
	WA Coast							
	Quillayute							
	Lk. Pleasant				4			
	Ozette R.				2	Olympic NP		
	Lake Ozette	2				Olympic NP		
	Puget Sound							
	Lake Washington							
	Lk. Washington Beach				2			
	Lk. Wa./Sammamish tribs.				2			
	Cedar				2			
	Skagit							
	Baker	1			1	N. Cascades NP	Mt. Baker-Snoqualmie	
Chum								
	Oregon							
	Elk	1				Coos Bay	Siskiyou	O-366
	Sixes	1				Coos Bay	Siskiyou	O-365
	Coquille			1		Coos Bay	Siskiyou	O-322, 324, 367
	Coos	1		1		Coos Bay		O-323
	Umpqua	1				Coos Bay, Roseburg, Medford	Siuslaw, Umpqua	O-317-319
	Lower Umpqua & Smith			1		Coos Bay, Eugene	Siuslaw	O-317-319
	Yachats			1		Salem	Siuslaw	O-311
	Alsea	1		1		Salem	Siuslaw	O-310
	Yaquina	1		5		Salem	Siuslaw	O-306
	Siletz	1		1		Salem	Siuslaw	
	Drift Cr. (Siletz Bay)			1		Salem	Siuslaw	O-308
	Salmon			1		Salem	Siuslaw	
	Neskowin			1			Siuslaw	
	Sand Cr.			1			Siuslaw	
	Nestucca	2		5		Salem	Siuslaw	O-304
	Little Nestucca			1		Salem	Siuslaw	
	Netarts	2						
	Tillamook Bay	2				Salem		O-301-303
	3 sm. Tillamook Bay tribs.			4				
	Miami			5				
	Kilchis			5		Salem		O-301
	Wilson			5		Salem		O-302
	Trask			5		Salem		O-303
	Tillamook			5		Salem		
	Necanicum			4				
	Columbia							
	L. Columbia small trib below Bonneville	2				Salem, Spokane	Mt. Hood, Gifford Pinchot	

Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Chum (continued)								
	Washington							
	Hamilton Cr. (fall)				2			
	Grays R. (fall)				2			
	Washougal	1					Gifford Pinchot	
	WA Coast							
	Queets (fall)				4	Spokane, Olympic NP	Olympic	
	Hoh (fall)				4	Spokane, Olympic NP		
	Quillayute				4	Olympic NP	Olympic	
	Ozette R.	1			4	Olympic NP		
	(SASSI rating for fall)							
	Hood Canal (su)	2			1	Olympic NP	Olympic	W-105, 106, 108, 204
	Lower Skokomish (fall)				4		Olympic	W-108
	Strait of Juan de Fuca							
	Elwha (fall)	1			4	Olympic NP	Olympic (C)	
	Hoko/Clallam/ Sekiu (fall)				4			
	Lyre (fall)				4		Olympic	
	Dungeness/ E. Strait tribs. (fall)				4	Olympic NP	Olympic	W-103
	Sequim Bay (su)				2		Olympic	
	Discovery Bay (su)				1		Olympic	
	Puget Sound							
	Puyallup/Carbon (fall)				4	Mt. Ranier NP	Mt. Baker-Snoqualmie	W-135
	Hylebos Cr. (fall)				4			
	Henderson Inlet (fall)				4			
	Chambers Cr. (su)	2			0			
	Snohomish							
	Snoqualmie (fall)				4	Spokane	Mt. Baker-Snoqualmie (C)	
	Duwamish-Green	1			4		Mt. Baker-Snoqualmie	
	Skagit							
	L. Skagit (fall)				4	Spokane	Mt. Baker-Snoqualmie	
	Nooksack							
	Mainstem/ S. Fk. (fall)				4	Spokane	Mt. Baker-Snoqualmie	W-115
	Sumas/Chilliwack (fall)				4	N. Cascades NP	Mt. Baker-Snoqualmie	
Pink								
	California							
	Russian	1				Ukiah		
	Washington							
	Hood Canal							
	Skokomish	1				Olympic NP	Olympic	W-108
	Dosewallips				2	Olympic NP	Olympic	W-105
	Strait of Juan de Fuca							
	Elwha	1			1	Olympic NP	Olympic (C)	
	Dungeness	2				Olympic NP	Olympic	W-103
	Upper Dungeness				2	Olympic NP	Olympic	W-103
	Lower Dungeness				1		Olympic	W-103
	Nooksack							
	N.Fk. & M.Fk. Nooksack				4	Spokane	Mt. Baker-Snoqualmie	W-114
	S. Fk. Nooksack				4		Mt. Baker-Snoqualmie	W-115



Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Winter Steelhead								
	California							
	Sacramento	1				Ukiah	Shasta-Trinity (C), Mendocino	
	Oregon							
	Chetco			2		Coos Bay	Siskiyou	O-375, 376
	Pistol			2		Coos Bay	Siskiyou	
	Rogue			5		Coos Bay, Medford	Siskiyou, Rogue River	O-364, 370-374, 379, 380, 384 O-389-393, C-501
	Illinois	2		2		Medford	Siskiyou	O-371, 373, 374, 379, O-380, C-501
	Sixes			2		Coos Bay	Siskiyou	O-365
	Coos			2		Coos Bay		O-323
	Umpqua							
	Smith			2		Coos Bay, Roseburg, Eugene	Siuslaw	O-317, 318, 320
	N. Umpqua			5		Roseburg	Umpqua	O-357-362
	Siuslaw	3		2		Eugene	Siuslaw	O-313, 314
	Big Cr.	3					Siuslaw	O-312
	Tenmile Cr.	3		2			Siuslaw	O-312
	Yachats	3		2		Salem	Siuslaw	O-311
	Alsea	3		2		Salem, Eugene	Siuslaw	O-305, 310, 315
	Yaquina	3				Salem	Siuslaw	O-306
	Siletz	3		2		Salem	Siuslaw	O-309
	Salmon	3		2		Salem	Siuslaw	
	Nestucca	3		2		Salem	Siuslaw	O-304
	Tillamook Bay	3				Salem		O-301-303
	Miami			2				
	Kilchis			2		Salem		O-301
	Wilson			2		Salem		O-302
	Trask			2		Salem		O-303
	Nehalem			2		Salem		
	Salmonberry			2				
	Necanicum			1				
	Columbia							
	Willamette							
	Calapooia	3				Eugene	Willamette	
	Clackamas	2				Salem	Mt. Hood	O-332, 333, 335, 336, 431
	Hood	1					Mt. Hood	O-326
	Fifteenmile Cr.	2				Prineville	Mt. Hood	O-328
	L. Columbia small tribs below Bonneville Dam	2				Salem, Spokane	Mt. Hood, Gifford Pinchot	
	L. Columbia small tribs above Bonneville Dam	1				Spokane, Prineville	Mt. Hood, Gifford Pinchot	O-327, 328, W-247
	Washington							
	Mill Cr.				2			
	Abernathy Cr.				2			
	Germany Cr.				2			
	Grays R.	3			2			
	Skamokawa Cr.				4			
	Elochoman	3			2			
	Cowlitz	2			2	Spokane, Mt. St. Helens NVM	Gifford Pinchot (C)	

Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Winter Steelhead (continued)								
	Toutle	3				Mt. St. Helens NVM	Gifford Pinchot	
	Mainstem/N.Fk. Toutle				2	Mt. St. Helens NVM	Gifford Pinchot	
	Green				2	Mt. St. Helens NVM	Gifford Pinchot	
	Coweeman	3			2			
	Kalama	3			5	Mt. St. Helens NVM	Gifford Pinchot	
	Lewis	3					Gifford Pinchot	W-148
	E. Fk. Lewis				2		Gifford Pinchot	W-148
	Mainstem/N.Fk. Lewis				2	Spokane, Mt. St. Helens NVM	Gifford Pinchot (C)	
	Salmon Cr.				2			
	Washougal	2					Gifford Pinchot	
	Mainstem Washougal				4		Gifford Pinchot	
	W Fk. of N.Fk. Washougal				4	Spokane	Gifford Pinchot	
	Wind	1			4		Gifford Pinchot	W-146
	White Salmon	1			2		Gifford Pinchot	W-244
	Hamilton Cr.				4			
WA Coast								
	Willapa Bay							
	North/Smith Cr.				4			
	Palix				4			
	Nemah				4			
	Bear				4			
Grays Harbor								
	Chehalis							
	Skookumchuck/ Newaukum				2		Mt. Baker-Snoqualmie	
	Satsop				2		Olympic	W-109, 110
	S. Harbor				4			
	Copalis				4			
	Raft				4			
	Kalaloch Cr.				4	Olympic NP		
	Mosquito Cr.				4	Olympic NP		
	Goodman Cr.				4	Olympic NP		
	Ozette				4	Olympic NP		
	Sooes/Waatch				4			
Strait of Juan de Fuca								
	Sail				4			
	Sekiu				4			
	Clallam				4			
	Lyre				4	Olympic NP	Olympic	
	Salt Cr./Independents				4	Olympic NP		
	Elwha				2	Olympic NP	Olympic (C)	
	Morse Cr./Independents				2	Olympic NP		
	Dungeness				2	Olympic NP	Olympic	W-103
	Sequim Bay				4		Olympic	
	Discovery Bay				2		Olympic	
Hood Canal								
	Dewatto	1			2			
	Tahuya	2			2			
	Union				4			
	Skokomish	3			2		Olympic	W-108
	Hamma-Hamma				4		Olympic	
	Duckabush				2	Olympic NP	Olympic	W-106

Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Winter Steelhead (continued)								
	Dosewallips				2	Olympic NP	Olympic	W-105
	Quilcene/Dabob Bays				4		Olympic	W-204
	Puget Sound							
	E. Kitsap				4			
	Case/Carr Inlets				4			
	Hammersley Inlet				4			
	Totten Inlet				4			
	Eld Inlet				4			
	Lake Washington	2			2			
	Skagit							
	Cascade				4	Spokane, N. Cascades NP	Mt. Baker-Snoqualmie	
	Samish	3			2			
	Dakota Cr.				4			
	Nooksack	3			4	Spokane, N. Cascades NP	Mt. Baker-Snoqualmie	W-114, 115
	N. Fk. Nooksack				4	N. Cascades NP	Mt. Baker-Snoqualmie	W-114
	S. Fk. Nooksack				4		Mt. Baker-Snoqualmie	W-115
	M. Fk. Nooksack				4	Spokane, N. Cascades NP	Mt. Baker-Snoqualmie	
Summer Steelhead								
	California							
	Eel	2				Ukiah	Mendocino, Six Rivers	C-522-526, 520
	Van Duzen		1			Ukiah	Six Rivers (C)	
	M. Fk. Eel		3			Ukiah	Mendocino, Six Rivers	C-524-526
	N. Fk. Eel		1			Ukiah	Six Rivers, Mendocino	C-520
	Mad	1	1			Ukiah	Six Rivers	C-518
	Redwood Cr.	1	1			Ukiah, Redwood NP	Six Rivers	
	Klamath	2					Six Rivers, Klamath, Shasta-Trinity	C-503-517, 519
	Middle Klamath tribs. (J)		1			Ukiah	Six Rivers, Klamath	C-508, 512, 503, C-504, 506
	Salmon		1			Ukiah	Klamath	C-510, 511
	Trinity							
	S. Fk. Trinity		1				Shasta-Trinity, Six Rivers	C-517, 519
	New River		2				Shasta-Trinity	C-514
	Upper Trinity		1				Shasta-Trinity	C-515, 516
	N. Fk. Trinity		2			Ukiah	Shasta-Trinity	C-515
	Smith	1				Redwood NP	Six Rivers, Siskiyou	C-502
	Oregon							
	Rogue	2		2		Coos Bay, Medford	Siskiyou, Rogue	O-364, 370-374, 379, 380, 384 O-389-393, C-501
	Siletz	2		2		Salem	Siuslaw	O-309
	Columbia							
	Hood	2					Mt. Hood	O-326
	L. Columbia small tribs above Bonneville Dam	1				Spokane, Prineville	Mt. Hood, Gifford Pinchot	O-327, 328, W-247
	Washington							
	Cowlitz	1				Spokane, Mt. St. Helens NVM	Gifford Pinchot (C)	
	Kalama				2	Mt. St. Helens NVM	Gifford Pinchot	
	Lewis							
	N. Fk. Lewis	1			2	Mt. St. Helens NVM	Gifford Pinchot (C)	
	E. Fk. Lewis	3			4	Spokane	Gifford Pinchot	W-148
	Washougal	1				Spokane	Gifford Pinchot	
	Mainstem Washougal				4		Gifford Pinchot	

Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Summer Steelhead (continued)								
	W.Fk. of N.Fk. Washougal				4	Spokane	Gifford Pinchot	
	Rock Cr.				4	Spokane	Gifford Pinchot	
	Wind	2			2		Gifford Pinchot	W-146
	Panther Cr.				2		Gifford Pinchot	W-146
	Trout Cr.				2		Gifford Pinchot	W-146
	White Salmon	1			2	Spokane	Gifford Pinchot	W-244
	Yakima				2	Spokane	Wenatchee	W-136-138
	Wenatchee	3			2	Spokane	Wenatchee	W-128, 129, 133, 134
	Entiat	1			2	Spokane	Wenatchee	W-127
	Methow/Okanogan				2	Spokane	Okanogan	W-123-126
	Methow	1				Spokane	Okanogan	W-123-126
WA Coast								
	Grays Harbor							
	Chehalis				4	Spokane, Olympic NP	Olympic	W-109-111
	Humptulips				4	Olympic NP	Olympic	
	Quinault				4		Olympic	
	Queets							
	Clearwater				4	Spokane		
	Hoh				4	Spokane, Olympic NP		
	Quillayute							
	Calawah				4	Olympic NP	Olympic	
	Bogachiel				4	Olympic NP	Olympic	
	Sol Duc				4	Olympic NP	Olympic	W-201
Strait of Juan de Fuca								
	Elwha				2	Olympic NP	Olympic (C)	
	Dungeness				2	Olympic NP	Olympic	W-103
Hood Canal								
	Dosewallips				4	Olympic NP	Olympic	W-105
	Duckabush				4	Olympic NP	Olympic	W-106
	Skokomish				4	Olympic NP	Olympic	W-108
	Snohomish							
	Snoqualmie							
	Tolt	1			2		Mt. Baker-Snoqualmie	
	Skykomish							
	N. Fk. Skykomish				4		Mt. Baker-Snoqualmie	W-121
	Stillaguamish/Deer Cr	1				Spokane	Mt. Baker-Snoqualmie	W-116, 117, 120
	S. Fk. Stillaguamish				4		Mt. Baker-Snoqualmie	W-120
	Canyon Cr.				4		Mt. Baker-Snoqualmie	W-120
	Deer Cr.				1		Mt. Baker-Snoqualmie	W-116
Skagit								
	Cascade				4	Spokane, N. Cascades NP	Mt. Baker-Snoqualmie	
	Sauk				4	Spokane	Mt. Baker-Snoqualmie	W-118, 119
	Finney Cr.				4		Mt. Baker-Snoqualmie	
Nooksack								
	S. Fk. Nooksack	2			4	Spokane	Mt. Baker-Snoqualmie	W-115
Sea-run Cutthroat Trout								
California								
	CA coastal streams	2				Ukiah, Redwood NP	Six Rivers, Trinity,	(too numerous to list)
	Lower Eel (E)		3			Ukiah	Six Rivers	C-520
	Lower Klamath		3			Ukiah	Six Rivers, Klamath, Shasta-Trinity	C-503-517, 519

Table B6-5. (continued)

Race	Stocks	Risk Ratings*				BLM Districts and National Parks	National Forests	Key Watersheds
		Nehlsen et al. 91	Higgins et al. 92	Nickelson et al. 92	SASSI** 93			
Sea-run Cutthroat Trout (continued)								
	Mad		3			Ukiah	Six Rivers	C-518
	Wilson Cr.		3			Redwoods NP		
	Oregon							
	OR coastal streams	2				Salem, Medford, Eugene, Coos Bay, Roseburg	Siskiyou, Siuslaw	(too numerous to list)
	Columbia							
	Hood	1					Mt. Hood	O-326
	L.Columbia small tribs. below Bonneville Dam	2				Salem, Spokane	Mt. Hood, Gifford Pinchot	
	Washington							
	Elochoman	3						
	Cowlitz	3				Mt. St. Helens NVM	Gifford Pinchot (C)	
	Toutle	3				Mt. St. Helens NVM	Gifford Pinchot	
	Coweeman	3						
	Kalama	3				Mt. St. Helens NVM	Gifford Pinchot	
	Washougal	3				Spokane	Gifford Pinchot	
	Rock Cr.	1				Spokane	Gifford Pinchot	
	WA coastal & Puget	3				Spokane, Olympic NP,	Olympic,	W-103, 116-121, 201
	Sound tribs. (except Grays Harbor & Hood Canal)					N. Cascades NP	Mt. Baker-Snoqualmie	
	Grays Harbor & Hood Canal tribs.	3				Spokane, Olympic NP	Olympic	W-105, 106, 108-111, 204

## Footnotes

\* Risk ratings reflect the authors' original ratings as described in Table B6-4.

\*\* State salmon and steelhead stock inventory (Washington Department of Fisheries et al. 1993).

A A National Forest or Bureau of Land Management District is listed for a stock if it is within the basin containing that stock, even if it is above the range of anadromy for that stock. In many such cases the federal land is important in maintaining water quality for the stock. BLM Districts, particularly the Ukiah District in California, may include watersheds or basins not listed here.

B A Key Watershed may be listed for a stock which is not found in the Key Watershed, but for which the Key Watershed is serving a function in maintaining downstream habitat for the stock. The preparers of this table tended to be conservative and overlist rather than underlist Key Watersheds.

C No anadromous fish run on lands administered by the Forest Service due to dam blocking access. Dams are not noted for other land management agencies.

D Stock is listed federally as threatened and by the State of California as endangered.

E Below N. Fork Eel River (Higgins et al. 1992).

F Below the community of Weitchpec (Higgins et al. 1992).

G Below Illinois River (Oregon Department of Fish and Wildlife, Provisional list of wild fish populations).

H Illinois River to Gold Ray (Oregon Department of Fish and Wildlife, Provisional list of wild fish populations).

I Above Gold Ray (Oregon Department of Fish and Wildlife, Provisional list of wild fish populations).

J Dillon, Elk, Indian, Clear, Red Cap, and Bluff Creeks (Higgins et al. 1992).

being developed by the National Council on Air and Stream Improvement. Analysis modules in Watershed Analysis are patterned after the first two approaches because a modular approach allows flexibility in selecting methods appropriate to a particular watershed and facilitates modification of specific techniques as improved methods become available. Unique aspects of the watershed analysis procedure described in the FEMAT Report include explicit consideration of biological as well as physical processes, and the joint consideration of upland and riparian areas (see also FEMAT Report, Chapter V, Appendix I).

Watershed analysis is one of the important aspects of effectively implementing ecosystem planning and management on a watershed basis. Information gained through watershed analysis will be vital to adaptive management over broad physiographic provinces. When current plans and draft plan preferred alternatives are revised, information gathered through watershed analysis will, in part, be the basis of these revisions.

#### 4) WATERSHED RESTORATION

Watershed restoration will be an integral part of a program to aid recovery of fish habitat, riparian habitat, and water quality. The analysis of effects described in this SEIS assumed that all the alternatives, except Alternative 7, included a comprehensive watershed restoration program. Restoration will be based on watershed analysis and planning. Watershed analysis is essential to identify areas of greatest benefit to cost relationships for restoration opportunities and greatest likelihood of success. Watershed analysis can also be used as a medium to develop cooperative projects involving various landowners. In many watersheds, the most critical restoration needs occur on private lands downstream from federally-managed lands. Watershed analysis, including the use of sediment budgets, provides a framework for considering benefit-to-cost relations in a watershed context. Thus, the magnitude of restoration needs within the planning area will be based on watershed analysis.

A viable, effective program must employ all restoration components and must be long term. Inventory, analysis, the National Environmental Policy Act process, implementation, and monitoring all require time. Without adequate investment in each of these steps, restoration efforts will be ineffective, as demonstrated by past efforts. Funding and an interagency commitment to a program similar to the 10-year program described in the FEMAT Report, Chapter V, Appendix J, is essential.

The most important components of a watershed restoration program are control and prevention of road-related runoff and sediment production, restoration of the condition of riparian vegetation, and restoration of in-stream habitat complexity. Other restoration opportunities exist, such as meadow and wetland restoration and mine reclamation, and these may be quite important in some areas. Regionally however, these opportunities are much less extensive than the three components listed above (see also FEMAT Report, Chapter V, Appendix J).

**Roads** - Road treatments range from full decommissioning (closing and stabilizing a road to eliminate potential for storm damage and the need for maintenance) to simple road upgrading, which leaves the road open. Upgrading can involve practices such as removing soil from locations where there is a high potential of triggering landslides, modifying road drainage systems to reduce the extent to which the road functions as an extension of the stream network, and reconstructing stream crossings to reduce the risk and consequences of road failure or washing out at the crossings.

The decision to apply a given treatment depends on the value and sensitivity of downstream uses, transportation needs, social expectations, assessment of probable outcomes for success at correcting problems, costs, and other factors. Watershed analysis, including the use of sediment budgets, provides a framework for considering benefit to cost relations in a watershed context. Thus, the magnitude of regional restoration needs will be based on watershed analysis.

**Riparian Vegetation** - Active silvicultural programs will be necessary to restore large conifers in Riparian Reserves. Appropriate practices may include planting unstable areas such as landslides along streams and flood terraces, thinning densely-stocked young stands to encourage development of large conifers, releasing young conifers from overtopping hardwoods, and reforesting shrub and hardwood-dominated stands with conifers. These practices can be implemented along with silvicultural treatments in uplands areas, although the practices will differ in objective and, consequently, design.

**Instream Habitat Structures** - Instream restoration, based on the interpretation of physical and biological processes and deficiencies during watershed analysis, can be an important component of an overall program for restoring fish and riparian habitat. In-stream restoration measures are inherently short term and must be accompanied by riparian and upslope restoration to achieve long-term watershed restoration. Maintaining desired levels of channel habitat complexity, for example, may best be achieved in the short term by introducing structures. However, a riparian area with the complete array of functions and processes should provide coarse woody debris to the channel in the long term.

Instream restoration will be accompanied by riparian and upslope restoration if watershed restoration is to be successful. Instream restoration, including in-channel structures, will not be used to mitigate for management actions that degrade existing habitat, to substitute for habitat protection, or to justify land-management activities and practices that have a potential to negatively affect aquatic and riparian habitat in the long term. Priority must be given to protecting existing high quality habitat.

## Monitoring

Watershed analysis will support decisions for a variety of planned ecosystem management actions within watersheds. Specific actions may include habitat restoration, sediment reduction programs, road removal and management, timber harvesting, development of a recreation facility, or any of a multitude of activities. Monitoring will be an essential component of these management actions and will be guided by the results of watershed analysis.

General objectives of monitoring will be to: (1) determine if best management practices have been implemented, (2) determine the effectiveness of management practices at multiple scales, ranging from individual sites to watersheds, and (3) validate whether ecosystem functions and processes have been maintained as predicted. In addition, monitoring will provide feedback for the adaptive management process.

Specific monitoring objectives will be derived from results of the watershed analysis and tailored to each watershed. Monitoring at the 20 to 200 square mile watershed level derived from watershed analysis will link monitoring for ecosystem management objectives for multiple scales of province, river basin, smaller watershed and site-specific levels. Specific locations of unstable and potentially unstable areas, roads, and harvest activities will be identified. In addition, the spatial relationship of potentially unstable areas and management actions to sensitive habitats such as wetlands will be determined. This information provides a basis for targeting watershed monitoring activities to assess outcomes associated with risks and uncertainties identified during watershed analyses.

Under natural conditions, river and stream habitats on federal forest lands exhibit an extremely wide diversity of conditions depending on past disturbances, topography, geomorphology, climate and other factors. Consequently, riparian area monitoring must be dispersed among the various landscapes rather than concentrated at a few sites and then extrapolated to the entire forest (Gregory and Ashkenas 1990). Logistical and financial constraints require a stratified monitoring program that includes:

- Post-project site review
- Reference to subdrainages
- Basin monitoring
- A water quality network.
- Landscape integration of monitoring data

A stratified monitoring program examines watersheds at several spatial and temporal scales. Information is provided on hillslope, floodplain, and channel functions, water quality, fish and wildlife habitat and populations, and vegetation diversity and dynamics.

Parameters selected for monitoring depend on the activities planned for a given watershed designed to specifically address forest practices and associated activities such as road construction and maintenance. Two of the more extensive activities related to water quality are timber harvest and road related operations. In localized areas, water quality can also be affected by other activities such as mining and instream channel alterations to improve habitat. Details on the selection of water quality parameters and interactions can be found in MacDonald et al. (1991). In addition to chemical and physical parameters, biological criteria may be appropriate to monitor using techniques such as Rapid Bioassessment Protocols for macroinvertebrates (Plafkin et al. 1989) or the index of biotic integrity for fish diversity (Karr 1981, Ohio EPA 1988).

Long-term systematic monitoring in selected watersheds will be necessary to provide reference points for effectiveness and validation monitoring. These watersheds should represent a range of forest and stream conditions which have been exposed to natural and induced disturbance. Requirements for reference evaluation areas are discussed in Gregory and Ashkenas (1990). Reference watersheds, subbasins, and individual sites will be selected as part of the overall adaptive management process proposed as part of Alternative 9.

Study plans will be cooperatively developed based on province\ river basin and watershed level analyses. Long-term data sets from reference watersheds will provide an essential basis for adaptive management and a gauge by which to assess trends in stream condition.

Monitoring plans must be tailored for each watershed. Significant differences in type and intensity of monitoring will occur based on watershed characteristics and management actions. For example, carefully targeted restoration activities may only require effectiveness monitoring of single activities, whereas watershed scale restoration would be accompanied by extensive riparian and instream monitoring. The specific design of monitoring programs can best be accomplished by the local interdisciplinary teams working in cooperation with state programs. Pooling the monitoring resources of federal and state agencies is a necessity to provide interagency consistency and to increase available resources.

Monitoring will be conducted and results will be documented, analyzed and reported by the agency responsible for land management in any particular watershed. Reports will be reviewed by local interdisciplinary teams. In addition, water resource regulatory agencies may review results to determine compliance with appropriate standards and province and river basin level strategies. A cross-section of team members that includes participants from states and regulatory agencies should assess monitoring results and recommend changes in Best Management Practices or the mechanisms for Best Management Practice implementation.

## Standards and Guidelines for Riparian Reserves

The following Riparian Reserve standards and guidelines are minimum land management prescriptions necessary to meet Aquatic Conservation Strategy objectives. The Riparian Reserve standards and guidelines were developed by a field team of managers and specialists and a technical team of scientists, and ratified by a validation team of managers and field scientists. They have been reviewed and revised by representatives of both the Bureau of Land Management and the Forest Service, with participation of professionals who were members of the Forest Ecosystem Management Assessment Team's Aquatic/Watershed Group.

### TIMBER MANAGEMENT

TM-1. Prohibit timber harvest, including fuelwood cutting, in Riparian Reserves, except as described below. Riparian Reserve acres shall not be included in calculations of the timber base.

- a. Where catastrophic events such as fire, flooding, volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and fuelwood cutting if required to attain Aquatic Conservation Strategy objectives.
- b. Remove salvage trees only when watershed analysis determines that present and future woody debris needs are met and other Aquatic Conservation Strategy objectives are not adversely affected.
- c. Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives.

### ROADS MANAGEMENT

RF-1. Cooperation among federal, state, and county agencies to achieve consistency in road design, operation, and maintenance necessary to attain Aquatic Conservation Strategy objectives.

RF-2. For each existing or planned road, meet Aquatic Conservation Strategy objectives by:

- a. minimizing road and landing locations in Riparian Reserves.



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- b. completing watershed analyses (including appropriate geotechnical analyses) prior to construction of new roads or landings in Riparian Reserves.
- c. preparing road design criteria, elements, and standards that govern construction and reconstruction.
- d. preparing operation and maintenance criteria that govern road operation, maintenance, and management.
- e. minimizing disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow.
- f. restricting sidecasting as necessary to prevent the introduction of sediment to streams.
- g. avoiding wetlands entirely when constructing new roads.

RF-3. Determine the influence of each road on the Aquatic Conservation Strategy objectives through watershed analysis. Meet Aquatic Conservation Strategy objectives by:

- a. reconstructing roads and associated drainage features that pose a substantial risk.
- b. prioritizing reconstruction based on current and potential impact to riparian resources and the ecological value of the riparian resources affected.
- c. closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to Aquatic Conservation Strategy objectives and considering short-term and long-term transportation needs.

RF-4. New culverts, bridges and other stream crossings shall be constructed, and existing culverts, bridges and other stream crossings determined to pose a substantial risk to riparian conditions will be improved, to accommodate at least the 100-year flood, including associated bedload and debris. Priority for upgrading will be based on the potential impact and the ecological value of the riparian resources affected. Crossings will be constructed and maintained to prevent diversion of streamflow out of the channel and down the road in the event of crossing failure.

RF-5. Minimize sediment delivery to streams from roads. Outsloping of the roadway surface is preferred, except in cases where outsloping would increase sediment delivery to streams or where outsloping is unfeasible or unsafe. Route road drainage away from potentially unstable channels, fills, and hillslopes.

RF-6. Provide and maintain fish passage at all road crossings of existing and potential fish-bearing streams.

RF-7. Develop and implement a Road Management Plan or a Transportation Management Plan that will meet the Aquatic Conservation Strategy objectives. As a minimum, this plan shall include provisions for the following activities:

- a. inspections and maintenance during storm events.
- b. inspections and maintenance after storm events.
- c. road operation and maintenance, giving high priority to identifying and correcting road drainage problems that contribute to degrading riparian resources.
- d. traffic regulation during wet periods to prevent damage to riparian resources.
- e. establish the purpose of each road by developing the Road Management Objective.

## GRAZING MANAGEMENT

GM-1. Adjust grazing practices to eliminate impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives. If adjusting practices is not effective, eliminate grazing.

GM-2. Locate new livestock handling and/or management facilities outside Riparian Reserves. For existing livestock handling facilities inside the Riparian Reserve, ensure that Aquatic Conservation Strategy objectives are met. Where these objectives cannot be met, require relocation or removal of such facilities.

GM-3. Limit livestock trailing, bedding, watering, loading, and other handling efforts to those areas and times that will ensure Aquatic Conservation Strategy objectives are met.

#### RECREATION MANAGEMENT

RM-1. New recreational facilities within Riparian Reserves, including trails and dispersed sites, should be designed to not prevent meeting Aquatic Conservation Strategy objectives. Construction of these facilities should not prevent future attainment of these objectives. For existing recreation facilities within Riparian Reserves, evaluate and mitigate impact to ensure that these do not prevent, and to the extent practicable contribute to, attainment of Aquatic Conservation Strategy objectives. Where this standard cannot be met, require relocation or closure of recreation facilities.

RM-2. Adjust dispersed and developed recreation practices that retard or prevent attainment of Aquatic Conservation Strategy objectives. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities, and/or specific site closures are not effective, eliminate the practice or occupancy.

RM-3. Wild and Scenic Rivers and Wilderness management plans will address attainment of Aquatic Conservation Strategy objectives.

#### MINERALS MANAGEMENT

MM-1. Require a reclamation plan, approved Plan of Operations, and reclamation bond for all minerals operations that include Riparian Reserves. Such plans and bonds must address the costs of removing facilities, equipment, and materials; recontouring of disturbed areas to near pre-mining topography; isolating and neutralizing or removing toxic or potentially toxic materials; salvage and replacement of topsoil; and seedbed preparation and revegetation to meet Aquatic Conservation Strategy objectives.

MM-2. Locate structures, support facilities, and roads outside Riparian Reserves. Where no alternative to siting facilities in Riparian Reserves exists, locate them in a way compatible with Aquatic Conservation Strategy objectives. Road construction will be kept to the minimum necessary for the approved mineral activity. Such roads will be constructed and maintained to meet roads management standards and to minimize damage to resources in the Riparian Reserve. When a road is no longer required for mineral or land management activities, it will be closed, obliterated, and stabilized.

MM-3. Prohibit solid and sanitary waste facilities in Riparian Reserves. If no alternative to locating mine waste (waste rock, spent ore, tailings) facilities in Riparian Reserves exists, and releases can be prevented, and stability can be ensured, then:

- a. analyze the waste material using the best conventional sampling methods and analytic techniques to determine its chemical and physical stability characteristics.
- b. locate and design the waste facilities using best conventional techniques to ensure mass stability and prevent the release of acid or toxic materials. If the best conventional technology is not sufficient to prevent such releases and ensure stability over the long term, prohibit such facilities in Riparian Reserves.
- c. monitor waste and waste facilities after operations to ensure chemical and physical stability and to meet Aquatic Conservation Strategy objectives.
- d. reclaim waste facilities after operations to ensure chemical and physical stability and to meet Aquatic Conservation Strategy objectives.
- e. require reclamation bonds adequate to ensure long-term chemical and physical stability of mine waste facilities.

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MM-4. For leasable minerals, prohibit surface occupancy within Riparian Reserves for oil, gas, and geothermal exploration and development activities where contracts and leases do not already exist. Adjust the operating plans of existing contracts to eliminate impacts that retard or prevent the attainment of Aquatic Conservation Strategy objectives.

MM-5. Sand and gravel mining and extraction within Riparian Reserves will occur only if Aquatic Conservation Strategy objectives can be met.

MM-6. Develop inspection and monitoring requirements and include such requirements in mineral plans, leases or permits. Evaluate the results of inspection and monitoring to modify mineral plans, leases and permits as needed to eliminate impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives.

### FIRE/FUELS MANAGEMENT

FM-1. Design fuel treatment and fire suppression strategies, practices, and activities to meet Aquatic Conservation Strategy objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuels management activities could be damaging to long-term ecosystem function.

FM-2. Locate incident bases, camps, helibases, staging areas, helispots and other centers for incident activities outside Riparian Reserves. If the only suitable location for such activities is within the Riparian Reserve, an exemption may be granted following review and recommendation by a resource advisor. The advisor will prescribe the location, use conditions, and rehabilitation requirements. Use an interdisciplinary team to predetermine suitable incident base and helibase locations.

FM-3. Minimize delivery of chemical retardant, foam, or additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist, or, following review and recommendation by a resource advisor, when an escape would cause more long-term damage.

FM-4. Design prescribed burn projects and prescriptions to contribute to attainment of Aquatic Conservation Strategy objectives.

FM-5. Immediately establish an emergency team to develop a rehabilitation treatment plan needed to attain Aquatic Conservation Strategy objectives whenever Riparian Reserves are significantly damaged by wildfire or a prescribed fire burning outside prescribed parameters.

(Additional Fire Management standards and guidelines are included in Appendix B8, Fire Management Standards and Guidelines.)

### LANDS

LH-1. Identify instream flows needed to maintain riparian resources, channel conditions, and fish passage.

LH-2. Tier 1 Key Watersheds: For hydroelectric and other surface water development proposals, require instream flows and habitat conditions that maintain or restore riparian resources, favorable channel conditions, and fish passage. Coordinate this process with the appropriate state agencies. During relicensing of hydroelectric projects, provide written and timely license conditions to Federal Energy Regulatory Commission (FERC) that require flows and habitat conditions that maintain/restore riparian resources and channel integrity. Coordinate relicensing projects with the appropriate state agencies.

For all other watersheds: For hydroelectric and other surface water development proposals, give priority emphasis to instream flows and habitat conditions that maintain or restore riparian resources, favorable channel conditions, and fish passage. Coordinate this process with the appropriate state agencies. During relicensing of hydroelectric projects, provide written and timely license conditions to FERC that emphasize instream flows and habitat conditions that maintain/restore riparian resources and channel integrity. Coordinate relicensing projects with the appropriate state agencies.

LH-3. Locate new support facilities outside Riparian Reserves. For existing support facilities inside Riparian Reserves that are essential to proper management, provide recommendations to FERC that ensure Aquatic Conservation Strategy objectives are met. Where these objectives cannot be met, provide recommendations to FERC that such support facilities should be relocated. Existing support facilities that must be located in the Riparian Reserves will be located, operated, and maintained with an emphasis to eliminate adverse effects that retard or prevent attainment of Aquatic Conservation Strategy objectives.

LH-4. Issue leases, permits, rights-of-way, and easements to avoid adverse effects that retard or prevent attainment of Aquatic Conservation Strategy objectives. Adjust existing leases, permits, rights-of-way, and easements to eliminate adverse effects that retard or prevent the attainment of Aquatic Conservation Strategy objectives. If adjustments are not effective, eliminate the activity. Priority for modifying existing leases, permits, rights-of-way and easements will be based on the actual or potential impact and the ecological value of the riparian resources affected.

LH-5. Use land acquisition, exchange, and conservation easements to meet Aquatic Conservation Strategy Objectives and facilitate restoration of fish stocks and other species at risk of extinction.

#### **GENERAL RIPARIAN AREA MANAGEMENT**

RA-1. Identify and attempt to secure in-stream flows needed to maintain riparian resources, channel conditions, and aquatic habitat.

RA-2. Fell trees in Riparian Reserves when they pose a safety risk. Keep felled trees on-site when needed to meet woody debris objectives.

RA-3. Herbicides, insecticides, and other toxicants, and other chemicals shall be applied only in a manner that avoids impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives.

RA-4. Locate water drafting sites to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows needed to maintain riparian resources, channel conditions, and fish habitat.

#### **WATERSHED AND HABITAT RESTORATION**

WR-1. Design and implement watershed restoration projects in a manner that promotes long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and attains Aquatic Conservation Strategy objectives.

WR-2. Cooperate with federal, state, local, and tribal agencies, and private landowners to develop watershed-based Coordinated Resource Management Plans or other cooperative agreements to meet Aquatic Conservation Strategy objectives.

WR-3. Do not use mitigation or planned restoration as a substitute for preventing habitat degradation.

#### **FISH AND WILDLIFE MANAGEMENT**

FW-1. Design and implement fish and wildlife habitat restoration and enhancement activities in a manner that contributes to attainment of Aquatic Conservation Strategy objectives.

FW-2. Design, construct and operate fish and wildlife interpretive and other user-enhancement facilities in a manner that does not retard or prevent attainment of Aquatic Conservation Strategy objectives. For existing fish and wildlife interpretive and other user-enhancement facilities inside Riparian Reserves, ensure that Aquatic Conservation Strategy objectives are met. Where Aquatic Conservation Strategy objectives cannot be met, relocate or close such facilities.

FW-3. Cooperate with federal, tribal, and state wildlife management agencies to identify and eliminate wild ungulate impacts that are inconsistent with attainment of Aquatic Conservation Strategy objectives.

FW-4. Cooperate with federal, tribal, and state fish management agencies to identify and eliminate impacts associated with habitat manipulation, fish stocking, harvest and poaching that threaten the continued existence and distribution of native fish stocks occurring on federal lands.

## RESEARCH

RS-1. A variety of research activities may be ongoing and proposed in Key Watersheds and Riparian Reserves. These activities must be analyzed to ensure that significant risk to the watershed values does not exist. If significant risk is present and cannot be mitigated, study sites must be relocated. Some activities not otherwise consistent with the objectives may be appropriate, particularly if the activities will test critical assumptions of this plan; will produce results important for establishing or accelerating vegetation and structural characteristics for maintaining or restoring aquatic and riparian ecosystems; or the activities represent continuation of long-term research. These activities should be considered only if there are no equivalent opportunities outside of Key Watersheds and Riparian Reserves.

RS-2. Current, funded, agency-approved research, which meets the above criteria, is assumed to continue if analysis ensures that a significant risk to Aquatic Conservation Strategy objectives does not exist. Research and other BLM and Forest Service units will, within 90 days of the signing of the Record of Decision of this SEIS, submit a brief project summary to the Regional Ecosystem Office of ongoing research projects that are potentially inconsistent with other standards and guidelines of the selected alternative but expected to continue under the above research exception. The Regional Ecosystem Office may choose to more formally review specific projects, and may require modification, up to and including cancellation, of those projects having an unacceptable risk to Key Watersheds and Riparian Reserves. Risk will be considered within the context of the Aquatic Conservation Strategy objectives.

# Appendix B7

## Late-Successional Reserve Standards and Guidelines

### Late-Successional Reserve Standards and Guidelines for Multiple-Use Activities Other Than Silviculture

The following standards and guidelines have been adapted from the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.) by the SEIS Team, and apply to Late-Successional Reserves and Managed Late-Successional Areas in all alternatives.

#### INTRODUCTION

A variety of activities currently occur in Late-Successional Reserves or may be proposed in the future. The highest priority of Late-Successional Reserves is to protect and enhance habitat for late-successional and old-growth forest related species including the northern spotted owl. These reserves are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem. As a general guideline, non-silvicultural activities located inside Late-Successional Reserves that are neutral or beneficial to the creation and maintenance of late-successional habitat are allowed.

While most existing uses and development are envisioned to remain, it may be necessary to modify or eliminate some current activities in Late-Successional Reserves that pose adverse impacts. This may require the revision of management guidelines, procedures, or regulations governing these multiple-use activities. Adjustments in standards and guidelines must be reviewed by the Regional Ecosystem Office.

Activities on federal lands are guided by various direction. This direction includes, but is not limited to directives, policy, handbooks, manuals, as well as other plans, regulations, laws, and treaties. The standards and guidelines presented in this appendix supersede other direction except treaties, laws, and regulations unless that direction is more restrictive or provides greater benefits to late-successional forest related species, or unless otherwise specifically noted with respect to a particular alternative. Agencies need to evaluate any activities not described for impacts to the objectives of Late-Successional Reserves.

#### Road Construction and Maintenance

Road construction in Late-Successional Reserves for silvicultural, salvage, and other activities generally is not recommended unless potential benefits exceed the costs of habitat impairment. If new roads are necessary to implement a practice that is otherwise in accordance with these guidelines, they will be kept to a minimum, be routed through unsuitable habitat where possible, and be designed to minimize adverse impacts. Alternative access methods, such as aerial logging, should be considered to provide access for activities in reserves.

Road maintenance may include felling hazard trees along rights-of-way. Leaving material on site should be considered if available coarse woody debris is inadequate. Topping trees should be considered as an alternative to felling.

#### Fuelwood Gathering

Fuelwood gathering will be permitted only in existing cull decks, where green trees are marked by silviculturists to thin unsuitable habitat, to remove blowdown blocking roads, and in recently harvested timber sale units where down material will impede scheduled post-sale activities or pose an unacceptable risk of future large-scale disturbances. In all cases these activities should comply with the standards and guidelines for salvage and silvicultural activities.

## **American Indian Uses**

When adverse impacts to Late-Successional Reserves are slight, continuation of tribal uses typically should be recognized as an obligation to treaty or agreement rights, even when the use is inconsistent with the standards and guidelines for Late-Successional Reserves. The Regional Ecosystem Office would approve exceptions to the standards and guidelines if it determines that the objectives of the strategy would not be jeopardized or that treaty obligations so require.

## **Mining**

The impacts of ongoing and proposed mining actions will be assessed, and mineral activity permits will include appropriate stipulations (e.g., seasonal or other restrictions) related to all phases of mineral activity. The guiding principle will be to design mitigation measures that minimize detrimental effects to late-successional habitat.

## **Developments**

Development of new facilities that may adversely affect Late-Successional Reserves should not be permitted. New development proposals that address public needs or provide significant public benefits, such as powerlines, pipelines, reservoirs, recreation sites, or other public works projects will be reviewed on a case-by-case basis and may be approved when adverse effects can be minimized and mitigated. These will be planned to have the least possible adverse impacts on Late-Successional Reserves. Developments will be located to avoid degradation of habitat and adverse effects on identified late-successional species. Existing developments in Late-Successional Reserves such as campgrounds, recreation residences, ski areas, utility corridors, and electronic sites are considered existing uses with respect to Late-Successional Reserve objectives, and may remain, consistent with other standards and guidelines of the selected alternative. Routine maintenance of existing facilities is expected to have less effect on current old-growth conditions than development of new facilities. Maintenance activities may include felling hazard trees along utility rights-of-way, trails, and other developed areas.

## **Land Exchanges**

Land exchanges involving Late-Successional Reserves will be considered if they provide benefits equal to or better than current conditions. Consider land exchanges especially to improve area, distribution, and quality (e.g., connectivity, shape, contribution to biodiversity) of Late-Successional Reserves, especially where public and private lands are intermingled (e.g., checkerboard ownership).

## **Habitat Improvement Projects**

Projects designed to improve conditions for fish, wildlife, or watersheds should be considered if they provide habitat benefits or if their effect on late-successional associated species is negligible. Projects required for recovery of threatened or endangered species should be considered even if they result in some reduction of habitat quality for other late-successional species. For example, watershed rehabilitation projects, such as felling trees along streams, will be coordinated with a wildlife biologist and may include seasonal restrictions. Design and implement watershed restoration projects in a manner that is consistent with Late-Successional Reserve objectives.

## **Range Management**

Range-related management that does not adversely affect late-successional habitat will be developed in coordination with wildlife and fisheries biologists. Adjust or eliminate grazing practices that retard or prevent attainment of reserve objectives. Evaluate effects of existing and proposed livestock management and handling facilities in reserves to determine if reserve objectives are met. Where objectives cannot be met, relocate livestock management and/or handling facilities.

## **Fire Suppression and Prevention**

Each Late-Successional Reserve will be included in fire management planning as part of watershed analysis. Fuels management in Late-Successional Reserves will utilize minimum impact suppression methods in

accordance with guidelines for reducing risks of large-scale disturbances. Plans for wildfire suppression will emphasize maintaining late-successional habitat. During actual fire suppression activities, consult resource specialists (e.g., botanists, fisheries and wildlife biologists, hydrologists) familiar with the area and this SEIS to assure that habitat damage is minimized. Until a fire management plan is completed for Late-Successional Reserves, suppress wildfire to avoid loss of habitat in order to maintain future management options.

### **Special Forest Products**

Special forest products include but are not limited to posts, poles, rails, landscape transplants, yew bark, shakes, seed cones, Christmas trees, boughs, mushrooms, fruits, berries, hardwoods, forest greens (e.g., ferns, huckleberry, salal, beargrass, Oregon grape, and mosses), and medicinal forest products. In all cases, evaluate whether activities have adverse effects on Late-Successional Reserve objectives. Sales will ensure resource sustainability and protection of other resource values such as special status plant or animal species. Where these activities are extensive (e.g., collection of Pacific Yew bark or fungi), it will be appropriate to evaluate whether they have significant effects on late-successional habitat. Restrictions may be appropriate in some cases.

### **Recreational Uses**

Dispersed recreational uses, including hunting and fishing, generally are consistent with the objectives of Late-Successional Reserves. Use adjustment measures such as education, use limitations, traffic control devices, or increased maintenance when dispersed and developed recreation practices retard or prevent attainment of Late-Successional Reserve objectives.

### **Research**

A variety of wildlife and other research activities may be ongoing and proposed in late-successional habitat. These activities must be assessed to determine if they are consistent with late-successional reserve objectives. Some activities (including those within experimental forests) not otherwise consistent with the objectives may be appropriate, particularly if the activities will test critical assumptions of the selected alternative, will produce results important for habitat development, or the activities represent continuation of long-term research. These activities should only be considered if there are no equivalent opportunities outside Late-Successional Reserves.

Current, funded, agency-approved research, which meets the above criteria, is assumed to continue if analysis ensures that a significant risk to Aquatic Conservation Strategy objectives does not exist. Research Stations and other BLM and Forest Service units will, within 90 days of the signing of the Record of Decision for this SEIS, submit a brief project summary to the Regional Ecosystem Office of ongoing research projects that are potentially inconsistent with other standards and guidelines of the selected alternative, but are expected to continue under the above research exception. The Regional Ecosystem Office may choose to more formally review specific projects, and may require modification, up to and including cancellation, of those projects having an unacceptable risk to Late-Successional Reserve objectives.

### **Rights-of-Way, Contracted Rights, Easements, and Special Use Permits**

Access to nonfederal lands through Late-Successional Reserves will be considered and existing right-of-way agreements, contracted rights, easements, and special use permits in Late-Successional Reserves will be recognized as valid uses. New access proposals may require mitigation measures to reduce adverse effects on Late-Successional Reserves. In these cases, alternate routes that avoid late-successional habitat should be considered. If roads must be routed through a reserve, they will be designed and located to have the least impact on late-successional habitat. Review all special use permits and when objectives of Late-Successional Reserves are not being met, reduce impacts through either modification of existing permits or education.

### **Nonnative Species**

In general nonnative species (plant and animal) should not be introduced into Late-Successional Reserves. If an introduction of nonnative species is proposed, complete an assessment of impacts and avoid any introduction that would retard or prevent achievement of Late-Successional Reserve objectives. Evaluate impacts of



## *Appendix B*

nonnative species (plant and animal) currently existing within reserves. Develop plans and recommendations for eliminating or controlling nonnative species which are inconsistent with Late-Successional Reserve objectives. Include an analysis of the effects of implementing such programs to other species or habitats within Late-Successional Reserves.

### **Other**

Other activities should be evaluated by local interdisciplinary teams and appropriate guidelines should be written and documented. Activities deemed to have potential adverse effects on Late-Successional Reserve objectives require review of the Regional Ecosystem Office. The Regional Ecosystem Office may develop additional criteria for exempting some additional activities from review.

# Appendix B8

## Fire Management Standards and Guidelines

This section of Appendix B, an addition in the Final SEIS, is a consolidation of standards and guidelines found in Appendix B2, Ecological Principles for Management of Late-Successional Forests, and Appendix B5, Recovery Plan Standards and Guidelines. Additional clarification and review of these standards and guidelines was provided by the Scientific Advisory Group for consistency with the objectives of the FEMAT Report. Standards and guidelines for the matrix, Administratively Withdrawn Areas, Congressionally Reserved Areas, and Riparian Reserves apply to all alternatives. Standards and guidelines for Adaptive Management Areas apply only to Alternative 9, while those for Late-Successional Reserves apply to Alternative 9 and other alternatives where Guidelines to Reduce Risk of Large-Scale Disturbance apply (Appendix B5, Recovery Plan Standards and Guidelines). In the absence of specific conflicts, fire management direction in existing plans also applies.

### Standards and Guidelines for Fire Management

One objective of ecosystem analysis and management is to identify disturbance regimes and to manage the landscape within that context. The role of fire management in the maintenance of ecosystems within the range of the northern spotted owl is well recognized. Thus, fire is inherently neither “bad” nor “good,” and should be used or suppressed in the context of achieving ecosystem management objectives at the landscape level.

Fire management activities consist of wildfire suppression, wildfire hazard reduction, and prescribed fire applications. In the course of implementing the following standards and guidelines to achieve ecosystem management objectives, it is critical that wildfire suppression and prescribed burning activities do not compromise the safety of firefighting personnel.

A wildfire is defined as any wildland fire that does not meet management objectives, and, thus, requires a suppression response. By regulation, a fire cannot be termed a prescribed fire once it has been declared a wildfire. A prescribed fire is defined as a fire burning within an approved, predefined and planned prescription. It may result from a planned or natural ignition. When a prescribed fire exceeds the prescription and/or planned perimeter, it may be declared a wildfire.

Fire management plans (including the use of prescribed fire for ecosystem management, fuel hazard reduction, and wildfire suppression) will be written or revised for all areas, as necessary, consistent with existing guidance. Additional guidance for fire management planning in Late-Successional Reserves is described below. The plans will be developed in an interdisciplinary manner and include specific objectives to support the unique management of the area. It is important to monitor and evaluate all fire management activities to ensure consistency with ecosystem management objectives.

The use of prescribed fire for ecosystem management will restore processes that have been limited by relatively effective fire exclusion. Most plant communities in the planning area are adapted to fire, although at the natural recurrence of fire is at widely varying intervals. Some species require periodic fire for their persistence (see the discussion of Vascular Plants in Chapter 3&4), and many additional species are well adapted to periodic burning. Fire can also be used effectively in the restoration and maintenance of wildlife habitat.

The goal of wildfire hazard reduction in all land allocations is to reduce the risk of large-scale, high intensity wildfires which would prevent land managers from meeting resource management objectives. It is essential to seek a balance between reducing cost and reducing the risk of wildfire, while promoting management objectives. The judicious use of prescribed fire for hazard reduction has the potential to restore ecosystem processes, lower smoke emissions from wildfires, limit the size of wildfires by facilitating fire suppression (while using methods that have a lower environmental impact), and reduce the costs of wildfire suppression.

## **LATE-SUCCESSIONAL RESERVES**

In Late-Successional Reserves, a specific fire management plan will be prepared prior to any habitat manipulation activities. This plan, as an element of watershed/landscape analysis, province-level planning, or a Late-Successional Reserve plan, should specify how hazard reduction and other prescribed fire applications will meet the objectives of the Late-Successional Reserve. Until the plan is approved, proposed activities will be subject to review by the Regional Ecosystem Office. The Regional Ecosystem Office may develop additional guidelines that would exempt some activities from review. In all Late-Successional Reserves, watershed/landscape-level analysis will provide guidance on how much coarse woody debris to retain when applying prescribed fire.

## **RIPARIAN AND LATE-SUCCESSIONAL RESERVES**

In Riparian and Late-Successional Reserves, the goal of wildfire suppression is to limit the size of all fires. When watershed/landscape analysis, province-level planning, or a Late-Successional Reserve plan are completed and approved, some natural fires may be allowed to burn under prescribed conditions. Rapidly extinguishing smoldering coarse woody debris and duff should be considered to preserve these ecosystem elements. In Riparian Reserves, water drafting sites should be located and managed to minimize adverse effects on riparian habitat and water quality, as consistent with the Aquatic Conservation Strategy, Appendix B6.

## **ADAPTIVE MANAGEMENT AREAS**

In Adaptive Management Areas, fire managers are encouraged to actively explore and support opportunities to research the role and effects of fire management on ecosystem functions. Cooperation across agency and ownership boundaries should be emphasized. The standards and guidelines in current plans and draft plan preferred alternatives for hazard reduction should be followed until approved Adaptive Management Area plans are established. Fire management experts will participate on the local Interdisciplinary Technical Advisory Panel on all Adaptive Management Areas. Management of Adaptive Management Areas is intended to be innovative and experimental. Wildfire suppression actions, however, should use accepted strategies and tactics, and conform with specific agency policy.

## **CONGRESSIONALLY RESERVED AREAS**

Fire management in Congressionally Reserved Areas should follow the standards and guidelines in existing Forest and District Plans. Congressionally Reserved Areas may be more fully incorporated into ecosystem management in future land management planning efforts. Revisions to current fire management standards and guidelines may occur when watershed/landscape-level analysis and province-level planning are completed.

## **ADMINISTRATIVELY WITHDRAWN AREAS**

Administratively Withdrawn Areas have been designated for a wide range of objectives. Fire management activities should be guided by current plans and draft plan preferred alternatives when their objectives are not addressed by this SEIS. Administratively Withdrawn Areas will have no additional standards and guidelines beyond those described in the section Wildfire Suppression Standards and Guidelines Common to All Land Allocations below.

## **MATRIX**

For areas in the matrix which are located in the rural interface, fire management activities should be coordinated with local governments, agencies, and landowners during watershed/landscape-level analyses to identify additional factors which may affect hazard reduction goals. Hazard reduction may become more important in the rural interface and areas adjacent to structures, dwellings or other amenities. Fire suppression actions in the matrix will have no additional standards and guidelines.

## **Prescribed Fire for Ecosystem Maintenance and Restoration**

Appropriate resource management experts should be involved in the development of project-level, prescribed fire plans. These plans should identify both the desirable and undesirable effects of burning. Planning and implementation of prescribed burns should be designed to meet stated objectives of the project and the land allocation.

Prescribed burning must adhere to smoke management and air quality standards and guidelines described in this Final SEIS, Chapter 3&4, the Air Quality Analysis section.

The goal of prescribed burning, other than hazard reduction and site preparation, is to maintain or restore ecosystem processes or structures. Natural fire and American Indian use of fire played an important role in the development of these ecosystems. Consequently, land managers should strongly consider the use of prescribed fire when developing alternatives to restore or maintain ecosystem processes or structures in these areas.

Application of prescribed fire for ecosystem maintenance and restoration, and for hazard reduction should vary in extent and frequency of application, and intensity of burning. The differences in applications should be related to the role of natural fire in specific landscapes, current ecosystem needs, and wildfire hazard analysis included in the fire management plan. In general, dry provinces will require more frequent application of prescribed fire over a greater area than other provinces in order to establish and maintain appropriate fuel profiles, and to maintain or restore ecosystem processes. Moist provinces, while requiring less frequent application of fire, can benefit from carefully planned and implemented prescribed burning programs. Deviations from the standards and guidelines of the selected alternative may be necessary due to local fuel-loading conditions. Also, the wide natural variability in provinces and individual stand histories may lead to fuels management prescriptions that are inconsistent with the standards and guidelines of the selected alternative, yet necessary to achieve the overall goal of reducing the threat of large-scale fire.

## **Fuels Management for Hazard Reduction**

The goal of wildfire hazard reduction is to modify fuel profiles in order to lower the potential of fire ignition and the rate of spread. Hazard reduction will also protect and support land allocation objectives by lowering the risk of high intensity, stand-replacing wildfires. This will be accomplished by reducing fuel accumulations to levels that provide the lowest cost plus net value change over time, while remaining consistent with the objectives of the affected land allocation.

Appropriate resource management experts should be included in developing project level hazard reduction plans. These plans should identify levels of coarse woody debris and snags (of adequate size and in sufficient quantities) to meet the habitat requirements of species of concern. Additionally, these plans must provide for the safety of firefighting personnel, and yield a fuel profile that supports land allocation objectives. It is essential to seek a balance between reducing the risk of wildfire, and the cost efficiency consistent with meeting land allocation objectives.

Hazard reduction activities will include, but not be limited to: prescribed burning, mechanical or manual manipulation of forest vegetation and debris; removal of forest vegetation and debris; as well as combinations of these methods. While fuelbreak construction and underburning are both valid hazard reduction techniques, prescribed underburning is generally more effective in reducing wildfire hazard.

Prescribed burning for hazard reduction must adhere to smoke management and air quality standards described in this Final SEIS, Chapter 3&4, in the Air Quality Analysis section.

## **Wildfire Suppression Standards and Guidelines Common to All Land Allocations**

The goal of fire suppression is to minimize the negative impacts of wildfires on ecosystem management objectives, consistent with "costs plus loss" criteria. In the absence of specific conflicts, fire management direction in existing Forest and District Plans also applies.

Fire managers will respond to all wildfires by taking appropriate suppression responses. In most cases, responses will consist of aggressive initial attack to extinguish fires at the smallest size possible. An analysis

(such as a Wildfire Situation Analysis) to determine the appropriate suppression response will be prepared for all wildfires that escape initial attack. This analysis should yield a suppression strategy that achieves fire suppression goals. Analysis teams should involve pertinent resource management experts.

Naturally-ignited fires may be managed as prescribed fires, following site-specific agency direction on a case-by-case basis. However, it is important to recognize that by regulation, wildfires cannot be used to meet resource objectives.

The land allocations of the alternatives in this SEIS have specific attributes that are important to promote and retain. Suppression actions should use strategies and tactics that strive to protect these attributes. Watershed/landscape analyses or Late-Successional Reserve plans will provide direction for managing fire to enhance and protect specific habitat areas and critical land allocation components. Depending on the result of each analysis, specific suppression techniques will be recommended to mitigate damage to the key components of that habitat. The appropriate use of suppression tools such as aircraft, dozers, pumps and other mechanized equipment should be identified and any restrictions relating to their use should be clearly defined. In addition to suppression actions, support efforts (e.g., transportation, fueling, sanitation) and facility establishment (e.g., camps, helibases, staging areas) should be evaluated for potential adverse effects on attaining ecosystem management objectives. Any restrictions to these activities or facility locations should be specified. Until watershed/landscape analyses or Late-Successional Reserve plans are completed, suppression activities should be guided by land allocation objectives in coordination with local resource management specialists.

Structural components such as snags, duff, and coarse woody debris should be protected from wildfire and suppression damage to the extent possible. Trees and snags should be felled only if they pose a threat to firefighter safety or contribute to the risk of wildfire spread. In general, those suppression actions which cause more damage to critical resources (threatened and endangered plant or animal species, and their habitats) than the fire itself should be carefully evaluated and alternative actions considered. Resource management experts should be involved to evaluate potential suppression damage compared to potential wildfire damage.

When taking fire suppression actions in areas where land allocations are intermingled (such as Riparian Reserves within Late-Successional Reserves), fire managers, in consultation with Resource Advisors, should consider the most critical resource and apply standards and guidelines associated with that resource.

Close interagency coordination is essential in mixed-ownership areas to minimize adverse impacts because wildfire suppression activities on nonfederal lands have the potential to adversely affect federal land allocation objectives. Conversely, wildfire suppression activities on federal lands should not cause adverse impacts on nonfederal lands.

The rehabilitation of areas damaged by wildfire suppression activities should be planned with the advice of applicable resource management experts.

# Appendix B9

## BLM Spotted Owl Standards and Guidelines

### Standards and Guidelines Specific to Northern Spotted Owl Habitat for Lands Administered by the Bureau of Land Management in Oregon

The following standards and guidelines are excerpted or adapted from the BLM Revised Preferred Alternative and are specific to northern spotted owl habitat. These standards and guidelines apply to all the action alternatives except Alternative 7.

Designated Conservation Areas, Reserved Pair Areas, and Residual Habitat Areas from the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.) and other standards and guidelines of the BLM's Revised Preferred Alternative that are specific to northern spotted owls do not apply except as described below.

1. For lands administered by the BLM north of the Grants Pass line, and including all of the Coos Bay District, outside of the South Willamette-North Umpqua Area of Concern, implement the Connectivity/Diversity Block design from the Revised Preferred Alternative with District modifications approved by the Scientific Advisory Group.
2. Apply additional matrix standards and guidelines to maintain the connectivity value of the I-5 Corridor (South Willamette/North Umpqua Area of Concern) in the Eugene District. Specifically, apply the Connectivity/Diversity Block standards and guidelines to all lands in the area designated as Deferred and Non-Deferred Old-Growth Emphasis Areas in the BLM's Revised Preferred Alternative (USDI unpub., see Appendix B1).

Connectivity/Diversity Block standards or guidelines call for 150-year area control rotations. Overall, 25 to 30 percent of each block will be maintained in late-successional condition, and periodic timber sales will leave 12 to 18 green trees per acre. Riparian Reserves count toward the 25 to 30 percent if they are in late-successional condition. Riparian Reserves do not count toward the 150-year rotation of the area control.

3. Apply Connectivity/Diversity Block standards and guidelines to the entire area of seven Managed Pair Areas and two Reserved Pair Areas near the Medford/Roseburg District boundary and on a portion of the Coos Bay District surrounding Designated Conservation Area OD-33.
4. The General Forest Management Area will be managed to retain six to eight green trees per acre in cutting units.



# Appendix B10

## Grants Pass Line

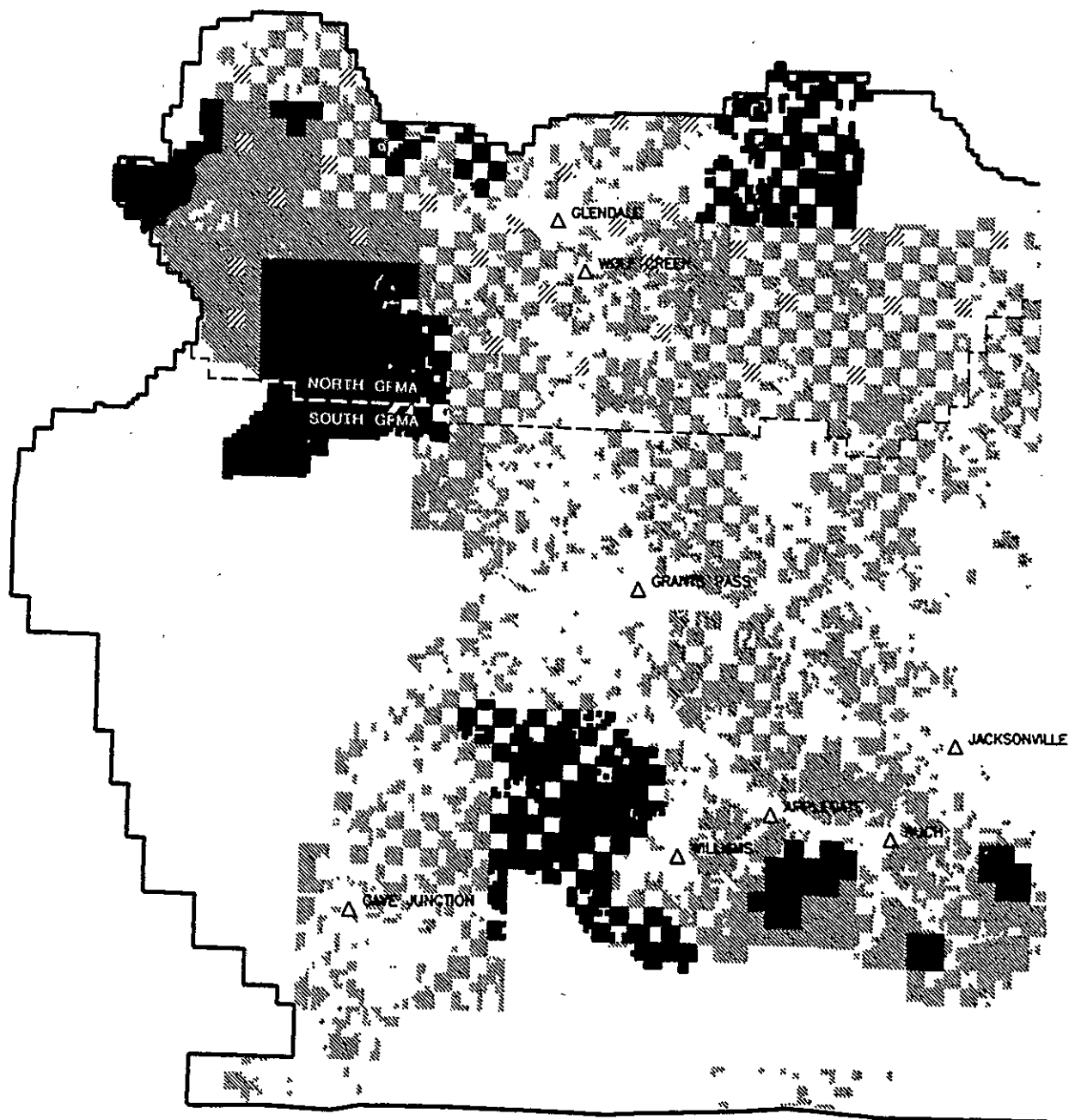
### Grants Pass Line Between Northern and Southern General Forest Management Areas

Lands in the BLM's Medford District which are allocated to timber management are divided into two separate categories based on site productivity, plant community, and forest condition. The line between these two categories is shown on the following map (Figure B10-1). Standards and guidelines differ on both sides of this line and are described in Appendix B1.

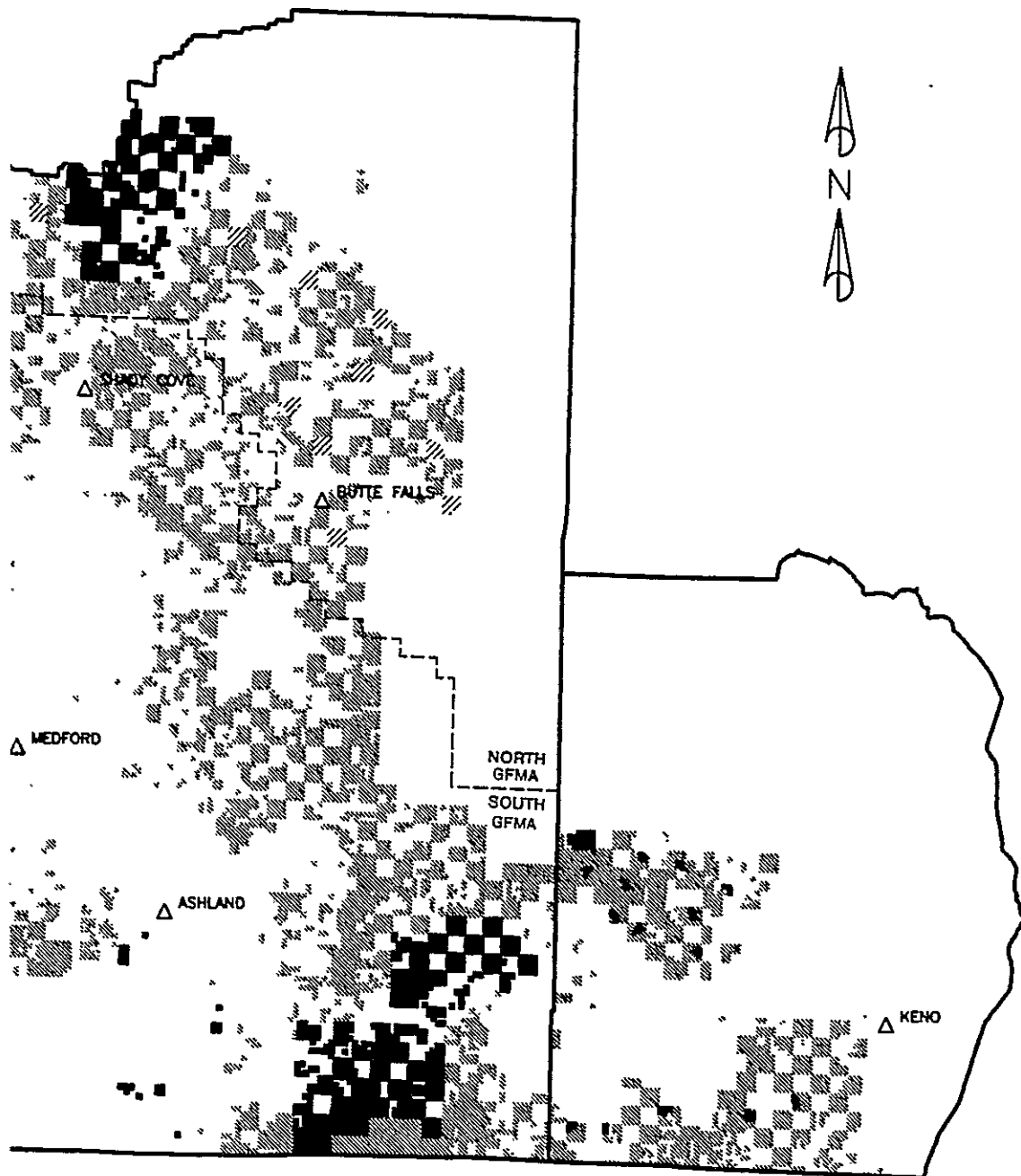
Lands north of this line fall into the generally more productive Northern General Forest Management Area, while lands south of this line, in the Southern General Forest Management Area, are generally less productive and dry.

This line applies to Alternative 9 only. For Alternative 9 standards and guidelines, all lands on the Coos Bay District are considered to be north of this line, while all lands on the Klamath Falls Resource Area of the Lakeview District are considered to be south of this line.





## MEDFORD/LAKEVIEW DISTRICT REVISED



NOTE: Conservation Areas are comprised of BLM Deferred & Non Deferred Old Growth Emphasis Areas, Recovery Plan Managed Pair Areas, Reserved Pair Areas, and Residual Habitat Areas.

ALL LANDS DISPLAYED ARE BLM ADMINISTERED ONLY

CONSERVATION AREAS  
CONNECTIVITY BLOCKS  
GENERAL FOREST MGT AREAS  
MAJOR CITIES



DRAFT PREFERRED ALTERNATIVE

JUNE 1993



# Appendix B11

## Standards and Guidelines Resulting From Additional Species Analysis and Changes to Alternative 9

The following standards and guidelines were developed in response to public and internal comments to increase protection of habitat for species whose habitat assessments were relatively low under Alternative 9. They are incorporated in Alternative 9 as standards and guidelines in this Final SEIS.

### Survey and Manage

The "survey and manage" standard and guideline would provide benefits to amphibians, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropods. The standard and guideline contains four components, and priorities differ among them:

#### 1. MANAGE KNOWN SITES

Management of known species sites should receive the highest priority. Efforts must be undertaken to acquire information on these known sites and to manage this information so that it is available to all project planners. An effective way to accomplish this is to compile the information in a Geographic Information System (GIS) data base. Those efforts should be coordinated by the Regional Ecosystem Office, and should be completed expeditiously. As soon as the information becomes available, it should be used in the design or modification of activities. Activities that are implemented in 1994 should use this information to the greatest degree possible. Activities implemented in 1995 and later must include provisions for these known sites. In most cases, the appropriate action will be protection of relatively small sites, on the order of tens of acres. For some species, including some vascular plants, the appropriate action will include the use of specific management treatments such as prescribed fire. For rare and endemic fungus species, areas of 160 acres should be temporarily withdrawn from ground-disturbing activities around known sites until those sites can be thoroughly surveyed and site-specific measures prescribed. For one fungus species, *Oxyporous nobilissimus*, there are only six known sites and two of these do not currently have a protected status. Management areas of 600 acres are to be established around these two sites for the protection of those populations. The actions to protect *Oxyporous* must be undertaken immediately.

#### 2. SURVEY PRIOR TO GROUND-DISTURBING ACTIVITIES

Measures to survey for species and manage newly discovered sites are to be phased-in over a somewhat longer timeframe than the measures to protect currently known sites. For some species, these efforts have been ongoing through rare and sensitive species programs. Where such efforts have been ongoing, they should continue. However, protocols have not been developed for surveys for all of these species, and the expertise needed to conduct them is not readily available in some cases. Efforts to design protocols and implement surveys should be started immediately. Where surveys are completed, the information gathered from them should be used to establish managed sites for species. Surveys must precede the design of all ground-disturbing activities that will be implemented in 1997 or later, and management standards and guidelines will be developed to manage habitat for the species on sites where they are located. These surveys may be conducted at a scale most appropriate to the species. For most species, this survey would start at the watershed analysis level with identification of likely species' locations based on habitat. Those likely locations would then be thoroughly searched prior to implementation of activities. For other species, the identification of likely sites may be most appropriately done at the scale of individual projects. Surveys should be designed for maximum

efficiency, focusing on the likely range and habitats of the target species. Multispecies surveys should be used wherever they would be most efficient. To the degree possible, surveys should be designed to minimize the number of site visits needed to acquire credible information. Survey protocols and proposed site management should be incorporated into interagency conservation strategies developed as part of ongoing planning efforts coordinated by the Regional Ecosystem Office.

### 3. EXTENSIVE SURVEYS

Conduct extensive surveys for the species to find high priority sites for species management. Specific surveys prior to ground-disturbing activities are not a requirement. Rather, the surveys will be done according to a schedule that is most efficient, and sites will be identified for protection at that time. This strategy entails some risk because some species sites may be disturbed prior to completion of surveys. It is recommended primarily for species whose characteristics make site and time-specific surveys difficult. For example, some fungi only produce fruiting bodies under specific climatic conditions, therefore, finding their location may take several to many years. It would be most efficient to do broad surveys for these species during times of appropriate conditions rather than attempting annual, site-specific surveys. Surveys under this strategy must be underway by 1996. As with surveys described in item 2 above, surveys should be designed for efficiency and standardized protocols should be developed.

### 4. GENERAL REGIONAL SURVEYS

The objective is to survey for the species to acquire additional information and to determine necessary levels of protection. Species intended to benefit from this standard and guideline are the arthropods, the fungi species that were not classed as rare and endemic, bryophytes, and lichens. These groups of species are particularly poorly known. Many species have likely not yet been identified, and there is only general information available on the abundance and distribution of known species. The information gathered through these efforts may be useful in refining the selected alternative as part of the adaptive management process to better provide for these species. These surveys are expected to be both extensive and expensive, but the information from them is critical to successful implementation of ecosystem management. They should be completed within 10 years.

Table B11-1 shows species covered by the survey and manage provision, and which of the four strategies above is to be applied to each. These measures may apply within any land allocations. However, the survey and manage provision for each species will be directed to the range of that species and the particular habitats that it is known to occupy.

## Riparian Reserves

Riparian Reserve Scenario 1 will be applied on intermittent streams throughout the range of the northern spotted owl. This is a change from the Draft SEIS that specified Riparian Reserve Scenario 2 outside of Tier 1 Key Watersheds. Scenario 1 is described in Appendix B6, Aquatic Conservation Strategy, and in Chapter 2 of this Final SEIS. As noted in Chapter 2, the prescribed Riparian Reserve widths for intermittent streams may be adjusted in decisions following watershed analysis. That analysis should take into account all species that were intended to be benefited by this standard and guideline. Those species include fish, mollusks, amphibians, lichens, fungi, bryophytes, vascular plants, American marten, red tree voles, bats, marbled murrelets, and northern spotted owls. The specific issue for spotted owls is retention of adequate habitat conditions for dispersal.

The second standard and guideline for riparian species is to ensure that riparian management in Adaptive Management Areas provides species protection equivalent to Riparian Reserves. In most cases, riparian protection in Adaptive Management Areas should be comparable to that prescribed for other federal land allocations. However, in those cases where alternate means are proposed to meet riparian objectives, those alternate means must meet objectives for management of all species. In areas where there are concerns about species as noted

above, species protection takes priority over any objectives that would reduce reserves, and adjustments to Riparian Reserves should take into account all species that were intended to be benefited by this standard and guideline.

## Matrix Management Standards and Guidelines

A variety of provisions for forest management in the matrix will be implemented. These measures build on the standards and guidelines originally presented in the Draft SEIS. The measures include standards and guidelines for coarse woody debris, revised standards and guidelines for green-tree and snag retention, modification of site treatment practices, provisions to protect cave entrances, and measures that provide additional protection of late-successional forests in watersheds where they are currently scarce. These measures are described as follows.

### PROVIDE SPECIFIED AMOUNTS OF COARSE WOODY DEBRIS IN MATRIX MANAGEMENT

A renewable supply of large down logs is critical for maintaining populations of fungi, arthropods, bryophytes and various other organisms that use this habitat structure. Provision of coarse woody debris is also a key standard and guideline for American marten, fisher, two amphibians, and two species of vascular plants. The objective is to provide coarse woody debris well distributed across the landscape in a manner that meets the needs of species and provides for ecological functions. Standards and guidelines should provide for appropriate coarse woody debris quantity, quality (such as species, decay stage and size) and distribution. Models for computing expected numbers and sizes of logs should be developed for groups of plant associations and stand types which can be used as a baseline for managers to develop prescriptions for landscape management. An important factor is to provide the coarse woody debris within a forest patch so that the appropriate microclimate for various organisms that use this substrate is available. Coarse woody debris that is already on the ground needs to be retained and protected from disturbance to the greatest extent possible during logging and other land management activities that might destroy the integrity of the substrate. As the stand regenerates, scattered green trees will provide a future supply of coarse woody debris and will be important in providing for the distribution of this substrate throughout the managed landscape.

### Specific Standards and Guidelines for Coarse Woody Debris

These measures are intended to be applied in matrix forests. The intent of the measures must also be met in Adaptive Management Areas, but specific standards and guidelines are not prescribed for those areas.

- A. Manage to provide a renewable supply of large down logs well distributed across the matrix landscape in a manner that meets the needs of species and provides for ecological functions. Develop models for groups of plant associations and stand types that can be used as a baseline for developing prescriptions.
- B. The following interim guidelines apply in areas of regeneration harvests: for northern California National Forests, use the Draft Forest Plan standards and guidelines for down logs; for western Oregon and Washington north of and including the Willamette National Forest, leave 240 linear feet of logs per acre greater than or equal to 20 inches in diameter. Logs less than 20 feet in length cannot be credited toward this total. In eastern Oregon and Washington, and western Oregon south of the Willamette National Forest and the Eugene BLM District, a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long should be retained. Decay class 1 and 2 logs can be counted towards these totals. Down logs should reflect the species mix of the original stand. In all cases, standards and guidelines from current plans and draft plan preferred alternatives apply if they provide greater amounts. In areas of partial harvest, the same basic guidelines should be applied, but they should be modified to reflect the timing of stand development cycles where partial harvesting is practiced.

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- C. Coarse woody debris already on the ground should be retained and protected to the greatest extent possible from disturbance during treatment (e.g., slash burning and yarding) which might otherwise destroy the integrity of the substrate.
- D. Down logs should be left within forest patches that are retained under green tree retention standards and guidelines in order to provide the microclimate that is appropriate for various organisms that use this substrate.
- E. As with all standards and guidelines, these are meant to provide initial guidance, but further refinement will be required for specific geographic areas. This can be accomplished through planning based on watershed analysis, and the adaptive management process.

### **EMPHASIZE CLUMPED GREEN-TREE AND SNAG RETENTION IN MATRIX MANAGEMENT**

For many species, benefits will be greatest if trees are retained in patches rather than singly. Because very small patches do not provide suitable microclimates for many of these organisms, patches should generally be larger than 1 hectare (about 2.5 acres, unit size permitting).

Although many species would benefit from retention of patches, others may be favored by retention of single trees. Ultimately, the relative proportion of patches versus single trees retained must reflect local knowledge of individual species' needs.

Retained patches should be protected for multiple rotations to provide support for those organisms that require very old forests.

### **Specific Standards and Guidelines for Green-Tree and Snag Retention**

These measures are intended to be applied throughout the matrix forests. Their intent should be met in Adaptive Management Areas, but standards and guidelines are not prescribed for those areas.

- A. For lands administered by the BLM in Oregon, follow standards and guidelines described in Chapter 2 and Appendix B9.
- B. For all other lands, retain at least 15 percent of the area of each cutting unit except within the Oregon Coast Range and Olympic Peninsula Provinces. On the Mt. Baker-Snoqualmie National Forest, this retention guideline does not apply, but site-specific prescriptions should be developed to maintain biological diversity and ecosystem function, including retention of green trees (singly and in patches), snags and down logs. Exceptions are made for the Oregon Coast Range and Olympic Peninsula Provinces because substantial retention is provided by marbled murrelet and riparian protection measures. If, as a result of watershed analysis or any future delisting of the murrelet, protection is reduced significantly, green-tree retention standards and guidelines may be required in these provinces.
- B. Of the total area to be retained, at least 70 percent should be in patches greater than 1 hectare (unit size permitting), with the remainder as single trees or smaller patches dispersed across the cutting unit. To the extent possible, patches should include the largest, oldest live trees, decadent or leaning trees, and hard snags occurring in the unit. Patches should be retained indefinitely.
- C. As a minimum, snags are to be retained within the harvest unit at levels sufficient to support species of cavity-nesting birds at 40 percent of potential population levels based on published guidelines and models. The objective is to meet the 40 percent minimum standard throughout the matrix, with per-acre requirements met on average areas no larger than 40 acres. To the extent possible, snag management within harvest units should occur within the areas of green-tree retention. The needs of bats should also be considered in these standards and guidelines as those needs become better known.

- D. As with all standards and guidelines, these are meant to provide initial guidance, but further refinement will be required for specific geographic areas. This can be accomplished through planning based on watershed analysis, and the adaptive management process which includes significant oversight review.

**PROVIDE ADDITIONAL PROTECTION FOR CAVES, MINES, AND ABANDONED WOODEN BRIDGES AND BUILDINGS THAT ARE USED AS ROOST SITES FOR BATS**

Most bat species occurring in the Pacific Northwest roost and hibernate in crevices in protected sites. Suitable roost sites and hibernacula, however, fall within a narrow range of temperature and moisture conditions. Sites commonly used by bats include caves, mines, snags and decadent trees, wooden bridges, and old buildings. Additional provisions for the retention of large snags and decadent trees are included in the standard and guideline for green-tree patches in the matrix. Caves, mines, and abandoned wooden bridges and buildings, however, are extremely important roost and hibernation sites, and require additional protection to ensure their value as habitat is maintained.

This provision is intended to apply in matrix forests and Adaptive Management Areas. Conduct surveys of crevices in caves, mines, and abandoned wooden bridges and buildings for the presence of roosting bats, including fringed myotis, silver-haired bats, long-eared myotis, long-legged myotis, and pallid bats. For the purposes of this standard and guideline, caves are defined as in the Federal Cave Resources Protection Act of 1988 as "any naturally occurring void, cavity, recess, or system of interconnected passages which occur beneath the surface of the earth or within a cliff or ledge (. . . but not including any. . . man-made excavation) and which is large enough to permit an individual to enter, whether or not the entrance is naturally formed or man-made." Searches should be conducted during the day in the summer (to locate day roosts and maternity colonies), at night during the late summer and fall (to locate night roosts, which are important for reproduction), and during the day in the winter (to locate hibernacula). If bats are found, identify the species using the site and determine for what purpose it is being used by bats. As an interim measure, timber harvest is prohibited within 250 feet of sites containing bats. Management standards and guidelines, which may be included as mitigation measures in project or activity plans, will be developed for the site. These standards and guidelines will be developed following an inventory and mapping of resources. The purpose of the standards and guidelines will be protection of the site from destruction, vandalism, disturbance from road construction or blasting, or any other activity that could change cave or mine temperatures or drainage patterns. The size of the buffer, and types of activities allowed within the buffer, may be modified through the standards developed for the specific site. Retention of abandoned bridges or buildings must be made contingent on safety concerns.

Townsend's big-eared bats are of concern to state wildlife agencies in both Washington and Oregon. These bats are strongly associated with caves, and are extremely sensitive to disturbance, especially from recreational cavers. When Townsend's big-eared bats are found occupying caves or mines on federal land, the appropriate agency should be notified, and management prescriptions for that site should include special consideration for potential impacts on this species.

**MODIFY SITE TREATMENT PRACTICES, PARTICULARLY THE USE OF FIRE AND PESTICIDES, AND MODIFY HARVEST METHODS TO MINIMIZE SOIL AND LITTER DISTURBANCE**

Many species of soil and litter-dwelling organisms, such as fungi and arthropods, are sensitive to soil and litter disturbance. Site treatments should be prescribed that will minimize intensive burning, unless appropriate for certain specific habitats, communities or stand conditions. Prescribed fires should be planned to minimize the consumption of litter and coarse woody debris. Other aspects to this standard and guideline include minimizing soil and litter disturbance that may occur as a result of yarding and operation of heavy equipment, and reducing the intensity and frequency of site treatments. Soil compaction, and removal or disturbance of humus layers and coarse woody debris, may impact populations of fungi and arthropods. These provisions are intended to apply throughout the matrix forests and within the Adaptive Management Areas.



## **PROVIDE FOR RETENTION OF OLD-GROWTH FRAGMENTS IN WATERSHEDS WHERE LITTLE REMAINS**

The distribution of old-growth stands throughout the landscape is an important component of ecosystem diversity, and plays a significant role in providing for biological and structural diversity across the landscape. Isolated remnant old-growth patches are ecologically significant in functioning as refugia for a host of old-growth associated species, particularly those with limited dispersal capabilities that are not able to migrate across large landscapes of younger stands. These include, but are not limited to, many species of fungi, lichens, bryophytes, arthropods, and vascular plants, and will likely include vertebrate species such as small mammals and amphibians, and various bird species. Isolated patches will function as refugia where old-growth associated species are able to persist until conditions become suitable for their dispersal into adjacent stands. Loss of these old-growth stands may result in local extirpation of an array of species. It is prudent to retain what little remains of this age class within landscape areas where it is currently very limited. This will ensure future options for management and enhancement of the diversity within adjacent developing stands.

Landscape areas where little late-successional forest persists should be managed to retain late-successional patches. This standard and guideline will be applied in fifth field watersheds (20 to 200 square miles) which are currently comprised of 15 percent or less late-successional forest. This assessment should include all allocations in the watershed. Within such an area, all remaining late-successional stands should be protected. Protection of these stands could be modified in the future, when other portions of the watershed have recovered to the point where they could replace the ecological roles of these stands.

In fifth field watersheds that contain more than 25 percent nonfederal land, this provision should be treated as a threshold for analysis rather than a standard and guideline. If less than 15 percent of the total landscape in such watersheds consists of late-successional forest, the role of those stands must be recognized. A proposal to modify such stands should only be implemented following a watershed analysis that considers the ecological function of the remaining late-successional forest and its location in the landscape.

In Adaptive Management Areas, less than 15 percent of fifth field watershed in late-successional forest should also be considered as a threshold for analysis rather than a strict standard, and the role of remaining stands of late-successional forests must be fully considered in watershed analysis before they can be modified.

### **Northern Spotted Owl Activity Centers**

This standard and guideline institutes a recommendation that was contained in both the Interagency Scientific Committee (ISC) Conservation Strategy for northern spotted owls and the Final Draft Spotted Owl Recovery Plan (USDI unpub.). The standard and guideline applies to spotted owl activity centers that are not protected by Congressionally Reserved Areas, Late-Successional Reserves, Riparian Reserves, Managed Late-Successional Areas, or Administratively Withdrawn Areas. One hundred acres of the best northern spotted owl habitat will be retained as close to the nest site or owl activity center as possible for all spotted owl activity centers known to occur in the matrix and Adaptive Management Areas as of January 1, 1994. This is intended to preserve an intensively used portion of the breeding season home range. "Activity center" is defined as an area of concentrated activity of either a pair of spotted owls or a territorial single owl. Timber management activities within the 100-acre area should comply with management standards and guidelines for Late-Successional Reserves. Management around this area will be designed to reduce risks of natural disturbance. These areas are to be maintained permanently, subject to normal changes through adaptive management.

## Protect Sites From Grazing

This standard and guideline is designed to benefit mollusks, arthropods, and vascular plants. Known and newly-discovered sites of these species will be protected from grazing by all practicable steps to ensure that the local populations of the species will not be impacted. This standard and guideline may apply throughout all land allocations. Species to be protected through this standard and guideline are:

**Arthropods:** Litter and soil-dwelling species (south range)

**Mollusks:** *Ancotrema voyanum*, *Monadenia fidelis klamathica*, *Monadenia fidelis ochromphalus*, *Pristiloma articum crateris*, *Fluminicola* n. sp. 1, *Fluminicola* n. sp. 11, *Fluminicola* n. sp. 19, *Fluminicola* n. sp. 20, *Fluminicola* n. sp. 3, *Fluminicola seminalis*

**Vascular Plants:** *Pedicularis howellii*

## Manage Recreation Areas to Minimize Disturbance to Species

This standard and guideline will benefit a number of fungi and lichen species whose known locations are predominantly within established recreation sites. This standard and guideline falls within the category of the survey and manage standard and guideline above, and species to be protected through this standard and guideline are among those shown in Table B11-1. This standard and guideline may apply throughout all land allocations. Additional information on the habitat requirements of these species are discussed in Appendix J.

## Other Measures

This category includes additional site-specific standards and guidelines that will be implemented to provide for sites under the survey and manage standard and guideline. Such measures have been identified for some of the mollusk, fungi, and lichen species. This standard and guideline falls within the category of the survey and manage standard and guideline above, and species to be protected through this standard and guideline are among those shown in Table B11-1. It may apply throughout all land allocations. Additional information on the habitat requirements of these species are discussed in Appendix J.

**Table B11-1. Species to be protected through survey and management standards and guidelines. Each of the four survey strategies is described in the text.**

Species	Survey Strategies			
	1	2	3	4
<b>Fungi</b>				
<b>Mycorrhizal Fungi</b>				
<b>Boletes</b>				
<i>Gastroboletus subalpinus</i>	x		x	
<i>Gastroboletus turbinatus</i>			x	
<b>Boletes, low elevation</b>				
<i>Boletus piperatus</i>			x	
<i>Tylopilus pseudoscaber</i>	x		x	
<b>Rare Boletes</b>				
<i>Boletus haematinus</i>	x		x	
<i>Boletus pulcherrimus</i>	x		x	
<i>Gastroboletus imbellus</i>	x		x	
<i>Gastroboletus ruber</i>	x		x	
<b>False Truffles</b>				
<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	
<b>Uncommon False Truffle</b>				
<i>Macowanites chlorinosmus</i>	x		x	
<b>Rare False Truffles</b>				
<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	
<i>Martellia idahoensis</i>	x		x	
<i>Martellia monticola</i>	x		x	

Survey 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.

Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Rare False Truffles (continued)</b>				
<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	
<b>Undescribed Taxa, Rare Truffles &amp; False truffles</b>				
<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>Hydnотrya</i> sp. nov. #Trappe 787, 792	x		x	
<i>Hydnотrya 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	
<b>Rare Truffles</b>				
<i>Balsamia nigra</i>	x		x	
<i>Choiromyces alveolatus</i>	x		x	
<i>Choiromyces venosus</i>	x		x	

Survey 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.

Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Rare Truffles (continued)</b>				
<i>Elaphomyces anthracinus</i>	x		x	
<i>Elaphomyces subviscidus</i>	x		x	
<b>Chanterelles</b>				
<i>Cantharellus cibarius</i>			x	x
<i>Cantharellus subalbidus</i>			x	x
<i>Cantharellus tubaeformis</i>			x	x
<b>Chanterelles - Gomphus</b>				
<i>Gomphus bonarii</i>			x	
<i>Gomphus clavatus</i>			x	
<i>Gomphus floccosus</i>			x	
<i>Gomphus kauffmanii</i>			x	
<b>Rare Chanterelle</b>				
<i>Cantharellus formosus</i>	x		x	
<i>Polyozellus multiplex</i>	x		x	
<b>Uncommon Coral Fungi</b>				
<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	
<b>Rare Coral Fungi</b>				
<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 hilaris</i> var. <i>olympiana</i>	x		x	
<i>Ramaria lorithamnus</i>	x		x	

Survey 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.

Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Rare Coral Fungi (continued)</b>				
<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	
<b>Phaeocollybia</b>				
<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	
<b>Uncommon Gilled Mushrooms</b>				
<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	
<i>Hygrophorus karstenii</i>			x	
<i>Hygrophorus vernalis</i>	x		x	
<i>Russula mustelina</i>			x	

Survey 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.

Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Rare Gilled Mushrooms</b>				
<i>Chroogomphus loculatus</i>	x		x	
<i>Cortinarius canabarpa</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	
<b>Uncommon Ecto-Polypores</b>				
<i>Albatrellus ellisii</i>			x	
<i>Albatrellus flettii</i>			x	
<b>Rare Ecto-Polypores</b>				
<i>Albatrellus avellaneus</i>	x		x	
<i>Albatrellus caeruleoporus</i>	x		x	
<b>Tooth Fungi</b>				
<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	
<b>Rare Zygomycetes</b>				
<i>Endogone acrogena</i>	x		x	
<i>Endogone oregonensis</i>	x		x	
<i>Glomus radiatum</i>	x		x	
<b>Saprobies (Decomposers)</b>				
<b>Uncommon Gilled Mushrooms</b>				
<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	

Survey 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.

Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Uncommon Gilled Mushrooms (continued)</b>				
<i>Mycena quinaultensis</i>	x		x	
<i>Mycena tenax</i>			x	
<i>Mythicomycetes corneipes</i>			x	
<i>Neolentinus kauffmanii</i>	x		x	
<i>Pholiota albivelata</i>	x		x	
<i>Stagnicola perplexa</i>			x	
<b>Rare Gilled Mushrooms</b>				
<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	
<b>Noble Polypore (rare and endangered)</b>				
<i>Oxyporus nobilissimus</i>	x	x	x	
<b>Bondarzewia Polypore</b>				
<i>Bondarzewia montana</i>	x	x	x	
<b>Rare Resupinates and Polypores</b>				
<i>Aleurodiscus farlowii</i>	x		x	
<i>Dichostereum granulosum</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	
<b>Rare Cup Fungi</b>				
<i>Aleuria rhenana</i>				
<i>Bryoglossum gracile</i>				

Survey 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.



Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Rare Cup Fungi (continued)</b>	x		x	
<i>Gelatinodiscus flavidus</i>				
<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>Neourmula 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	
<b>Club Coral Fungi</b>				
<i>Clavariadelphus ligula</i>			x	x
<i>Clavariadelphus pistilaris</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
<b>Jelly Mushroom</b>				
<i>Phlogotitis helvelloides</i>			x	x
<b>Branched Coral Fungi</b>				
<i>Clavulina cinerea</i>			x	x
<i>Clavulina cristata</i>			x	x
<i>Clavulina ornatipes</i>			x	x
<b>Mushroom Lichen</b>				
<i>Phytoconis ericetorum</i>			x	x
<b>Parasitic Fungi</b>				
<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	
<b>Cauliflower Mushroom</b>				
<i>Sparassis crispa</i>			x	

Survey 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.

Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Moss Dwelling Mushrooms</b>				
<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	
<b>Coral Fungi</b>				
<i>Clavicornia avellanea</i>			x	
<b>Lichens</b>				
<b>Rare Forage Lichen</b>				
<i>Bryoria tortuosa</i>	x		x	
<b>Rare Leafy (arboreal) Lichens</b>				
<i>Hypogymnia duplicata</i>	x	x	x	
<i>Tholurna dissimilis</i>	x		x	
<b>Rare Nitrogen-fixing Lichens</b>				
<i>Dendriscocaulon intricatum</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	
<b>Nitrogen-fixing Lichens</b>				
<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
<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

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Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Nitrogen-fixing Lichens (continued)</b>				
<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>Sticta beauvoisii</i>				x
<i>Sticta fuliginosa</i>				x
<i>Sticta limbata</i>				x
<b>Pin Lichens</b>				
<i>Calicium abietinum</i>				x
<i>Calicium adaequatum</i>				x
<i>Calicium adspersum</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>Chaenothecopsis 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
<b>Rare Rock Lichens</b>				
<i>Pilophorus nigricaulis</i>	x		x	
<i>Sticta arctica</i>	x		x	
<b>Riparian Lichens</b>				
<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 teretiunculium</i>				x
<i>Platismatia lacunosa</i>				x
<i>Ramalina thrausta</i>				x
<i>Usnea longissima</i>				x

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Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Aquatic Lichens</b>				
<i>Dermatocarpon luridum</i>	x		x	
<i>Hydrothyria venosa</i>	x		x	
<i>Leptogium rivale</i>	x		x	
<b>Rare Oceanic Influenced Lichens</b>				
<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 sorediatum</i>	x		x	
<i>Hypogymnia oceanica</i>	x		x	
<i>Leioderma sorediatum</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	
<b>Oceanic Influenced Lichens</b>	x		x	
<i>Cetraria californica</i>	x		x	
<i>Heterodermia leucomelos</i>	x		x	
<i>Loxospora</i> sp nov. "corallifera" (Brodo in edit)	x		x	
<i>Pyrrhospora quernea</i>				
<b>Additional Lichen Species</b>				
<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	
<b>Bryophytes</b>				
<i>Antitrichia curtipendula</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</i> var. <i>crumiana</i>	x		x	
<i>Herbertus aduncus</i>	x		x	
<i>Herbertus sakuraii</i>	x		x	

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Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Bryophytes (continued)</b>				
<i>Iwatsuklella leucotricha</i>	x		x	
<i>Kurzia makinoana</i>	x	x		
<i>Marsupella emarginata</i> var. <i>aquatica</i>	x	x		
<i>Orthodontium gracile</i>	x		x	
<i>Plagiochila satol</i>	x		x	
<i>Plagiochila semidecurrens</i>	x		x	
<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	
<b>Amphibians</b>				
Del Norte salamander		x		
Larch Mountain salamander		x		
Shasta salamander	x	x		
Siskiyou Mountains salamander	x	x		
Van Dyke's salamander (Cascades)		x		
<b>Mammals</b>				
Red tree vole ( <i>P. longicaudus</i> )		x		
<b>Mollusks</b>				
<i>Cryptomastix devia</i>	x	x		
<i>Cryptomastix hendersoni</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 troglodytes wintu</i>	x	x		
<i>Oreohelix</i> n. sp.	x	x		
<i>Pristiloma articum crateris</i>	x	x		
<i>Trilobopsis roperi</i>	x	x		
<i>Trilobopsis tehamana</i>	x	x		
<i>Vertigo</i> n. sp.	x	x		

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Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Mollusks (continued)</b>				
<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		
<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		
<b>Vascular Plants</b>	x	x		
<i>Allotropa 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		

Survey 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.

Table B11-1. (continued)

Species	Survey Strategies			
	1	2	3	4
<b>Vascular Plants (continued)</b>				
<i>Coptis trifolia</i>	x	x		
<i>Corydalis aquae-gelidae</i>	x	x		
<i>Cypripedium fasciculatum</i> (Klamath)	x	x		
<i>Cypripedium montanum</i> (west Cascades)	x	x		
<i>Galium kamtschaticum</i>	x	x		
<i>Habenaria orbiculata</i>	x	x		
<i>Pedicularis howellii</i>	x	x		
<i>Pedicularis howellii</i>	x	x		
<i>Scoliopus biglovei</i>	x	x		
<b>Arthropods</b>				
Canopy herbivores (south range)				x
Coarse wood chewers (south range)				x
Litter and soil dwelling species (south range)				x
Understory and forest gap herbivores				x

Survey 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.

# Appendix B

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# Appendix C

## **Letters of Direction**

# Appendix C

## Letters of Direction

This appendix consists of three letters of direction.

The first item is a memorandum dated May 12, 1993, from Secretary of Agriculture Mike Espy and Secretary of the Interior Bruce Babbitt to the Chief of the Forest Service and the Director of the Bureau of Land Management. It directs the Forest Service and Bureau of Land Management to begin preparing a draft supplemental environmental impact statement on the options developed by the Forest Ecosystem Management Assessment Team.


The second item is a statement of mission dated May 7, 1993, from the Forest Conference Executive Committee to the Forest Conference Inter-Agency Working Groups. It includes overall guidance and specific guidance for each working group.


The final item consists of a memorandum dated June 21, 1993, from Dinah Bear, General Counsel with the Executive Office of the President, Council on Environmental Quality; to David Cottingham, Office of Environmental Policy. The memo discusses the Council of Environmental Quality's understanding of the appropriate procedures to be followed in preparation of the Supplemental Environmental Impact Statement to comply with the National Environmental Policy Act (NEPA).

May 12, 1993

**MEMORANDUM FOR CHIEF OF THE FOREST SERVICE  
DIRECTOR OF THE BUREAU OF LAND MANAGEMENT**

**FROM:**

Mike Espy   
Secretary of Agriculture

Bruce Babbitt   
Secretary of the Interior

**SUBJECT:**

**SEIS on Forest Conference Alternatives**

Since the Forest Conference, three inter-agency working groups have been convened to evaluate options for implementing policies discussed at the Forest Conference. The Ecosystem Management Assessment working group and the Labor and the Community Assistance working group will be submitting their reports about June 1.

To better assess the environmental effects of the options prepared by the Ecosystem Management Assessment working group and provide for additional public participation in this process, we are directing the Forest Service and Bureau of Land Management to immediately begin preparing a draft supplemental environmental impact statement (SEIS) on the options being developed by the Ecosystem Management Assessment working group. Among other things, the SEIS will supplement the Forest Service Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests (January 1992).

The Forest Service and Bureau of Land Management will be joint lead agencies on this SEIS, with the National Park Service, Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency and other appropriate agencies as cooperating agencies. The interdisciplinary team will be led by Robert Jacobs of the Forest Service, with members from the Forest Service, Bureau of Land Management, and other agencies as appropriate.

The SEIS will encompass the consideration of (1) amendments to Forest Service Regional Guides and Forest Plans for maintenance of viability of old-growth related species within the range of the northern spotted owl and (2) standards for maintenance of viability of old-growth related species within the range of the northern spotted owl for use in Bureau of Land Management Resource and Management Plans.

The SEIS will take an ecosystem approach to forest management and discuss those issues outlined in the Statement of Mission for the Ecosystem Management Assessment



working group (May 7, 1993) and disclose the environmental, economic and social consequences of the alternatives presented.

The rapid preparation of this SEIS is a high priority for our Departments. The preparation of the SEIS should be coordinated with the Ecosystem Management Assessment working group before its report is complete and should draw upon information previously collected in order to complete the draft SEIS as quickly as possible. The draft SEIS should be ready to release to the public by July 16. This schedule would allow time for the comment period to close by October 18, a final EIS to be issued by November 30, and decision documents to be issued by December 31, 1993.

May 7, 1993

**TO: FOREST CONFERENCE INTER-AGENCY WORKING GROUPS**  
Ecosystem Management Assessment  
Labor and Community Assistance  
Agency Coordination

**FROM: FOREST CONFERENCE EXECUTIVE COMMITTEE**  
Department of Agriculture  
Department of Interior  
Department of Labor  
Department of Commerce  
Environmental Protection Agency  
Office on Environmental Policy  
Office of Science and Technology  
National Economic Council  
Council of Economic Advisors  
Office of Management and Budget

**RE: STATEMENT OF MISSION**

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Together, we are working to fulfill President Clinton's mandate to produce a plan to break the gridlock over federal forest management that has created so much confusion and controversy in the Pacific Northwest and northern California. As well, that mandate means providing for economic diversification and new economic opportunities in the region. As you enter into the critical phase of your work reviewing options and policy, this mission statement should be used to focus and coordinate your efforts. It includes overall guidance and specific guidance for each team.

## **BACKGROUND**

President Clinton posed the fundamental question we face when he opened the Forest Conference in Portland.

"How can we achieve a balanced and comprehensive policy that recognizes the importance of the forests and timber to the economy and jobs in this region, and how can we preserve our precious old-growth forests, which are part of our national heritage and that, once destroyed, can never be replaced?"

And he said, "the most important thing we can do is to admit, all of us to each other, that there are no simple or easy answers. This is not about choosing between jobs and the environment, but about recognizing the importance of both and recognizing that virtually everyone here and everyone in this region cares about both.

The President said five principles should guide our work:

"First, we must never forget the human and the economic dimensions of these problems. Where sound management policies can preserve the health of forest lands, sales should go forward. Where this requirement cannot be met, we need to do our best to offer new economic opportunities for year-round, high-wage, high-skill jobs.

"Second, as we craft a plan, we need to protect the long-term health of our forests, our wildlife, and our waterways. They are, as the last speaker said, a gift from God; and we hold them in trust for future generations.

"Third, our efforts must be, insofar as we are wise enough to know it, scientifically sound, ecologically credible, and legally responsible.

"Fourth, the plan should produce a predictable and sustainable level of timber sales and non-timber resources that will not degrade or destroy the environment.

"Fifth, to achieve these goals, we will do our best, as I said, to make the federal government work together and work for you. We may make mistakes but we will try to end the gridlock within the federal government and we will insist on collaboration not confrontation."

## **ECOSYSTEM MANAGEMENT ASSESSMENT**

Our objectives based on the President's mandate and principles are to identify management alternatives that attain the greatest economic and social contribution from the forests of the region and meet the requirements of the applicable laws and regulations, including the Endangered Species Act, the National Forest Management Act, the Federal Land Policy Management Act, and the National Environmental Policy Act. The Ecosystem Management Assessment working group should explore adaptive management and silvicultural techniques and base its work on the best technical and scientific information currently available.

Your assessment should take an ecosystem approach to forest management and should particularly address maintenance and restoration of biological diversity, particularly that of the late-successional and old growth forest ecosystems; maintenance of long-term site productivity of forest ecosystems; maintenance of sustainable levels of renewable natural resources, including timber, other forest products, and other facets of forest values; and maintenance of rural economies and communities.

Given the biological requirements of each alternative, you should suggest the patterns of protection, investment, and use that will provide the greatest possible economic and social contributions from the region's forests. In particular, we encourage you to suggest innovative ways federal forests can contribute to economic and social well-being.

You should address a range of alternatives in a way that allows us to distinguish the different costs and benefits of various approaches (including marginal cost/benefit assessments), and in doing so, at least the following should be considered:

- timber sales, short and long term;
- production of other commodities;
- effects on public uses and values, including scenic quality, recreation, subsistence, and tourism;
  - effect on environmental and ecological values, including air and water quality, habitat conservation, sustainability, threatened and endangered species, biodiversity and long-term productivity;
  - jobs attributable to timber harvest and timber processing; and, to the extent feasible, jobs attributable to other commodity production, fish habitat protection, and public uses of forests; as well as jobs attributable to investment and restoration associated with each alternative;
  - economic and social effects on local communities, and effects on revenues to counties and the national treasury,
  - economic and social policies associated with the protection and use of forest resources that might aid in the transitions of the region's industries and communities;
  - economic and social benefits from the ecological services you consider;
  - regional, national, and international effects as they relate to timber supply, wood product prices, and other key economic and social variables.

As well, when locating reserves, your assessment also should consider both the benefits to the whole array of forest values and the potential cost to rural communities.

The impact of protection and recovery of threatened and endangered species on non-federal lands within the region of concern should be minimized. However, you should note specific non-federal contributions that are essential to or could significantly help accomplish the conservation and timber supply objectives of your assessment.

In addition, your assessment should include suggestions for adaptive management that would identify high priority inventory, research and monitoring needed to assess success over time, and essential or allowable modifications in approach as new information becomes available. You should also suggest a mechanism for a coordinated inter-agency approach to the needed assessments, monitoring, and research as well as any changes needed in decision-making procedures required to support adaptive management.

You should carefully examine silvicultural management of forest stands -- particularly young stands - especially in the context of adaptive management. The use of silviculture to achieve those ends, or tests of silviculture, should be judged in an ecosystem context and not solely on the basis of single species or several species response.

Your conservation and management assessment should cover those lands managed by the Forest Service, the Bureau of Land Management, and the National Park Service that are within the current range of the northern spotted owl, drawing as you have on personnel from those agencies and assistance from the Fish and Wildlife Service, the National Marine

Fisheries Service and the Environmental Protection Agency. To achieve similar treatment on all federal lands involved here, you should apply the "viability standard" to the BLM lands.

In addressing biological diversity you should not limit your consideration to any one species and, to the extent possible, you should develop alternatives for long-term management that meet the following objectives:

- maintenance and/or restoration of habitat conditions for the northern spotted owl and the marbled murrelet that will provide for viability of each species -- for the owl, well distributed along its current range on federal lands, and for the murrelet so far as nesting habitat is concerned;

- maintenance and/or restoration of habitat conditions to support viable populations, well-distributed across their current ranges, of species known (or reasonably expected) to be associated with old-growth forest conditions;

- maintenance and/or restoration of spawning and rearing habitat on Forest Service, Bureau of Land Management, and National Park Service lands to support recovery and maintenance of viable populations of anadromous fish species and stocks and other fish species and stocks considered "sensitive" or "at risk" by land management agencies, or listed under the Endangered Species Act; and,

- maintenance and/or creation of a connected or interactive old-growth forest ecosystem on the federal lands within the region under consideration.

Your assessment should include alternatives that range from a medium to a very high probability of insuring the viability of species. The analysis should include an assessment of current agency programs based on Forest Service plans (including the final draft recovery plan for the northern spotted owl) for the National Forests and the BLM's revised preferred alternative for its lands.

In your assessment, you should also carefully consider the suggestions for forest management from the recent Forest Conference in Portland. Although we know that it will be difficult to move beyond the possibilities considered in recent analysis, you should apply your most creative abilities to suggest policies that might move us forward on these difficult issues. You also should address short-term timber sale possibilities as well as longer term options.

Finally, your assessment should be subject to peer review by appropriately credentialed reviewers.

## **LABOR AND COMMUNITY ASSISTANCE WORKING GROUP**

Resolving the forest management issues confronting this region must involve addressing related economic and community issues. The forests of the Pacific Northwest and northern California have provided a foundation for the region's economy for the past century. And, while economic growth has diversified a region that was once much more heavily dependent on timber manufacturing, some rural areas depend almost totally on forest industries not just for jobs but for revenues from timber sales. The work of the Labor and Community Assistance Working Group should proceed from the following:

- The economic development and assistance plan should be far-sighted and comprehensive. As noted at the Forest Conference, many species are at risk in old-growth forests. Just as the Ecosystem Management Assessment working group must focus on an ecosystem approach that takes into account the region's vast and varied natural resources, the economic plan must focus on the regional economy and take into account its resources and needs. The plan must be long-term and address not just temporary efforts but economic development and diversification over time.

- Government policy should accommodate properly functioning markets and facilitate the transitions inevitable in the modern global economy. The American economy is more dynamic than ever before. The federal government may be able to play a role in directing the development of the economy but it cannot overcome large-scale market forces. Economy policy here should encourage necessary adjustments and ease inevitable transitions.

- Some region-specific community and worker assistance will be necessary because of the unique circumstance surrounding this issue. However, the economic plan must be consistent with national policies. The Labor and Community Assistance working group should develop a comprehensive plan for economic dislocations whether those are caused by slack demand, productivity growth, technological advances, or structural changes in the economy. This approach would mark a dramatic improvement over the current patchwork of programs, which are both inefficient and inequitable.

- Any assistance plan should be open to all displaced forest industry workers, regardless of the precise cause of their dislocation. Revolutions in technology, improvements in productivity, and the development of new products are changing the nature of forest industries. We should reach out to all forest industries workers who are affected without distinguishing the cause of the impact.

- Policies should be coordinated among federal and state agencies to maximize benefits to affected communities and workers. More than a dozen federally-funded programs currently provide assistance to timber workers and their communities. A coordinated federal response would make the system more accessible and more efficient.

° State and local governments are best situated to direct economic development. Federal policy should not attempt to dictate preferred paths for economic development but instead should build upon the independence and strength of these communities and their residents and provide them with the tools needed for economic revitalization based on their own needs and on potential new opportunities in forest related employment.

#### **AGENCY COORDINATION WORKING GROUP**

Too often in the past, various federal agencies with responsibility for some aspect of forest management in the Pacific Northwest and northern California have acted in isolation or even at cross-purposes. This problem becomes even more critical as we move toward an ecosystem approach to forest management where a number of agencies must be involved in planning and implementing a management strategy. We must improve the working relationships among federal and state agencies in the region and eliminate impediments that block coordinated action. The efforts of this working group are key to our success in this area.

To help identify new means to encourage coordination at all levels, we believe you should examine a range of issues.

- Identify structural and procedural problems that in the past have made coordinated action difficult and suggest solutions or procedures for reaching solutions to those problems.

Identify ways the federal land management agencies can and should work together in the future to achieve coordinated management strategies that take into account the statutory mandates of those agencies.

Identify and suggest ways for dealing with issues concerning agency coordination related to implementing strategies currently being developed by the Ecosystem Management Assessment working group.

Identify ways to improve the process in which the land management agencies are required to consult with the Fish and Wildlife Service and the National Marine Fisheries Service concerning their responsibilities under the Endangered Species Act.

Identify ways to improve coordination between the land management agencies and the Environmental Protection Agency.

And, identify ways to improve working relationships between federal and state agencies in the region and suggest a course of action for involving those state agencies in the implementation of strategies being developed by the Ecosystem Management Assessment working group.

As you develop your recommendations, you should continue to call on personnel from the Forest Service, the Bureau of Land Management, the Fish and Wildlife Service, the National Marine Fisheries Service, the Environmental Protection Agency, and others as appropriate, as well as on advice from the states in the region.

### **CONCLUSION**

We appreciate your efforts and recognize, as President Clinton did, that these are difficult issues with difficult choices. And, we'll remind you of something else the President said at the Forest Conference, talking to the people of the Pacific Northwest and northern California: "We're here to begin a process that will help ensure that you will be able to work together in your communities for the good of your businesses, your jobs, and your natural environment. The process we (have begun) will not be easy. Its outcome cannot possibly make everyone happy. Perhaps it won't make anyone completely happy. But the worst thing we can do is nothing."

##





EXECUTIVE OFFICE OF THE PRESIDENT  
COUNCIL ON ENVIRONMENTAL QUALITY  
WASHINGTON, D.C. 20503

TO: David Cottingham  
Office of Environmental Policy

FROM: Dinah Bear *Dinah Bear*  
General Counsel

DATE: June 21, 1993

RE: Supplemental Environmental Impact Statement for  
Management Standards and Guidelines for Old-Growth  
Related Species within the Range of the Northern  
Spotted Owl

In your discussions with the interagency team which is preparing the above-referenced supplemental environmental impact statement (SEIS), several questions have arisen in regards to the appropriate procedures to be followed under the National Environmental Policy Act (NEPA). This memo sets forth CEQ's understanding of those questions and our views on the matters raised.

First, we understand that the Forest Service and Bureau of Land Management, acting as joint lead agencies pursuant to 40 CFR 1501.5(b), are preparing a supplemental environmental impact statement (SEIS) on the options being developed by the Ecosystem Management Assessment working group. This SEIS is to supplement the Forest Service Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests (January 1992) and the Bureau of Land Management Draft Environmental Impact Statements for Resource Management Plans for the Coos Bay, Eugene, Medford, Roseburg, and Salem districts and the Klamath Falls Resource Area of the Lakeview District in Oregon, and Final Environmental Impact Statements for the Resource Management Plans for the Arcata and Redding Resource Areas of the Ukiah District in California. The SEIS will consider standards for maintenance of viability of old-growth related vertebrate species within the range of the northern spotted owl for use in the Bureau of Land Management Resource and Management Plans and for amendments to Forest Service Regional Guides and Land and Resource Management Plans.

The first question posed regarding this EIS relates to the issue of scoping. The CEQ regulations require supplemental environmental impact statements to be prepared, circulated and filed in the same fashion as a draft and final statement, except that scoping is not necessary. 40 C.F.R. 1502.9(c) (4). Thus, scoping is not required as apart of the process for this SEIS. Of course, this assumes that the Forest Service and the Bureau of Land Management undertook scoping for the original EISs

which are being supplemented. Additionally, the President's Forest Conference of April 2, 1993, served as a forum for discussion of these issues. Following that Conference, the Ecosystem Management Assessment Working Group received and considered a number of letters from interested parties, and administration officials have met with numerous interested parties. These steps, plus the initial scoping, have served to adequately define the scope of the issues, potential effects, and appropriate analyses for this SEIS.

I also understand that the Forest Service and Bureau of Land Management have raised a question over preparation of the "no action" alternative, which is a required part of any EIS. 40CFR 1502.14 (d). In our opinion the "no action" alternative should consist of the "no action" alternative from the Forest Service Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests (January 1992), the "no action" alternatives from the Bureau of Land Management Draft Environmental Impact Statement for Resource Management Plans for the Coos Bay, Eugene, Medford, Rosenberg, and Salem districts and the Klamath Falls Resource Area of the Lakeview District in Oregon and the selected alternatives from the Final Environmental Impact Statements for the Resource Management Plans for the Arcata and Redding Resource Areas of the Ukiah District in California. Because these alternatives have already been published and made available to the public, the SEIS need not reprint all the details of these alternatives. A summary of these alternatives in the SEIS, with reference to the underlying documents, is sufficient to constitute a "no action" alternative for the SEIS. However, the underlying documents (in other words, the original EISs) must be made available to anyone who asks for them.

We understand that comparison of the alternative in the SEIS with this summary "no action" alternative will be difficult, because most of the analysis underlying the various portions of the "no action" alternative were prepared are not fully comparable to the analyses prepared for the alternatives to be included in the SEIS. In addition, implementation of the "no action" alternative on Forest Service and Bureau of Land Management lands will not meet the requirements of the viability regulation. Therefore, a full discussion of the alternative is not necessary, as it does not constitute a reasonable alternative. 40CFR 1502.14(a).

However, to facilitate the decisionmaker's and the public's understanding of the various alternatives, and the ability to comment on them, a point of comparison for the alternatives is necessary. You have indicated that the Ecosystem Management Assessment working group report provides a proper basis for comparison. Option 7 is the most consistent with the current management of Forest Service and Bureau of Land Management lands in the applicable area, and takes direction from the Designated Conservation Areas from the Final Draft of the Northern Spotted

Owl Recovery Plan applied to lands administered by the Forest Service and Bureau of Land Management. The matrix used is the 50-11-40 rule with modifications for the Bureau of Land Management. All other management elements would be subject to the following plans.

- Existing Forest Land and Resource Management Plans for the Pacific Northwest Region of the Forest Service.

- The preferred alternatives of the Draft Forest and Resource Management Plans for the Pacific Southwest Region of the Forest Service.

- The Revised Preferred Alternatives of the Bureau of Land Management Draft District Resource Management Plans/Environmental Impact Statements for Oregon.

You have suggested that the SEIS should compare, to the extent feasible, the "no action" alternative, described above as suitable, with the alternative representing Option 7, and then compare all other alternatives with the alternative representing Option 7. This two-step comparison process will provide a suitable benchmark for the decision-maker and the public to compare the effects of the alternatives. 40 CFR. 1502.14. This proposed use of Option 7 appears to be an appropriate means of comparing alternatives.

I hope this is helpful in addressing your questions regarding the application of NEPA and the CEQ regulations in this matter. We are available to help in the future, should further questions arise.

# Appendix D

## **Related Direction and Activities**

# Appendix D

## Related Direction and Activities

### Introduction

Appendix C of the Forest Service's 1992 Final Environmental Impact Statement on Management for the Northern Spotted Owl (USDA FS 1992), which this document supplements, presents an overview of how other land managers and landowners are managing spotted owl habitat. Appendix E of the FEIS presents other related activities in progress at the national and state level that may affect how the Forest Service and Bureau of Land Management (BLM) manage spotted owl habitat. The activities described in those two appendices are relevant to the alternatives presented in this SEIS because management of habitat for the northern spotted owl is one of the primary objectives of this SEIS, and because management of owl habitat is so closely related to management of habitat for other late-successional and old-growth related species. Therefore, some portions of those two appendices have been updated and rewritten as follows. It is important to note that significant revisions or modifications to existing requirements for nonfederal management of habitat for the northern spotted owl are currently being developed for Washington, Oregon, and California and may alter the management direction discussed in this Appendix.

### Federal

#### Legislation

Several bills were described in the Forest Service's 1992 Final Environmental Impact Statement on Management for the Northern Spotted Owl (USDA FS 1992) that addressed issues related to management of the northern spotted owl. None of these bills, or any other bills affecting management of the northern spotted owl, have been passed subsequent to the 1992 Final Environmental Impact Statement on Management for the Northern Spotted Owl.

#### Recovery Plan for the Northern Spotted Owl - USDI

In December 1992, the U.S. Department of the Interior Northern Spotted Owl Recovery Team completed the Final Draft Recovery Plan for the Northern Spotted Owl (USDI unpub.). Recovery plans, as called for in the Endangered Species Act (ESA), set recovery goals and recommend management actions necessary for the recovery of federally listed species. The Recovery Plan was not signed when the Final SEIS went to press.

A limited distribution of the Final Draft Recovery Plan was made early in 1993, and the standards and guidelines, for federal lands, from that document are included in this SEIS in Appendix B, Recovery Plan Standards and Guidelines. After the ROD for the SEIS is signed, the U.S. Fish and Wildlife Service is expected to review northern spotted owl recovery needs and to prepare an amended recovery plan.

#### Proposal to Issue a Special Section 4(d) Rule of the Endangered Species Act and Section 10(a) of the Endangered Species Act - USDI

## Appendix D

A recent proposal by the U.S. Fish and Wildlife Service (Federal Register, December 29, 1993) to issue a rule pursuant to section 4(d) of the ESA would redefine federal protective measures for the northern spotted owl on nonfederal lands in Washington, Oregon, and California. The U.S. Fish and Wildlife Service is preparing an EIS for the 4(d) rule to disclose the impacts of the redefined protection measures that is scheduled to be released in April or May 1994.

On nonfederal lands in Oregon and Washington, the proposed rule would require retention of all existing nesting, roosting, and foraging habitat within 1,000 feet (70 acres) of an active northern spotted owl activity center in areas proposed for timber harvest. However, the proposal also identifies 10 Special Emphasis Areas, adjacent to areas where federal habitat is inadequate, where 40 percent of a specified home range must be retained. Home ranges vary from around 14,200 acres to 6,700 acres in Washington and from around 4,800 acres to 3,000 acres in Oregon. In California, the proposed rule would recognize the significant conservation benefits to the northern spotted owl of the applicable California laws, and would impose no separate federal restrictions beyond those currently practiced under California law.

On American Indian Reservations, the proposed rule recognizes the conservation contributions of the various American Indian Nations, eliminates federal restrictions, and continues tribal law prohibitions on harm to endangered and threatened species. The U.S. Fish and Wildlife Service EIS for the 4(d) rule will provide additional analysis of the effects of the rule for nonfederal lands.

A nonfederal landowner may apply for authorization to take northern spotted owls incidental to an otherwise lawful activity under an incidental take permit issued by the U.S. Fish and Wildlife Service pursuant to section 10(a) of the ESA. The incidental take permit provides a mechanism by which nonfederal landowners can comply with the ESA. The permit promotes protection of the spotted owl on nonfederal lands while allowing the permittee to proceed with other activities.

An applicant for an incidental take permit must submit a "conservation plan", sometimes called a habitat conservation plan, that specifies, among other things, the impacts that are likely to result from the taking of a spotted owl, measures the applicant will undertake to minimize and mitigate such impacts, and reasons why alternatives that do not involve taking a spotted owl are not being utilized by the applicant. The U.S. Fish and Wildlife Service may issue the permit if it finds that: 1) the taking will be incidental; 2) the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking; 3) the applicant will ensure that adequate funding for the plan will be provided; 4) the taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild; and 5) such other measures that may be necessary or appropriate to meet the purposes of the plan will be undertaken. Issuance of an incidental take permit is a federal action subject to the National Environmental Policy Act.

The 4(d) rule and conservation plans developed for nonfederal lands pursuant to section 10(a) of the ESA may modify or revise the direction and activities for nonfederal lands discussed below in Appendix D.

## National Park Service

The northern spotted owl is known to occur in eight National Parks or Monuments including North Cascades, Mount Rainier, and Olympic National Parks in Washington; Crater Lake National Park and Oregon Caves National Monument in Oregon; and Redwood, Point Reyes, and Muir Woods National Parks in California. Spotted owls may also occupy the Whiskeytown National Recreation Area because spotted owls are known to occur in that region of California. National Parks within the range of the northern spotted owl may contain as much as 570,000 acres of nesting, roosting, and foraging habitat. Estimates are currently being refined as inventories of old-growth forests are completed.

Generally, the management objectives for National Parks are considered compatible with maintaining spotted owl habitat. National Park Service policy states that, "Natural resources will be managed with a concern for fundamental ecological processes as well as for individual species and features. Managers and resource specialists will not attempt solely to preserve individual species (except threatened or endangered species) or individual natural processes; rather, they will try to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and ecological integrity of the plants and animals" (USDI NPS 1988).

The emphasis on maintaining ecological processes, as opposed to particular biological states, may be relevant to managing spotted owl habitat, especially in the large parks. Natural fires are recognized as a force that often drives processes of plant succession and they are therefore to be perpetuated in the parks (USDI NPS 1988). Historically, fires in parks containing spotted owls ranged from frequent, low intensity surface fires to infrequent, stand-replacing crown fires (Henderson et al. 1989). The effects of surface fires on spotted owl habitat are poorly understood; crown fires, however, clearly reduce habitat. The amount of nesting, roosting, and foraging habitat in National Parks can thus be expected to vary over time, to the extent that natural disturbances are allowed to operate. Over long periods of time, maintaining mosaics of different-aged forest communities in parks (which differ in amount of fuel and susceptibility to burning) may be an important means of reducing the probability of catastrophic fires (for example, Romme and Despain 1989).

The National Park Service is currently surveying for spotted owls in Washington, Oregon, and California. Surveys of Crater Lake National Park have been jointly conducted with the Oregon Department of Fish and Wildlife. At least eight pairs of spotted owls were found in Crater Lake National Park. There were 17 pairs of spotted owls and 12 single adults found in surveys conducted on 30,000 acres of the Olympic National Park in 1992 and 1993. Additional owls have been located and banded outside the 30,000 acres surveyed. Complex analysis will be required to determine total spotted owl numbers in the Olympic National Park. California surveys have varied from none in some years to only low intensity surveys in others; no information was compiled in 1992. In 1993, the National Park Service expanded its survey program to one comparable to that of the Forest Service. In the future, the National Park Service will be surveying many more National Parks within the range of the northern spotted owl (Starky, E. pers. comm.).

## **Fort Lewis Military Reservation**

Located south of Tacoma, Washington, the Fort Lewis Military Reservation includes about 52,000 acres of forest, generally between 50 and 70 years old. Current management plans call for multiaged forests on approximately 43,000 acres. Some lands will be left in an unmanaged condition but no estimate of acreage is currently available. The nearest known spotted owl pair is located about 15 miles southeast of the reservation on the Gifford Pinchot National Forest. To date, surveys have not located northern spotted owls on the Fort Lewis Military Reservation (Rohde, J. pers. comm.).

## **American Indian Tribal Lands**

Lands of the Quinault, Makah, Yakama, Confederated Tribes of Warm Springs, Confederated Tribes of Grande Ronde, Siletz, Hoopa, and Round Valley Tribes contain large acreages of forest. Much of this area has been designated for timber production; harvest methods vary from clearcutting to selective harvest. The number of northern spotted owls and amount of nesting, roosting, and foraging habitat is currently being determined through project analysis and Geographic Information System mapping. Specific funding has been allocated for spotted owl habitat management.

In Washington, the Quinault Tribe is consolidating older forest lands in and around the reservation. Habitat classification and spotted owl surveys are currently underway in these areas. Spotted owl surveys have been completed on 90 percent of all suitable habitat within the Quinault Indian Reservation. Three activity centers adjacent to the Olympic National Park have been located. Harvest within these areas will be adjusted to protect activity center cores as long as they remain occupied. Approximately 250,000 acres of the Yakama Indian Reservation are classified as suitable owl habitat. A 60,000-acre block of this suitable habitat is in tribally designated reserve status. The Yakama Tribe has managed all their lands under a selective harvest schedule for the past 40 years. Numerous owl pairs have reproduced in these managed areas. Forty-one activity centers were located during 1989-1992 spotted owl surveys. At a minimum, tribal biologists estimate that a total of 50 nesting sites will be found when surveys of all spotted owl habitat have been completed. The Bureau of Indian Affairs funds the Yakama Tribe to conduct radio-telemetry research on spotted owl use in various forest types and complements these investigations with an active banding program. Many of the small reservations in the Puget Sound area of Washington contain managed forests. Habitat typing to date does not indicate the presence of suitable northern spotted owl habitat, and it is assumed there are no spotted owls in these second-growth stands (Renwald, D. pers. comm.). Northern spotted owls have not been located during surveys on Makah Tribal lands.

In Oregon, lands belonging to three tribes fall within the range of the northern spotted owl. The entire Grand Ronde Indian Reservation has been surveyed and only small amounts of second-growth stands on the eastern part of the reservation are suitable northern spotted owl habitat. One breeding pair and an additional resident owl have been located on the reservation. Northern spotted owls are occupying both younger and older forests averaging no more than 80-years old. About 1,000 acres of these forests are classified as nesting, roosting, and foraging habitat. The Siletz Tribe has numerous scattered parcels of older forest between 80 and 120 years old; however, surveys have found no spotted owls occupying these sites. The Confederated Tribes of Warm Springs in the eastern Cascade Range has 311,000 acres of commercial forest land ranging from seedlings to old-growth stands. There is a significant amount of nesting, roosting, and foraging habitat, located primarily in a mixed-conifer zone on the west edge of the reservation, that supports numerous pairs of spotted owls. Areas within the reservation that have management conditions or harvest restrictions total 96,277 acres. Spotted owl surveys have identified 36 activity centers on the reservation. Intensive habitat inventory and a spotted owl banding program have been underway since 1991 to determine the impacts of both timber harvest and silvicultural practices on spotted owl habitat development. Northern spotted owls have not been located during surveys on Siletz Tribal lands.

In California, a significant portion of the 88,000-acre Hoopa Valley Indian Reservation may provide suitable owl habitat. Almost 32,000 acres of the reservation is designated as reserves, cultural sites, stream zones, or wild and scenic river viewshed where timber harvest is limited to partial cutting. Surveys for the northern spotted owl have located 44 activity centers within the reservation. There is likely only a limited amount of suitable northern spotted owl habitat on the Round Valley Indian Reservation. Spotted owl surveys conducted on the reservation during the 1991 and 1992 field seasons located two spotted owl activity centers (Lathrop, K. pers. comm.).

## Washington Current Situation

The State of Washington has a timber relief package for workers and communities affected by declines in harvest levels on federal lands. The package provides training, including self-employment training, and conducts worker employment and career orientation programs.



## Washington Department of Wildlife

In 1992 and 1993, surveys located a nesting pair of spotted owls and a single resident owl in the Colockum Wildlife Area, an area managed by the Washington Department of Wildlife.

## Washington State Parks

Washington State Parks manage several widely scattered, forested parcels within the range of the northern spotted owl. No standing timber over 10 inches diameter at breast height is harvested unless it conflicts with use of roads, trails, or campground facilities. Of particular importance to spotted owl habitat are Beacon Rock State Park (4,500 acres), located along the Columbia River near Stevenson; Lake Easton (200 acres) and Olallie (540 acres) State Parks located along Interstate 90 in the central Cascade Range; Federation Forest State Park (600 acres of old-growth forest) located along the White River near Enumclaw; and Rockport State Park (600 acres of old-growth forest) located along the Skagit River in the north Cascade Range. A 1992 survey in Federation Forest State Park located a single spotted owl.

Other state parks that may be used for nesting, roosting, or foraging habitat throughout the Cascade Range include the Skykomish Scenic River Designation Area (1,300 acres); Mount Pilchuck State Park (1,900 acres); Wallace Falls State Park (1,400 acres); Packwood State Park (200 acres); and Lake Wenatchee State Park (475 acres). These state parks may provide important links among spotted owl habitat, as well as travel corridors for spotted owls.

## Washington State Department of Natural Resources

Lands administered by the Washington State Department of Natural Resources provide substantial habitat for northern spotted owls. In the Olympic Peninsula, surveys located resident activity centers for 28 spotted owl pairs and 5 single (status unknown) spotted owls. Surveys east of the Cascade Range located resident activity centers for 14 spotted owl pairs and 3 single (status unknown) spotted owls. Surveys southwest and west of the Cascade Range located 27 resident activity centers for spotted owl pairs and 11 single (status unknown) spotted owls.

## Private Lands

A total of 66 spotted owl activity centers and 20 single (status unknown) spotted owls were surveyed on private lands in Washington. Two activity centers and four single (status unknown) spotted owls were located on the Olympic Peninsula. In southwest Washington, west of the Cascade Range, 28 activity centers and 11 single (status unknown) spotted owls were located. Surveys east of the Cascade Range located 36 resident activity centers and 5 single (status unknown) spotted owls. A substantial portion of these sites were located in 1991 and 1992 when intensive surveys were initiated on many private lands. An additional number of spotted owl activity centers are located within 2 miles of private land in Washington, and spotted owls in these centers likely use remaining older stands that might occur on these lands.

## Washington Management Status

The northern spotted owl is listed as an endangered species by the Washington Department of Wildlife. On June 26, 1992, the Forest Practices Board adopted changes to the forest practices rules via the Washington Department of Natural Resources policy statement memo, which supersedes the previous Owl Memo No. 3 of March 5, 1991. The modifications to the Washington Administrative Code on Class IV

Critical Wildlife Habitats (state) and Critical Habitat (federal) of threatened and endangered species require environmental review for timber harvest, road construction, and pesticide use within 500 acres of a known spotted owl activity center. These proposed actions, now classified as "Special Forest Practices", would require a site-specific plan and consultation with various agencies, particularly the Washington Department of Wildlife.

Specifically, the regulations state, "This rule is intended to be interim and shall be changed as necessary upon completion of the Northern spotted owl recovery plan, rule making under the Federal Endangered Species Act, or other federal action, or other state actions," (WDNR 1992).

## **City of Seattle**

The Seattle Water Department currently manages about 68,000 acres of forest land, including approximately 3,000 acres of old-growth forest in the Cedar River Watershed near North Bend, Washington. Current management provides for the establishment of a permanent reserve approximately 73,000 acres in size. The reserve will consist of old-growth forest, second-growth forest, and nonforested lands.

In addition, the Cedar River Watershed Land Exchange Act of 1992 directs the Forest Service to exchange with the city all remaining federal land in the watershed (approximately 17,000 acres including part of a Habitat Conservation Area). The exchange is expected to occur within 2 to 7 years. Covenants on the exchange prohibit the city from harvesting timber within the Habitat Conservation Area, or late-successional or old-growth forest in the watershed. The federal land in the Habitat Conservation Area and all federal late-successional and old-growth forest will be added to the reserve.

Three single spotted owls and one pair have been located on lands in multiple ownership within the watershed managed by the Mt. Baker-Snoqualmie National Forest and the City of Seattle. The pair successfully reproduced during 1990 within the Habitat Conservation Area.

## **Oregon Current Situation**

Efforts have increased to assist individuals and communities who are affected by changes resulting from declines in harvest levels. Programs and services include extended unemployment benefits and supplemental benefits, skill assessment and retraining, and a loan fund for beginning entrepreneurial ventures. Community assistance includes loan programs to help businesses in timber-dependent communities and loans and grants for cities and counties to help existing and new businesses.

## **Oregon Department of Fish and Wildlife**

Oregon Department of Fish and Wildlife currently maintains a depository for information on the spotted owl. Similar to Washington and California, Oregon's spotted owl data base is collected statewide and is continually updated. The agency uses this information to track population gains and losses over time, assess management options, and assist them in their decision-making process.

## **Oregon State Board of Forestry and State Land Board**

The Oregon Department of Forestry manages 786,000 acres of forest lands in Oregon: 654,000 acres owned by the Oregon State Board of Forestry and 132,000 acres owned by the State Land Board. These lands support 24 pairs of spotted owls. The State Land Board manages the South Slough Sanctuary near Coos Bay, which includes a 3,800-acre block of upland forest. A habitat conservation plan is currently being

developed for the Elliot State Forest. This conservation plan would allow for the long term forest management and spotted owl protection in approximately 93,000 acres of forest in the Oregon Coastal Range (McCallister, D. pers. comm.).

## **Oregon State Parks**

Currently, three pairs of spotted owls have been located in Silver Creek Falls State Park and one pair in the Van Duzer Forest corridor. Spotted owls have been sighted during surveys for Christmas birds near Cape Meares State Park but none were found during the 1991 summer surveys. Additional surveys are planned in selected state parks in 1993.

Although habitat for spotted owls is expected to increase on lands managed by Oregon State Parks in future years, few parks are expected to have enough nesting, roosting, and foraging habitat to support breeding pairs. Because of the wide distribution of park lands, some parks may support dispersing spotted owls or provide foraging habitat for spotted owls nesting on adjacent federal lands.

## **Private Lands**

Systematic surveys for spotted owls have not been done on all private lands, although some extensive surveys have occurred in association with federal and state land surveys and research. Where lands administered by the Bureau of Land Management occur in a checkerboard pattern (intermingled ownerships), limited surveys have been conducted on private lands. In demographic study areas, such as that on the Roseburg District of the BLM, nearly all private land has been surveyed. About 128 pairs of spotted owls have been located on private lands statewide (USDI unpub.).

## **Oregon Management Status**

The spotted owl is listed as a threatened species in Oregon by the Oregon Fish and Wildlife Commission. Under Oregon's regulations, this listing requires protection and conservation of the species and its habitat on state lands only; not private lands. All state agencies must consult with the Oregon Department of Fish and Wildlife when a project or action may affect a listed species. Forest management operations on state and private lands are governed by rules under the Oregon Forest Practices Act. The Oregon Forest Practices Act was amended in 1987 and requires that the Board of Forestry adopt rules to protect state listed species or nest sites of sensitive birds. Interim rules have been adopted that require approval of a written plan by the State Forester when any forest operation is proposed within 300 feet of a nesting or roosting site of a listed species. Seventy acres of suitable habitat must be retained around a known spotted owl nest site or activity center.

## **California Current Situation**

Under direction from the Board of Forestry, the state is proceeding with the development of a Habitat Conservation Plan which will cover the entire range of the northern spotted owl in California on state and private lands. The draft plan, presented to the board in the spring of 1993, is still under review.

## **California Department of Forestry and Fire Protection**

Of the state forests within the range of the northern spotted owl, spotted owls are known to occupy seven nest sites in the Jackson State Forest while none have been reported in the Boggs Mountain or Ellen Pickett

State Forests. Surveys in 1992 located seven pairs and two single spotted owls at 14 sites in the Jackson State Forest. No spotted owl surveys have been done on the Ellen Pickett State Forest. The dry, inland pine forest type on the Boggs Mountain State Forest is not known to regularly support spotted owls.

Both the Jackson and Boggs Mountain State Forests have active timber sale programs and are managed with the intent of providing a sustained yield of timber. At the Jackson State Forest, both clearcutting and selective cutting are used. Current quantities of forest in various age classes should remain relatively stable or show an increase in older, second-growth forest.

## **California Lands Commission**

The California State Lands Commission administers school lands in Del Norte, Humboldt, Mendocino, Lake, Sonoma, Siskiyou, Tehama, and Trinity Counties, all within the range of the northern spotted owl.

Through land exchanges, the commission is currently in the process of consolidating its school land holdings (township sections 16 and 36, or land selected in lieu thereof) located within lands managed by the Forest Service. When this process is completed, long-term forest management plans will be developed by the California Land Commission. The larger forest management units will include 15,000 acres in Mendocino County and 2,000 acres in Butte County. These parcels range in size from 40 to 3,600 acres. The parcels in the other counties range in size from 1 to 640 acres.

The data collected for the preparation of the commission's forest management plans will include an inventory for the northern and California spotted owls. The northern spotted owl is known to occupy Oak-Bay (*Quercus* sp.) hardwood forests types in Lake, Sonoma, Napa, and lower Mendocino Counties.

Foresters from the State Lands Commission will continue to work with California Department of Fish and Game environmental specialists to maintain the integrity of, and perpetuate, spotted owl habitat within the forested school lands within the commission's jurisdiction.

## **Private Lands**

A segment of the timber industry in California has conducted major surveys and inventory efforts in the last 3 years. Private lands contain 630 known owl sites, 525 of which had known pairs (Gould 1993).

In 1991, the U.S. Fish and Wildlife Service approved northern spotted owl resource plans developed by Sierra Pacific Industries, Inc. This plan, along with the Fish and Wildlife Service's conditions of concurrence, proposed a number of timber management practices to reduce the "likelihood of take situations", and has been reapproved.

In September 1992, the Fish and Wildlife Service approved northern spotted owl resource plans submitted by the Simpson Timber Company (Blue Lake, California). Simpson timber management practices include setting aside special management areas and calls for changes in cutting areas. Similarly, in November 1992, the Fish and Wildlife Service approved a spotted owl habitat management plan developed by the Pacific Lumber Company. The Pacific Lumber Company (Scotia, California) Spotted Owl Management Plan was prepared as a management guide to insure no "take" situations (CDFFP 1993)

## **The Nature Conservancy**

The Nature Conservancy owns two parcels of land with nesting, roosting, and foraging habitat within the range of the northern spotted owl in California. The Northern California Coast Range Preserve in northern

Mendocino County contains about 6,500 acres of old-growth, Douglas-fir forest in an 8,000-acre tract managed in about equal parts by the Nature Conservancy and Bureau of Land Management. The second area, the McCloud River Preserve in north/central Shasta County, contains 2,300 acres of forests with about 1,600 acres in old-growth, Douglas-fir and mixed-conifer stands which are considered nesting, roosting, and foraging habitat. Habitat in both areas is fairly contiguous along major watercourses.

Management direction for both areas is intended to preserve their natural qualities, including the continued maintenance of old-growth, Douglas-fir forests. The Northern California Coast Range Preserve is managed by the University of California as a part of their Natural Reserve System and is part of a management agreement with the Bureau of Land Management. According to BLM's Resource Management Plan for the Arcata Planning Area, the agency will continue to manage this area as an Area of Critical Environmental Concern.

## **Audubon Canyon Ranch**

The Audubon Canyon Ranch, located in coastal Marin County, is managed for native plants and animals. At least one pair of spotted owls utilize the ranch's 1000-acre tract of second-growth redwood forest (Schwartz, S. pers. comm.).

## **California Management Status**

Since the U.S. Fish and Wildlife Service listed the northern spotted owl as a threatened species, the State of California has been reviewing timber harvest proposals which potentially affect northern spotted owl habitat on state and private lands under state regulations designed to meet Fish and Wildlife Service guidelines to prevent take (USDI FWS 1990). For any proposed project, the landowner must submit for approval a Timber Harvesting Plan.

Each Timber Harvesting Plan is prepared by state licensed foresters and reviewed and approved by state biologists following procedures approved by the Fish and Wildlife Service. In addition to Timber Harvesting Plans, a larger habitat protection plan, the Spotted Owl Resource Plan, which uses site-specific information to develop protection measures, allows harvest without "taking" spotted owls or diminishing habitat capability. The Spotted Owl Resource Plan necessarily involves more than one Timber Harvesting Plan area.

The management strategy, taken from the California Forest Practice Rules (Title 14 CCR section 919.9) for known nest sites or activity centers states, "Where a nest site or activity center has been located within the Timber Harvesting Plan boundary or within 1.3 miles of that boundary, a Registered Professional Forester shall determine and document within the Timber Harvesting Plan that the habitat described in [California Forest Practice Rules] will be retained after the proposed operations are completed."

## **British Columbia, Canada**

The spotted owl is designated as endangered by the Committee on the Status of Endangered Wildlife in Canada. This means that spotted owls are believed to be threatened with imminent extirpation throughout all or a significant portion of their range in Canada.

Based on 1985-1992 field surveys, the entire Canadian population of northern spotted owls, estimated to be less than 100 pairs, occurs in the southwest mainland of British Columbia. Two of 43 forest districts are affected. Twenty-seven spotted owl activity sites (areas known to be inhabited regularly by spotted owls)

#### *Appendix D*

have been recorded. Four are within existing parks and six are on lands managed by the Greater Vancouver Water District. The remaining 17 activity centers are within the Fraser Timber Supply Area and the So0 Timber Supply Area, and of these, 8 fall within Protected Areas Strategy study areas.

In 1990, a national Spotted Owl Recovery Team was appointed to develop a recovery plan. The Recovery Team has finalized six recovery options for spotted owls in British Columbia that range from minimum to maximum protection. Biological assessment teams will review and rate recovery options. After completion of a socio-economic analysis and review of the options by community advisory groups the Canadian Cabinet will select an option. A national spotted owl recovery plan will be prepared and submitted to the Committee for the Recovery of Nationally Endangered Wildlife once the Cabinet has selected an option. Until the Cabinet selects the preferred recovery option, government officials are working closely with forest industry representatives to maintain all conservation options (Blackburn 1993).

## Appendix D

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# Appendix E

## **Implementation Structure**

# Appendix E

## Implementation Structure

This appendix is comprised of three parts.

Part one of this appendix consists of a discussion of Adaptive Management. It outlines the general concepts of adaptive management and how it will be used in implementing the selected alternative.

Part two of this appendix consists of the Memorandum of Understanding for Forest Ecosystem Management. This document establishes a framework for cooperative planning, improved decision making, and coordinated implementation of the forest ecosystem management component of the President's Forest Plan for a Sustainable Economy and a Sustainable Environment.

Part three consists of the Report of the Agency Coordination Working Group which was prepared shortly after completion of the Forest Ecosystem Management Assessment Team's report Forest Ecosystem Management: An Ecological, Economic, and Social Assessment.

The report addressed coordination among agencies in developing an ecosystem management approach to managing late-successional and old-growth forests within the range of the northern spotted owl. While it was printed in its entirety in the Draft SEIS, it is an uncirculated appendix in this Final SEIS and available upon request. To receive a copy of the Report of the Agency Coordination Working Group, send a written request to:

Agency Coordination Report Request  
Interagency SEIS Team  
P.O. Box 3623  
Portland, Oregon 97208-3623

## Adaptive Management

This discussion outlines the general concepts of the adaptive management process. An understanding of what adaptive management means, and does not mean, is important because the concept is incorporated into all alternatives and applies to all land allocations. The concept of adaptive management is straightforward and simple: new information is identified, evaluated, and a determination is made whether to adjust the strategy or goals. Adaptive management is a process of action-based planning, monitoring, researching, evaluating, and adjusting with the objective of improving the implementation and achieving the goals of the selected alternative.

While the concept of adaptive management is straightforward, applying it to complex management strategies requires a more in-depth explanation. What new information would compel an adjustment management strategy? Who decides when and how to make adjustments? What are the definitions and thresholds of acceptable results?

The concept of adaptive management acknowledges the need to manage resources under circumstances that contain varying degrees of uncertainty, and the need to adjust to new information. Different management strategies, resources, and geographic locations have degrees of confidence that vary from

very high to very low. Although there are acknowledged gaps in information, there is enough reliable information, field experience, and research data to proceed with implementation of the alternatives. Although formal experimentation and research is an important part of the adaptive management process, the alternatives do not constitute widespread experiments on large areas of public lands and resources.

Adaptive management is a process that can be associated with any particular management strategy. The process can be applied successfully to management with differing or changing goals (K. Franklin pers. comm.). Adaptive management is designed to improve implementation and increase the likelihood of achieving the goals and objectives of the selected alternative.

Essential requirements for adaptive management include:

- Clear goals
- Clear standards and guidelines
- A process for changing standards and guidelines or goals
- Monitoring and/or research aimed at adaptive management questions

Figure E-1, the model which was displayed in the FEMAT Report, identifies the various steps, activities, and outline of a procedure for the adaptive management process. This diagram conveys the general concept, and is valuable as a starting point, for understanding adaptive management. A full and detailed explanation of the model, which is beyond the scope of this discussion, would require that each step be further broken down and defined.

The personnel, organizations, and members of the public who are involved at different steps of the adaptive management process will vary with the issue being considered. Issues may be very local; the organization and personnel involved may constitute a Ranger District or BLM Resource Area, or work group within them. Issues may also have Forest or BLM District, province, or regional scope involving personnel and organizations from many levels, units, and/or agencies. Some issues, such as a technical engineering concern may involve very few professional disciplines, while others such as an ecosystem concern may involve a broad interdisciplinary approach. New information that could be the basis for changes through the adaptive management process may come from many different sources.

These concepts and model provide the means to answer questions about the what, who, and how of adaptive management.

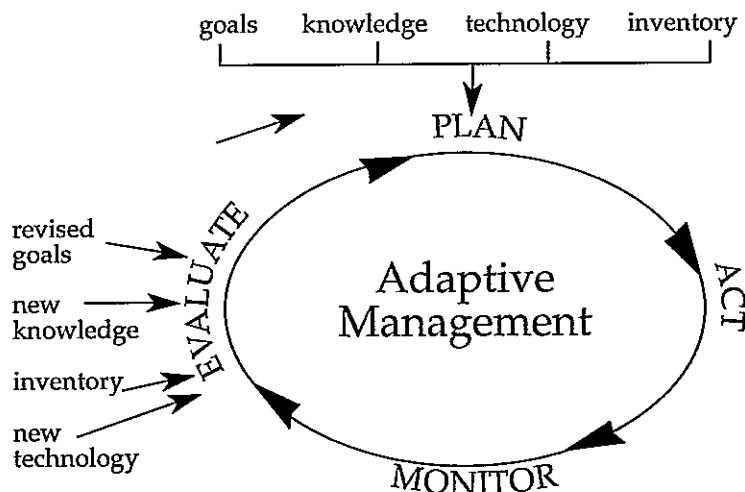
What new information would compel an adjustment of strategy? New information may come from monitoring, research, statutory or regulatory changes, organizational or process assessments, or any number of additional sources. During the evaluation process, personnel will analyze the information to determine the nature, scope, and importance of the new information.

Who decides when to adjust the strategy or goals? The answer will depend on the character and scope of the issue. While public interest and participation will differ with the issue being considered, the authority to manage the public lands and resources remains by law with the land management agencies. On a local issue of limited scope, the decision maker may be the local manager. Broader issues and/or issues of regional scope may involve the Regional Forester, State Director, Regional Interagency Executive Committee, or Interagency Steering Committee.

How are adjustments made to strategies or goals? Any changes in federal land management decisions, whether arising from adaptive management or any other process, will be subject to existing regulatory and statutory requirements such as the National Environmental Policy Act (NEPA). Most adjustments will be within the realm of administrative change, while others may need to meet formal NEPA requirements. A few adjustments may be beyond the scope of agency authority and would require statutory changes.

The adaptive management process can be used for large-scale, highly-complex problems such as ecosystem management, localized technical problems, and organizational problems. Fundamentally, adaptive management is the application of the scientific principle of feedback and adjustment, of identifying and evaluating new information, and adjusting to improve implementation and to achieve the goals and the objectives of the selected alternative.

**Figure E-1.** The adaptive management process as represented in the Forest Ecosystem Management Assessment Team Report (Appendix A)



## Appendix E Reference

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# **MEMORANDUM OF UNDERSTANDING**

## **FOR FOREST ECOSYSTEM MANAGEMENT**

### **I. PARTIES**

This is an understanding among five parties:

The Director of the White House Office on Environmental Policy  
The Secretary of the Interior  
The Secretary of Agriculture  
The Administrator of the Environmental Protection Agency  
The Under Secretary of Commerce for Oceans and Atmosphere

### **II. BACKGROUND**

The President has proposed a comprehensive plan to alleviate the impasse over management of federal forest lands in the Pacific Northwest within the range of the northern spotted owl. The plan fulfills the President's request for "a balanced and comprehensive strategy for the conservation and management of forest ecosystems, while maximizing economic and social benefits from the forests." By taking an innovative approach based on ecosystem and watershed management, the plan transcends traditional administrative boundaries. Successful implementation will require unprecedented interagency cooperation, coordination, and collaboration, both in the long-term and in the short-term.

The report of the Agency Coordination team established by the President following the April 2, 1993 Forest Conference presents a mechanism to achieve better coordination and cooperation among the federal agencies that are involved in forest management issues. It concluded that "bold changes are required" in how agencies relate to one another and to the states, tribes, private landowners, and communities and people in the region.

### **III. PURPOSE**

The purpose of this Memorandum of Understanding is to establish a framework for cooperative planning, improved decision making, and coordinated implementation of the forest ecosystem management component of the President's *Forest Plan for a Sustainable Economy and a Sustainable Environment* which is designed to resolve northwest forest issues within the range of the northern spotted owl.

Signatories to this Memorandum of Understanding agree to:

- develop a cohesive vision and shared sense of mission for the management of federal forest lands which balances multiple objectives;
- improve their ability to adapt to change, such as new scientific understanding or changing societal values, in a cohesive manner;
- cultivate greater trust, coordination, and cooperation among federal agencies, within individual agencies, and between federal agencies and non-federal interests;
- address inconsistencies among statutory mandates;
- improve integrated application of agency budgets to maximize efficient use of funds for overlapping or related efforts;
- improve the sharing of information and the pooling of agencies' technology and expertise;
- coordinate ecosystem management activities in concert with federal, state and local programs for economic, labor, and community assistance.

#### **IV. STRUCTURE**

The following interagency groups are established to develop, monitor, and oversee the implementation of the comprehensive forest management strategy for federal forests within the range of the northern spotted owl. They will support the development and implementation of land and resource management plans. This agreement does not substitute for or alter the line authority of individual agencies.

- A. Interagency Steering Committee: The Interagency Steering Committee will establish overall policies governing the prompt, coordinated and effective implementation of the President's forest management plan by all relevant federal agencies and address and resolve issues referred to it by the Regional Executive Committee, described below. The Committee will be located in Washington, D.C. The signatories will appoint representatives to this Committee which will be chaired by the Director of the White House Office on Environmental Policy or her/his designee. A White House appointed representative of the ISC will serve as interagency coordinator to provide general oversight and guidance of regional activities.

- B. Regional Interagency Executive Committee (RIEC): This group will consist of regional representatives of the agencies signatory to this M.O.U. The chairmanship of the RIEC will alternate between the Regional Forester and State Director of the Bureau of Land Management. In appropriate situations this core group will consult with other federal and state agencies and tribes. The Regional Interagency Executive Committee will serve as the senior regional entity to assure the prompt, coordinated and successful implementation of the President's forest management plan at the regional level. It will serve as the principal conduit for communications between the Interagency Steering Committee and the region. It will be responsible for implementing the directives of the Interagency Steering Committee, reporting regularly on implementation progress, and referring issues relating to the policies or procedures for implementing the plan to the Interagency Steering Committee.

The RIEC will appoint an interim interagency implementation team to oversee and initiate actions during the interim period moving toward to full implementation of the new forest management strategy.

The Regional Interagency Executive Committee will work together with the Multi-Agency Command group (MAC) of the Northwest Economic Adjustment Initiative to develop criteria and priorities for restoration projects or other ecosystem investment opportunities.

The Regional Interagency Executive Committee will be accountable to the Interagency Steering Committee for establishment and oversight of the Regional Ecosystem Office, Research and Monitoring Committee and Provincial Teams. The Regional Interagency Executive Committee will also make recommendations for minimizing planning redundancies.

1. Regional Ecosystem Office: This office will provide a focal point for scientific and technical expertise in support of implementation of the forest management plan. It will also be responsible for evaluation of major modifications arising from the adaptive management process and will coordinate the formulation and implementation of data standards. This office will report to the Regional Interagency Executive Committee and will be responsible for development, evaluation, and resolution of consistency and implementation issues with respect to specific topics including, but not limited to, the following:

- Geographic Information Systems
- Prototype watershed analyses
- Restoration and reforestation guidelines
- Support of agency efforts to meet obligations of Endangered Species Act (e.g. Section 7 consultations, preparation of recovery plans)



- Adaptive management guidelines
- Monitoring
- Research
- Refining definition of reserve boundaries

Agencies will detail staff to the Regional Ecosystem Office as appropriate.

2. Research and Monitoring Committee: This committee, composed of research scientists and managers from a variety of disciplines will provide advice to the Regional Interagency Executive Committee on implementation of the forest plan including adaptive management areas and watershed assessments. The Research and Monitoring Committee will review and evaluate ongoing research, develop a research plan to address critical natural resource commodity and non-commodity questions, and address biological, social, economic, and adaptive management research questions. It will also develop scientifically credible, cost-efficient monitoring plans. The Research and Monitoring Committee will report to the Regional Interagency Executive Committee.
3. Provincial Teams: These teams will consist of representatives of federal agencies, states, tribes, and others. The Interagency Steering Committee and the Regional Interagency Executive Committee will determine the appropriate role for these teams at the level of physiographic provinces, adaptive management areas or particular watersheds.

## **V. TERMS**

The term of this agreement is five years from the date of execution, after which time the parties may extend the agreement.

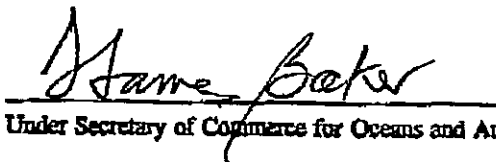
AGREED:

  
Director, White House Office on Environmental Policy

  
Secretary of the Interior

  
Secretary of Agriculture

  
Administrator, Environmental Protection Agency

  
Under Secretary of Commerce for Oceans and Atmosphere

# Appendix F

## **Response to Public Comments**

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# Appendix F

## Response to Public Comment

### INTRODUCTION

The public comment period for the *Draft 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* (Draft SEIS) began July 30, 1993, and closed October 28, 1993. Agencies, officials and the public were invited to comment on the Draft SEIS. Public hearings were held in Olympia, Washington; Salem, Oregon; and Redding, California.

During the 90-day public comment period, approximately 102,000 written comments were received. More than 7,600 untimely (postmarked after October 28, 1993) comments were received and reviewed. These came from students, various organizations and groups, and individuals, and geographically represented rural areas, small towns and large cities. There were many personal, emotional letters from residents of the Pacific Northwest, vacationers to the area, or people who have relatives in, or other ties to, the vicinity.

A total of 359 individuals gave testimony or provided written comments at the three public hearings: 154 in Olympia, 89 in Salem, and 109 in Redding.

Of the total comments received, 90 percent were either form or modified form letters, and the other 10 percent were letters written by individuals.

While the majority came from just a few states, comments were received from every state in the U.S., 4 Canadian Provinces and 34 foreign countries. There were 162 comments received from foreign countries. The three states in the northern spotted owl region (California, Oregon and Washington) had the highest response totals.

### ORGANIZATION OF APPENDIX F

This appendix contains the responses to public comments. After analyzing the substantive comments described above, the Interagency SEIS Team grouped related topics to avoid cumbersome text duplication, then responded to the concerns expressed in the comments. The comments and responses are intended to be only explanatory in nature. If there are any inadvertent contradictions between Appendix F and the text of the Final SEIS, the Final SEIS direction prevails.

The Environmental Protection Agency has a legal obligation under Section 309 of the Clean Air Act to review and comment on environmental impact statements. Their letter reviewing the Draft SEIS appears following the comments and responses. In addition to the letter from the EPA, the SEIS Team received



about 90 comments from federal agencies, state and local governments, American Indian tribes, and elected officials. Copies of these letters are available to the public on request. To receive a copy of the comments from agencies, governments, tribes and officials, send a request in writing to:

Agency Comments Request  
Interagency SEIS Team  
P. O. Box 3623  
Portland, OR 97208-3623

## Ecosystem

The following comments and responses address ecosystem management, terrestrial restoration, management of Late-Successional Reserves, old-growth forests and land allocations, ecosystem assessment, connectivity, presettlement conditions, and physiographic provinces.

### ECOSYSTEM MANAGEMENT

- **Comment:** The SEIS should not assume that the reserve system would be stable. In actuality, the forest ecosystems are dynamic. Ecosystem management requires recognition of the dynamic nature of ecosystems and the maintenance of ecosystem processes at a variety of spatial scales.

**Response:** The SEIS does not assume that the forest ecosystem would remain stable. The development of late-successional characteristics in young stands requires change. Standards and guidelines have been designed to enhance the development of late-successional characteristics. Appendix B2, Ecological Principles for Management of Late-Successional Forests, describes some of the changes that are expected. Additionally, the Chapter 3&4 section, Results of Assessing the Maintenance of a Functional and Interconnected, Late-Successional Forest Ecosystem, discusses the role of ecosystem processes and functions, including disturbance.

- **Comment:** Explain why stands that regenerate naturally following stand-replacing disturbances are more likely to achieve late-successional stages than stands established by planting.

**Response:** Stands that originate following disturbance by fire often have residual trees from the previous stand. These residual trees provide seed sources and are a recruitment pool for snags for the subsequent stand. Until recently, only a limited number of residual trees and relatively little coarse woody debris were left after timber harvest. Large quantities of coarse woody debris, such as snags or down logs, are typically left following natural disturbances. Because natural regeneration of the new stand may take place over a period of time, individual trees may vary considerably in age. Also, natural regeneration often includes more tree species than are typically planted in a commercial forest. Tree plantations have traditionally focused on fiber production rather than species diversity. Thus, naturally regenerated stands are generally more likely to retain the biological diversity of the previous, predisturbance stand. By retaining coarse woody debris, snags and green trees in harvested stands, some of the characteristics of natural stand development processes can be replicated.

- **Comment:** Numerous factors may influence biological diversity in forest ecosystems, including those beyond a management strategy based on successional forest development as presented in the Draft SEIS. Neither theoretical bases nor compelling technical analyses support the simplified strategy for the protection of biological resources that is presented.

**Response:** This SEIS includes a comprehensive assessment of the species associated with late-successional forest conditions. Furthermore, the SEIS includes an ecosystem assessment that focuses on three important late-successional forest ecosystem attributes: (1) abundance and diversity, (2) processes and functions, and (3) connectivity. The management direction proposed in the SEIS is designed to protect ecosystem values, including biological diversity.

- **Comment:** Ecosystem management requires hierarchical links at a variety of scales, including wildlife habitat, forest stand, plant community, and landscape scales. The goal of delineating reserves to maintain biological diversity is derived from insufficient habitat-association studies. This method is unreliable. Physical factors (such as rainfall, topography, and soil productivity) were not considered in designing the reserves.

**Response:** The design of the network of reserves was based on the distribution of existing late-successional and old-growth forests; the needs of 1,118 terrestrial species and species groups, and most specifically, the needs of the northern spotted owl and the marbled murrelet, both of which are listed as threatened species; the needs of 259 at-risk fish stocks; and the needs of the aquatic and terrestrial ecosystems. Physical attributes of the ecosystem are important to the habitat needs of individual species, and the large numbers of species across the planning area have a variety of needs. These physical factors were used to assist in the delineation of physiographic provinces and will be integrated into landscape/watershed-level analysis as appropriate.

- **Comment:** Successful ecosystem management does not require uniform management or large reserves.

**Response:** Within a broad framework, the SEIS standards and guidelines allow for a variety of management options at different scales: across the planning area, among moist and dry provinces, and within land allocations including Adaptive Management Areas. Results of watershed analysis will be used in future planning efforts. The size of the reserve network was designed to meet the needs of the late-successional forest ecosystem, including the large number of species that are dependent on that ecosystem. Ecosystem management is a component of all the land allocations in this SEIS.

- **Comment:** Biological diversity is not adequately protected under Alternative 9 because the Draft SEIS is too focused on individual species. There should be more analysis on the interdependence of species. Without knowing with more certainty the individual species' viability and interdependence with other species, the ecosystem assessment is overly optimistic. The risk to individual species should be mitigated by maintaining ecosystem integrity. All of the alternatives are analyzed by species or species group, thus ignoring interaction with the ecosystem. Alternative 9 should be changed to provide protection for all organisms in an intact, sustainable ecosystem. A biosphere approach needs to be taken

**Response:** The viability provision of the National Forest Management Act fish-and-wildlife-resource regulation speaks in terms of managing habitat to support each vertebrate species in the planning area. Thus, to the extent practical, the SEIS addresses individual species' habitat conditions under each of the alternatives. The ecosystem assessment addresses these concerns through three attributes: (1) abundance and ecological diversity, (2) processes and functions, and (3) connectivity. The interrelationships among species are highly complex and cannot be analyzed at the scale of this programmatic SEIS even if they were all identified and fully understood. Each of the alternatives are designed to protect the biological diversity of a functional and interconnected, late-successional forest ecosystem. The additional standards and guidelines that have been incorporated in Alternative 9 in Appendix B11 further strengthen the likelihood of maintaining a functional and interconnected, late-successional forest ecosystem.

- **Comment:** Late-successional habitat is constantly subject to change. A preferred ecosystem management strategy is one that incorporates species' needs within the natural range of successional

habitat conditions that occur within each drainage. This approach would identify the natural processes that create and sustain the required habitat conditions.

**Response:** The dynamic nature of the late-successional forest ecosystem is acknowledged throughout this SEIS. Natural processes that create and sustain habitat conditions are among the topics that will be addressed at the watershed/landscape level of analysis as necessary.

- **Comment:** Instead of managing for species, the emphasis should be on managing ecosystems. Watersheds would be the ideal units to represent ecosystems.

**Response:** This SEIS proposes direction for management of species, habitat, and ecosystems. Ecosystem management is based on an hierarchical system of ecological units, including watershed, landscapes, and provinces or large river basins. Each of these ecological units provides unique opportunities for land managers who may use watershed/landscape-level analyses and province-level planning to implement ecosystem management. This SEIS directs management on a regional basis to provide overall coordination between provinces and watersheds.

- **Comment:** Land management agencies should not attempt to grow late-successional forest habitat where early or mid-successional habitat would occur through natural processes. The mapped Late-Successional Reserves contain areas that will never attain late-successional characteristics due to natural vegetation patterns and site conditions, such as those found on the upper slopes of southerly exposures in the drier provinces. The desired future condition implied by the standards and guidelines in these areas is unattainable. Successional stages should be managed for the aspects and slope positions they would naturally occupy. Management emphasis should not exclude other successional stages; management and harvest patterns should try to emulate spatial patterns caused by natural disturbances.

**Response:** A single "desired future condition" is not applicable to all forest types throughout the range of the northern spotted owl. Analysis at the watershed and province levels, as well as Late-Successional Reserve plans, will help determine the range of desired natural conditions, including natural vegetation patterns. Mosaics created by natural disturbance patterns are a component of the range of natural conditions of a landscape.

- **Comment:** The SEIS team should consider developing new alternatives based on ecological capabilities. Ecosystem health should be the goal. The basis for ecosystem management in the Final SEIS can be improved by incorporating information on the physical environment. A hierarchical, ecologically-based land classification system that includes both biotic and physical components could strengthen the selected alternative. This system should include physiography, geology, soil properties, and climax plant populations. Landforms, soils, and climax plant communities all result from interactions with climate and soil-forming processes, as well as the geological structure.

**Response:** The maintenance of a functional and interconnected late-successional forest ecosystem is one of the goals of this SEIS. The ecosystem is complex: its health is dependent on the health of individual species and the quantity and quality of habitat conditions. Similarly, the health of individual species is dependent on the health of the ecosystem. The biophysical components of the ecosystem will be described in greater detail in future watershed/landscape-level analysis, as well as in province-level planning.

- **Comment:** After removing land allocations for Wildernesses, reserves, and Adaptive Management Areas, the amount of land left in the matrix is insufficient to allow for ecosystem management. Ecosystem management should be implemented across all landscapes.

**Response:** The ecosystem management proposed in this SEIS is designed to be implemented across all land allocations. The matrix is one part of that design. This SEIS proposes management to maintain the ecosystem, as well as to facilitate recovery and restoration of the ecosystem.

- **Comment:** Proposed standards and guidelines under Alternative 9 would not protect ecosystem values within the matrix. Interior old-growth conditions would be eliminated from the matrix, and residual patches of old growth would be too small and isolated to be of much ecological value. The highly fragmented landscape would be nearly devoid of old-growth ecosystem characteristics. Since both the reserves and the matrix are part of the same ecosystem, logging in the matrix should be curtailed to prevent damage to the reserves.

**Response:** By definition, the matrix supports a different set of ecological values than some of the other land allocations, such as the Late-Successional and Riparian Reserves. The design of Alternative 9 is one of an entire ecosystem, which includes the matrix. Not all components of that ecosystem will occur on every acre within the planning area. Standards and guidelines for the matrix include retention of 15 percent of the forest within each harvest unit. However, the standards and guidelines do not include retention of interior old-growth conditions. Residual old growth in the matrix will function as refugia for some species, become centers where new species may evolve over time, and provide habitat for species that require partial shading or partial sunlight. The matrix will also function as connectivity habitat for some species, as will the Riparian Reserves that are interlaced with the matrix. Standards and guidelines for Late-Successional and Riparian Reserves and the matrix are designed to maintain and enhance the ecosystem values of the reserves. Some of the additional standards and guidelines incorporated into Alternative 9 would provide further benefits to the habitat of species found in the matrix (see Appendix B11, Standards and Guidelines Resulting From Additional Species Analysis and Changes to Alternative 9).

## TERRESTRIAL RESTORATION

- **Comment:** Where old-growth structures do not exist, explore the possibility of creating them more rapidly by proactively thinning younger stands. No consideration is given to mechanical treatments to enhance less-than-optimal late-successional habitat under Alternative 9.

**Response:** Silvicultural practices to develop late-successional habitat are recognized as an acceptable component of the management of forests in this SEIS (see Appendix B2, Ecological Principles for Management of Late-Successional Forests, and Appendix B5, Recovery Plan Standards and Guidelines). The location and specific conditions of the stand are important factors in the development of late-successional characteristics. Mechanical manipulation of habitat is an accepted silvicultural technique and will be used among land allocations, under site-specific conditions, and as a result of the occurrence of particular forest stand characteristics. Under specific conditions, and subject to review by the Regional Ecosystem Office, these silvicultural practices may be implemented in Late-Successional Reserves within the dry physiographic provinces. These methods may include thinning, girdling, and various types of hazardous fuel reduction. Studies of mechanical or manual techniques are among the management methods that may be encouraged within Adaptive Management Areas.

- **Comment:** Any activity that removes a large portion of the basal area is not natural. Fires only remove a small part of the biomass; remnants of the previous stand provide many useful functions to the subsequent stand. Logging can never mimic this process. Therefore, no management activities should be allowed in the reserves.

**Response:** The types of silvicultural and fuel reduction techniques being proposed are intended to thin unnaturally dense stands to improve stand structure and manage risk of wildfire. Salvage in Late-Successional Reserves, when permitted, will occur only where operations will not diminish the quality

of late-successional habitat, where stand-replacing disturbance exceeds a specified size, and under a number of other conditions listed in Appendix B5, Recovery Plan Standards and Guidelines, and in The Alternatives section of Chapter 2. Salvage logging is not intended to replicate wildfire events.

- **Comment:** The FEMAT Report had a discussion on terrestrial restoration that was not included in the Draft SEIS. It would be useful to have that section included in the Final SEIS, and it should be considered for implementation.

**Response:** Terrestrial restoration discussions are included in Appendix B2, Ecological Principles for Management of Late-Successional Forests, and in Appendix B5, Recovery Plan Standards and Guidelines, of this Final SEIS.

- **Comment:** Old-growth forests, because of their age, have a limited life remaining. Young stands could be allowed to grow to an old age to replace the older stands as they deteriorate.

**Response:** Old-growth forests in the planning area continue to grow and develop until they are replaced by disturbance events or forest succession. Some stands exceed 1,200 years in age. They retain ecological value throughout their existence and may "deteriorate" only as a commodity value.

- **Comment:** Given that old-growth forests will never again contain the values they now provide (Draft SEIS, p. 3&4-139), explain the rationale for placing so much area of younger forests in the reserve system.

**Response:** Today's remaining old-growth forests developed under climatic periods, disturbances, and uses by American Indians that cannot be replicated. However, it is believed that forests with similar characteristics can support many of the species that are dependent on old-growth forests, and that the entire forest ecosystem can remain intact as a system. Younger forests are placed in the Late-Successional Reserve allocation so they can develop into late-successional habitat and eventually provide connectivity with other late-successional and old-growth stands.

## MANAGEMENT OF LATE-SUCCESSIONAL RESERVES

- **Comment:** Thinning in Late-Successional Reserves is an unproven technique for developing spotted owl habitat, and may disrupt many of the processes necessary for the development and maintenance of fully functioning late-successional forest ecosystems. Any removal of organic material from the reserves is detrimental to the forest and must be prevented. Dead trees are necessary for many species and provide nutrients to the soil.

**Response:** Large areas of very dense undercanopy are not optimum spotted owl habitat, are often at high risk of severe fires and are not natural to our forest ecosystem. Thinning in unnatural, managed stands can accelerate the development of certain late-successional forest characteristics. The Final Draft Spotted Owl Recovery Plan (USDI unpub.) states that the risks of inaction outweigh the risks associated with these restoration activities. Plans for limited thinning must be beneficial to the development and maintenance of the late-successional forest ecosystem, and are subject to review by the Regional Ecosystems Office. Standards and guidelines in this Final SEIS provide for the retention of coarse woody debris in the reserves, as well as in all other land allocations. These standards and guidelines reflect the habitat needs of species other than the spotted owl, as well as those necessary for the maintenance of a late-successional forest ecosystem.

- **Comment:** To be implemented, the reserve system should either be large enough to withstand major disturbance events (e.g., wind or fire), or provide an active management system for multiple-use needs.

**Response:** Simulation of forest development in the discussion of Effects of Alternatives on Terrestrial Ecosystems in Chapter 3&4 shows a net increase of late-successional forest, even with wildfire disturbance events. Management of disturbance risk is discussed in Appendix B5, Recovery Plan Standards and Guidelines, and Appendix B2, Ecological Principles for Management of Late-Successional Forests. The network of reserves and matrix is expected to be sufficient in spite of catastrophic disturbance events.

- **Comment:** Reserves should be comprised of areas that have never been logged because logged areas can never become old-growth habitat.

**Response:** Areas that have not been logged are limited in extent and distribution. Terrestrial restoration techniques can accelerate and enhance the development of late-successional and old-growth forest characteristics.

- **Comment:** Some Late-Successional Reserves in the eastside provinces have forests more characteristic of the moist provinces, and should therefore not have the same level of management as the dry provinces.

**Response:** Late-Successional Reserve and province plans, as well as watershed analysis, will delineate these areas and assist in the application of appropriate management direction. The standards and guidelines of this SEIS will be followed until these plans and analyses are completed and approved, and these plans are subject to review by the Regional Ecosystems Office.

- **Comment:** Late-Successional Reserves east of the crest of the Cascade Range are a part of the old-growth forest ecosystem and must not be salvage logged.

**Response:** Old-growth forests throughout the planning area are part of the late-successional and old-growth forest ecosystem. Salvage in Late-Successional Reserves, when permitted, will occur only where operations will not diminish the quality of late-successional habitat, where stand-replacing disturbance exceeds a specified size, and under a number of other conditions listed in Appendix B5, Recovery Plan Standards and Guidelines, and in the Alternatives section of Chapter 2. These conditions include an emphasis on long-range objectives for the reserve, especially the development of late-successional forest characteristics such as snags and the accumulation of coarse woody debris.

## OLD-GROWTH FORESTS AND LAND ALLOCATIONS

- **Comment:** Alternative 9 would allow much of the ecologically significant old-growth forests to be harvested. Based on maps of LS/OG1 and LS/OG2 stands, it appears that 25 percent of these areas would be subject to harvest. Low elevation old-growth stands are particularly limited in the Pacific Northwest. These fragments act as refuges and centers of dispersal for many species with limited distributions and/or dispersal capability

**Response:** One objective of the proposed action analyzed in this SEIS is to maintain or create a connected or interactive old-growth forest ecosystem on federal lands within the range of the northern spotted owl. A network of reserves was designed to accomplish this objective. Inclusion of low elevation old-growth forests in the reserve system was considered. Not all existing old-growth stands, including low elevation stands, are included within this network. However, some of these stands would be maintained in Administratively Withdrawn Areas, Riparian Reserves, and in Connectivity/Diversity Blocks (on lands managed by the Bureau of Land Management). Some of the additional standards and guidelines added to Alternative 9, such as the application of Riparian Reserve Scenario 1, matrix management provisions, and the protection of northern spotted owl activity centers (see Appendix B11,

Standards and Guidelines Resulting From Additional Species Analysis and Changes to Alternative 9), would provide additional habitat and function as connectivity for many species.

- **Comment:** The SEIS fails to protect the least fragmented stands of old growth. These are the stands referred to as "LS/OG1" in Johnson et al. (1991).

**Response:** Each SEIS alternative, except Alternative 7, protects all of the LS/OG1 stands in Marbled Murrelet Zone 1 which extends 10 to 40 miles inland from the coast. Additional LS/OG1 stands are maintained in the network of Late-Successional Reserves located elsewhere within the range of the northern spotted owl. Some LS/OG1 stands occur outside this network. In Alternative 1, all LS/OG1 stands are included in the reserve network. Many Late-Successional Reserves are comprised of a mixture of early and late-successional stands. Because early-successional stands within the reserves will be allowed to mature into late-successional forests, the amount of late-successional forest will increase over time.

- **Comment:** Identification of stands 80 years old as old-growth forest is misguided because these stands have virtually none of the characteristics associated with old-growth forests.

**Response:** As described in Appendix B2, Ecological Principles for Management of Late-Successional Forest, 80 years is the age when many forest stands begin to develop late-successional characteristics, such as the formation of heavy limbs and an accumulation of coarse woody debris on the forest floor. An 80-year-old stand is not defined as old-growth forest

## ECOSYSTEM ASSESSMENT

- **Comment:** Alternative 9 provides only medium-high viability for the ecosystem. To enhance ecosystem viability, logging should not be allowed in reserves.

**Response:** Alternative 9 received its overall rating partly because of its restorative silvicultural treatments in the Late-Successional Reserves. Without these practices, the assessment of Alternative 9 would have yielded a lower result.

- **Comment:** The SEIS fails to analyze ecological processes that determine the ecological potential of an area. Landscape-level studies must be undertaken because organism-specific and site-specific data cannot be used to measure ecosystem health and function.

**Response:** Landscape-level descriptions and analyses are more detailed and complex than is appropriate for this programmatic SEIS. However, watershed analysis will incorporate these landscape-level analyses.

- **Comment:** Two of the three key factors used in the evaluation of the alternatives are based on the amount of reserved lands, not on ecosystem structure and function. Other measures of ecosystem integrity are necessary.

**Response:** The three attributes used in the ecosystem assessment (abundance and diversity, processes and functions, and connectivity) are interrelated, and not based solely on the acreage of reserves. The assessment of connectivity, for instance, is based on the capability of late-successional forests to provide biological flows across the landscape. These biological flows themselves are processes that are based on the ability of connectivity to function as dispersal habitat. The text of the Final SEIS has been modified to clarify this (see Methods for Assessing the Maintenance of a Functional and Interconnected, Late-Successional Forest Ecosystem in Chapter 3&4).

- **Comment:** Perhaps more critical than species viability is ecosystem viability. Neither Alternative 1 nor Alternative 9 achieved an 80 percent or greater likelihood of achieving Outcomes 1 and 2 combined, which indicate conditions within the range of natural variability. The processes and functions attribute is probably the single most important objective of the SEIS. All alternatives fall below 80 percent likelihood, and the ratings for the dry provinces are especially low.

**Response:** The ratings for Outcomes 1 and 2 combined are due in part to an incomplete knowledge of ecological processes and functions. Disturbance ecology and long-term climate change are among those uncertainties described in the FEMAT Report and in Chapter 3&4, Results of Assessing the Maintenance of a Functional and Interconnected, Late-Successional Forest Ecosystem. The degree to which wildfire may be allowed to function as a natural process is not known, nor is it known if land managers have the ability to bring fuel accumulations in the dry provinces back to their natural levels before large scale wildfire events occur. Note that Alternatives 3 and 9 (as originally formulated) are rated the highest for the processes and functions attribute; Alternative 9 rates slightly higher than Alternative 3. The additional standards and guidelines added in Appendix B11, Standards and Guidelines Resulting From Additional Species Analysis and Changes to Alternative 9, improve the ecosystem attributes of (1) abundance and ecological diversity, and (2) connectivity of Alternative 9 to a higher level than stated in the FEMAT Report and the Draft SEIS.

## CONNECTIVITY

- **Comment:** The outcomes for connectivity in the Draft SEIS are insufficient and vague. The Draft SEIS overestimates the connectivity that will actually exist because the future amount of late-successional forests will not exceed 22 percent of the total federal and private landscape. The riparian buffers are too narrow to provide the necessary connectivity, and past harvests in the Riparian Reserves further weakens their role as connectivity areas.

**Response:** This is clarified in the Final SEIS. The assessment of connectivity described in Chapter 3&4 is based on the distance between large areas of late-successional and old-growth forest; the distribution of smaller-sized patches, including riparian buffers; and on the total proportion of the landscape containing late-successional and old-growth forest. The assessment considers possible outcomes over the next 100 years. Forest successional development in Riparian Reserves during this time should allow these areas to become suitable connectivity habitat. Development of forests in the Late-Successional Reserves will increase the portion of the landscape containing late-successional and old-growth forest conditions. Additionally, standards and guidelines in this SEIS will cause the retention or development of connectivity in other land allocations. The increase in Riparian Reserve widths of intermittent streams under Riparian Reserve Scenario 1, as described in Appendix B11 (Standards and Guidelines Resulting From Additional Species Analysis and Changes to Alternative 9), would increase their function as connectivity. Other measures described in Appendix B11 would also increase the ability of the matrix to function as connectivity for some species.

- **Comment:** Explain why the outcomes for connectivity under each alternative are not rated lower.

**Response:** The ratings are based on projections ranging 100 years into the future, and thus are a function of current and projected amounts and distributions of late-successional forest across that time period. Ingrowth in Late-Successional and Riparian Reserves is expected to improve connectivity over the next 200 years

- **Comment:** An independent panel of landscape ecologists should be assembled to ensure that Late-Successional Reserves are well distributed and adequately connected to each other and to late-successional forests within all land allocations.



**Response:** All land allocations except the matrix contribute to connectivity between Late-Successional Reserves. Riparian Reserves interspersed through the matrix, and the green tree and 15 percent retention standards in the matrix, provide additional connectivity. These standards and guidelines, as well as the distributions of the land allocations including the Late-Successional Reserves, were used in the assessments of species, species groups, and ecosystems. The species assessments included determination of the adequacy of connectivity habitat by wildlife biologists familiar with the individual species and species groups. The expert panel that performed the ecosystem assessment included landscape ecologists who were not part of the Assessment Team.

## PRESETTLEMENT CONDITIONS

- **Comment:** The alternatives were formulated with the underlying goal of bringing our region back to pre-European settlement conditions. This basic assumption is flawed: those forests never had that much old growth. All of the alternatives would transform the forests of the Pacific Northwest into forest types that never occurred naturally.

**Response:** Pre-European settlement conditions represent a range of natural conditions over space and time. The ecosystem assessment compares the alternatives to the range of pre-settlement conditions across all landscapes within the range of the northern spotted owl, rather than to one specific condition. The assessment includes analysis of abundance and diversity, processes and functions, and connectivity. The presettlement late-successional forest ecosystem was dynamic and included forest development and succession, as well as a variety of types of disturbance events. More detailed future analysis such as watershed-level analysis will describe landscape-specific current conditions, and the range of natural variability for that landscape. The objective is to manage the ecosystem for the range of natural variability that has been and is prevalent on those landscapes.

- **Comment:** Neither the Draft SEIS nor the FEMAT Report contain any historical, factual or scientific bases for the assumption that presettlement forests were 65 percent late successional or old growth. The Draft SEIS states that there is no historical evidence to gauge the amount of late-successional and old-growth forest in historical times. Historical data contradicts the "blanket of old growth" assumption used in both the ecosystem and species assessments.

**Response:** Published scientific reports estimating natural fire rotations and coverage of late-successional forests are referenced in the SEIS (see Franklin and Spies 1984, USDI unpub.). The SEIS states that there are no data for determining the average lowest amount of old-growth forest for the previous millennium (1,000 years). However, there is a considerable amount of information on the amounts of late-successional and old-growth forests during the historical period (less than 200 years). The assumptions of occurrences for this analysis included large disturbance events and are detailed in Chapter 3&4 under Methods for Assessing the Maintenance of a Functional and Interconnected, Late-Successional Forest Ecosystem. The SEIS does not imply that the entire range of the northern spotted owl was forested by a "blanket of old growth" in the days before European settlement

- **Comment:** Presettlement conditions do not provide a valid basis for judging the viability of species or ecosystems. The SEIS does not explain why presettlement distribution of forest stages is the only valid measure of a functional, interconnected, late-successional forest. There is no scientific basis provided for the assumption that an ecosystem with a different amount of late-successional forest is not a functional, viable ecosystem. The desire to approach long-term past conditions is not necessarily best for future forests.

**Response:** Pre-European settlement conditions represent a range of natural conditions over space and time, rather than at one moment in time or location. This includes a full range of natural disturbance and vegetative development processes and ecological functions, late-successional and old-growth

ecosystem abundance at least as high as the long-term average (200 to 1,000 years), and a distribution of late-successional and old-growth forests that allows forest ecosystem connectivity. At the time of European settlement, the planning area comprised a functional and interconnected late-successional forest ecosystem. The degree to which management can deviate from those conditions and keep a functional and interconnected late-successional forest ecosystem intact is unknown. Varying amounts and distributions of late-successional forest, as well as other types of ecosystems, were present during other climatic periods. While various amounts of late-successional forest may have been present during other climatic periods, the expected future late-successional forest attributes were compared with those of a period in the recent past for which a sufficient level of knowledge is available. Using the recent past provided a useful benchmark against which to measure the alternatives for the purposes of comparing them. The uncertainty regarding possible future climatic warming caused all of the alternatives to receive a lower assessment.

- **Comment:** The forests of the planning area were never entirely covered by old growth; therefore, ecosystem management should encompass the management of a wide variety of seral stages, not just old growth. The SEIS disproportionately emphasizes late-successional forest ecosystems.

**Response:** The scope of this SEIS specifically includes an emphasis on the management of late-successional and old-growth forests. However, some areas within the range of the northern spotted owl include nonforest and other special habitat types. Forest and aquatic disturbance events will continue to cause changes in seral stages and in forest and riparian structure. The matrix, and to a lesser extent, the Adaptive Management Areas, would provide a variety of seral stages in addition to late-successional forest. Management of nonforest habitat types will follow direction in current plans and draft plan preferred alternatives, provided that this direction is consistent with the standards and guidelines of the selected alternative. Watershed/landscape-level analysis and province-level planning will address these special management areas in more detail.

## PHYSIOGRAPHIC PROVINCES

- **Comment:** The range of the northern spotted owl is not an ecologically-sound ecosystem planning area. Standards and guidelines cannot be applied across such a large area, and must be tailored for the various physiographic provinces. Ecosystem planning areas based on physiographic provinces or watersheds would have been more appropriate.

**Response:** The range of the northern spotted owl is an appropriate planning area for the scope of this programmatic SEIS. Certain standards and guidelines of some alternatives do vary by physiographic province. In the long term, provinces have been proposed as planning areas. Analysis will be performed at the watershed and landscape level.

- **Comment:** Descriptions of the biophysical environments (soils, topography, hydrology, climate, and plant and animal communities) within the physiographic provinces lack the detail that is available in published literature. These descriptions should include the historic, prehistoric, and prehuman descriptions of biogeography and physical geography. Explain to what extent these environments will be altered by the implementation of the selected alternative. Describe what will happen to those species that are sensitive to disturbance by humans.

**Response:** The Final SEIS contains several pages of descriptive summaries of the provinces, which are sufficiently detailed for the decision makers to make an informed choice among the alternatives. Environmental impact statements are to be analytic, not encyclopedic, and as brief and concise as possible (40 CFR 1502.2). More detailed descriptions will be included in watershed/landscape-level analysis, and province-level planning. Assessments of the effects of the alternatives on individual

species and species groups are included in Chapter 3&4. Also, much of the relevant published literature was referenced, even though the SEIS does not, obviously, discuss each piece explicitly. See the references list.

- **Comment:** The description of the California Coast Range Physiographic Province does not mention the Hoopa or Round Valley Reservations, nor the Rancherias of scattered allotments that are located there. The Washington Western Lowlands and the Washington Cascades Western Provinces additionally have American Indian reservations.

**Response:** This information is now reflected in the Description of Terrestrial Physiographic Provinces of Chapter 3&4 in the Final SEIS.

- **Comment:** There are two sets of province maps used in the Draft SEIS and they are based on very different perspectives. This indicates a substantial gap in how aquatic and terrestrial biologists view the landscape, and the corresponding gap in watershed analyses. Physiographic provinces are based purely on physiography, ignoring differences in climate, soils, geology, vegetation, fauna, and land use. Provinces are split at state boundaries for no ecological reason. Province and river basin boundaries do not coincide, and therefore, aquatic and terrestrial analysis is and will continue to be incompatible. The Environmental Protection Agency developed hierarchical ecoregions, and a map that integrates aquatic and terrestrial concerns has been developed for the Oregon and Washington Coast Range. Clarify whether these maps were considered.

**Response:** The terrestrial and aquatic physiographic province classifications were designed for different purposes and meet needs of those purposes. Neither is inherently better than the other because both sets use all of the criteria mentioned in the comment, with the exception that land use was not fully incorporated into the terrestrial set, and not at all in the aquatic set. A single set of provinces can never be designed to meet the needs of all possible ecosystem management analyses or questions. One set of provinces, the terrestrial physiographic provinces, was selected for the majority of data analyses in the FEMAT Report and the SEIS. This provided some continuity to previously published reports (such as the Final Draft Spotted Owl Recovery Plan, USDI unpub.). Other types of ecological unit classifications, such as those developed by the Environmental Protection Agency, were considered but were not expected to provide substantial improvement in the analyses of the SEIS alternatives. Ecological units based on hydrologic basins have been adopted by the Regional Interagency Executive Committee for province planning and analysis (Figure 2-3).

- **Comment:** Some of the provinces are too large and incorporate more than one watershed.

**Response:** The provinces used in this SEIS provide an analytical tool to measure differences among alternatives, which often occur in areas much larger than individual watersheds. Province-level analysis and planning areas that will be used for implementation of the selected alternative differ both in design and intent from those used in this Final SEIS (see Chapter 2). Watershed and landscape analysis, however, will focus on specific watersheds.

## MISCELLANEOUS

- **Comment:** Small islands of forest that are completely isolated from other forests cannot be expected to contain the same level of species diversity found at the landscape level. Protecting 0.5 to 4-acre parcels of old-growth forest in the matrix is ineffective due to "edge effect."

**Response:** These fragments of old-growth forest are not expected to contain the same diversity of species that may be found at the landscape level. Residual old-growth forests in the matrix will function as refugia for some species, and become centers where new species may evolve over time.

The matrix supports a different set of ecological values than some of the other land allocations, such as the Late-Successional and Riparian Reserves. Some species require habitat conditions that occur at the edges of old-growth forests, and these habitats are sometimes biologically diverse. These parcels will also provide diversity to future stands. Additional analysis performed for this Final SEIS indicate that these areas do provide important habitat for certain species (see Appendix B11, Standards and Guidelines Resulting From Additional Species Analysis and Changes to Alternative 9).

- **Comment:** Meadows and other special habitats need to be identified and protected, regardless of the land allocation in which they occur. The SEIS needs to address meadow management, including timber harvest and other vegetation management techniques, to prevent tree invasion into meadows. The SEIS fails to address the ecosystems that require open spaces, such as those that result from catastrophic or recurrent fires.

**Response:** The focus of the proposed action is management of late-successional and old-growth federal forests within the range of the northern spotted owl. Thus, for the most part, meadows are beyond the scope of this SEIS. Special habitats are addressed in some current plans and draft plan preferred alternatives and will also be addressed in watershed/landscape-level analysis and in province-level planning. Maintenance of meadows in Late-Successional Reserves using silvicultural techniques is appropriate.

- **Comment:** The SEIS does not analyze the impacts of land allocations on rare and sensitive plant habitat, wetlands, or biological diversity in general.

**Response:** The species and species group assessments analyzed the effects of the alternatives on habitat. These included rare and sensitive plant species, and those species that occur in wetlands. A large number of species that occur within the planning area were analyzed. Abundance and ecological diversity of late-successional and old-growth forest ecosystems are analyzed in the section Results of Assessing the Maintenance of a Functional and Interconnected, Late-Successional Forest Ecosystem in Chapter 3&4.

- **Comment:** The recovery of some components of the ecosystem is expected to take at least 200 years. Therefore, the Draft SEIS should have looked beyond the 100-year timeframe that was used.

**Response:** Some of the analyses did extend beyond 100 years. Watershed recovery, for example, extended to 200 years. The level of uncertainty can be expected to increase substantially under longer time frames for some ecosystem attributes; therefore analyses that project ecosystem conditions beyond some point in time may be less reliable.

- **Comment:** The SEIS states that some late-successional forest attributes require 200 to 500 years to develop. If major fires burned every 200 years, identify the attributes which would be degraded by logging.

**Response:** Many locations within the planning area have trees or stands that exceed the average natural fire rotation for forests in the planning area or province. Some areas may have burned more than once or experienced fires that were not lethal to the trees or stands. Some parts of the landscape may be more prone to severe fires, and others may be less likely to burn. Virtually all of the attributes of late-successional and old-growth forests have been removed by clearcut harvesting, with the possible exception in recent years of the accumulation of coarse woody debris and the retention of green trees.

- **Comment:** Watershed analysis should not be restricted to aquatic habitat and species abundance. It should include the health, interactions, and processes of the entire ecosystem within the watershed, including landscape ecology and terrestrial processes.

**Response:** The description of watershed analysis in Chapter 2 of the SEIS addresses these concerns.

- **Comment:** The SEIS does not recognize the regional differences between northern California and the Pacific Northwest. Data for these two regions were lumped together. The forest ecosystems of northern California are unique and warrant individual analysis.

**Response:** Subregional ecosystem differences are reflected in various standards and guidelines. Differences between the dry provinces and moist provinces, including their vegetation types, forest structure, and fire regimes, occur in each of the three states within the planning area. More detailed analysis will follow in the watershed and landscape analysis and province-level planning.

- **Comment:** Old-growth forests absorb more carbon dioxide than second-growth forests and are necessary to prevent global warming. Calculations of increased carbon dioxide need to be explicitly shown as a consequences of each alternative.

**Response:** A discussion on the effects of the alternatives on the global climate is included in Chapter 3&4.

- **Comment:** Harvest of old-growth forests provides protection against global warming because a forest of vigorously-growing trees will remove five to seven times the carbon dioxide that old-growth forests absorb.

**Response:** Younger trees may accumulate carbon dioxide at a faster rate, however, old-growth forests store a considerable amount in the form of live wood, leaf area, duff, and coarse woody debris. A discussion on the effects of the alternatives on the global climate is included in Chapter 3&4.

- **Comment:** The Draft SEIS does not state the likelihood of reaching long-term late-successional forest conditions under Alternative 9.

**Response:** While this likelihood is not estimated or calculated for any particular forest stand, the discussion of Results of Assessing the Maintenance of a Functional and Interconnected, Late-Successional Ecosystem in Chapter 3&4 addresses the likelihood of outcomes for the ecosystem.

- **Comment:** The Draft SEIS shows amounts of "medium and large conifers" in the Late-Successional and Riparian Reserves. However, it does not provide the number of acres that meet the traditional definition of old-growth forest. It appears that in the short term, Alternative 9 actually decreases the total amount of old-growth forest (according to the traditional definition).

**Response:** The SEIS is focused on the management of late-successional and old-growth forest habitat, rather than on old-growth forests alone. As discussed in Appendix B2, Ecological Principles for Management of Late-Successional Forests, stands begin to develop late-successional characteristics at around 80 years of age, this corresponds to the category "medium and large conifers" in the analysis. Therefore, amounts of forest in other definitions of old-growth forests are not analyzed in this SEIS

- **Comment:** The Draft SEIS claims to propose change to "ecosystem management", but lacks an operational definition of this type of management. There is not yet any generally accepted approach for meeting this objective.

**Response:** A definition of ecosystem management has been added to the glossary of the Final SEIS, although it is acknowledged that it is an emergent, and hence, rather dynamic concept at present.

## Fire and Air Quality

The following comments and responses address wildfire hazard, the role of fire, fire effects, air quality, American Indian use of fire, fire suppression, and other disturbances such as blowdown (not salvage), insect infestations and disease, and natural catastrophes such as earthquakes.

### STANDARDS AND GUIDELINES

- **Comment:** The option to enter reserves for risk management should be retained. There should be a prompt analysis of the reserve system to identify and prioritize reserves for risk management to reduce the risk of wildfire. Fuel management plans are critical to reducing current fuel loads and minimizing future risk. However, none of the alternatives, including Alternative 9, present a detailed, well-planned program of fuels management. The standards and guidelines for fire management (both fire suppression and the use of prescribed fire) are unclear and are scattered throughout the Draft SEIS. These standards appear to be uniform across all landscapes. There should be some mechanism to allow fire management prescriptions to be developed on a more site-specific or watershed basis.

**Response:** Clarified fuels management direction has been added in Appendix B8, Fire Management Standards and Guidelines, in response to this concern. Additional discussion may be found in the Air Quality Analysis section of Chapter 3&4. Area-specific fire management (including risk management) concerns will be identified in watershed/landscape-level analyses, and incorporated into province-level planning, Late-Successional Reserve plans and Adaptive Management Area plans.

- **Comment:** Proposed fire management in Late-Successional and Riparian Reserves is misguided. Thinning, understory burning, and other fuel reduction techniques would result in a direct reduction of old-growth habitat quality by eliminating multistoried canopy conditions. Construction of fuelbreaks would increase habitat fragmentation and pose threats to species that require interior forest habitat. Moreover, the use of chainsaws and other equipment for the purposes of fire reduction could actually increase the risk of severe fire. The effects of fuelbreaks and other protection activities on habitat availability and quality are not adequately addressed in the Draft SEIS.

**Response:** Appendix B8, Fire Management Standards and Guidelines, has been added to this SEIS and is consistent with the direction provided in Appendix B5, Recovery Plan Standards and Guidelines, and Appendix B2, Ecological Principles for Management of Late-Successional Forests. To be more consistent with other ecosystem management objectives, cleared fuelbreaks have been de-emphasized in favor of areas of reduced fuels. Risk from hazard fuel reduction operations will be mitigated during implementation of projects.

- **Comment:** Fuelbreaks should be constructed along roads and on ridgelines in the drier provinces to allow natural fires to burn freely within the reserves.

**Response:** While cleared fuelbreaks may be constructed in some cases, the preferred method of reducing fire spread and intensity will be to develop broader areas of reduced fuels. This strategy is also more compatible with other ecosystem management objectives.

- **Comment:** Instead of reintroducing fire, which destroys wood resources, the Final SEIS should consider alternative methods to achieve the same results.

**Response:** Alternative fuel treatments will be considered, as detailed in Chapter 3&4, Air Quality Analysis. The appropriate methods will be determined in watershed and landscape analysis and incorporated at the project planning level.

- **Comment:** The Draft SEIS standard and guideline FM-1 (p. 3&4-B-87) should be more specific about fire suppression methods to avoid. Some suppression activities, such as the use of heavy equipment in riparian areas, can result in greater damage than the fire itself. Standard and guideline FM-3 should prohibit the use of chemical retardants and foams, or other additives, to surface waters, with justifiable exceptions for safety or to prevent greater long-term damage to a watershed.

**Response:** These concerns have been addressed in Appendix B8, Fire Management Standards and Guidelines, in this Final SEIS.

- **Comment:** The Draft SEIS states that the small amount of remaining late-successional ecosystems should be protected from stand-replacing fire. However, this conflicts with another section that states that natural processes such as fire should be allowed to function to the extent possible. Natural fire regimes need to be restored in all allocations to the greatest extent possible, including the matrix. Active fire management in all areas is essential to ecosystem management.

**Response:** All fires in Late-Successional Reserves will be suppressed until specific fire management plans are developed and approved. Approved fire management plans may contain provisions to allow naturally ignited prescribed fires to function as a natural process when they remain in a predetermined prescription. However, in areas that formerly had low to moderate intensity underburns as part of their natural fire regime, management application of fire may also be an appropriate strategy for restoring the natural role of fire to the ecosystem. Fire management in other land allocations is addressed in Appendix B8, Fire Management Standards and Guidelines.

- **Comment:** Restoration silviculture in Late-Successional Reserves may cause an accumulation of coarse woody debris to reach the threshold which will lead to an insect infestation that could threaten the reserve. Also, many root diseases are associated with exposed stumps, creating additional hazards to the adjacent green trees and the rest of the stand.

**Response:** Restoration silviculture will not cause a greater accumulation of coarse woody debris than would occur naturally. Trees that might otherwise undergo natural thinning would be felled. Fuel accumulation from these activities could be reduced by prescribed fire if they are considered to be an insect or fire hazard, as determined in the Late-Successional Reserve plans. Thinning will reduce overall stress on the forest stand, and the increased vigor of the stand will reduce the threat of disease, especially in the dry provinces.

- **Comment:** Standards and guidelines that allow salvage logging in Late-Successional Reserves under Alternative 9 may encourage arson. A change in the standards and guidelines could prevent such activity.

**Response:** All federal land management agencies actively investigate all suspected arson fires. The Interagency Arson Task Force in the Pacific Northwest, under the leadership of the Oregon State Police, has a high case resolution for wildland arson fires (74 percent in 1993, with 100 percent resolution expected upon completion of ongoing investigations). The Task Force includes all federal agencies with fire protection responsibility in the Pacific Northwest as well as the States of Oregon and Washington, and has a national reputation as a model organization.

The standards and guidelines for salvage in Late-Successional Reserves under Alternative 9 will not be changed at this time. However, the adaptive management process enables changes to be incorporated

as appropriate. Salvage in Late-Successional Reserves will be permitted only where operations will not diminish the quality of late-successional habitat, where stand-replacing disturbance events exceed 10 acres, and under a number of other conditions listed in SEIS Appendix B5, Recovery Plan Standards and Guidelines. Salvage will not be driven by economic or timber sale program factors.

## WILDFIRE HAZARD

- **Comment:** Fire exclusion and fire suppression under Alternative 9 will result in accumulation of forest fuels, increased difficulty of controlling fires, and loss of forest health. Because of road decommissioning and reduced management activities, fires will grow larger and cause more damage to the ecosystem due to their high intensity. Unless the fuels in our forests are reduced systematically through regulated harvest, nature will reduce them through catastrophic fire. Fuels reduction should include some limited thinning, removing dead and dying trees, prescribed underburning, cutting and hand piling dense understory vegetation, and establishing shaded fuelbreaks.

**Response:** The standards and guidelines for fire management in Appendix B8 are largely directed at lowering the risk of large scale, stand-replacing wildfires. These standards and guidelines identify appropriate fuels management for hazard reduction for land allocations, and are adjusted for the level of wildfire risk. Harvest (excluding salvage and density management) is not identified as a fuel reduction technique, although post-harvest fuel reduction is a consideration in the matrix and Adaptive Management Areas. In Late-Successional Reserves, Riparian Reserves, and Administratively Withdrawn Areas, the levels of hazard reduction are commensurate with the levels of risk and are consistent with the resource management objectives for the specific areas.

- **Comment:** Private industry fire suppression resources are scattered throughout forests managed for timber harvest, and continued harvest will assure their continued availability. If harvest levels are reduced, these private fire suppression resources would no longer be available, which would result in larger losses due to catastrophic fire.

**Response:** The level of firefighting response and the availability of fire suppression resources is not expected to vary by alternative. Forest Service fire suppression resources handle initial attack to suppress wildfires on lands managed primarily by the Forest Service. Initial attack of wildfires on lands managed by the BLM is primarily contracted with the California Division of Forestry and the Oregon Department of Forestry in their respective states. All firefighting agencies have the ability to procure emergency contract labor and other resources. The agencies also have the ability to mobilize fire suppression resources from across the nation through regional interagency coordination centers.

- **Comment:** Future catastrophic fires in the reserves will likely decrease the current amount of spotted owl and marbled murrelet habitat.

**Response:** This comment is based on the assumption that the loss of late-successional habitat due to stand-replacing fires will be very high, and will exceed the development of late-successional habitat in reserves over time. However, simulation of forest development described in Chapter 3&4, Effects of Alternatives on Terrestrial Ecosystems, shows a net increase of late-successional forest, even with wildfire disturbance events. Therefore, by managing an entire ecosystem through a network of reserves and matrix, the amount of spotted owl and marbled murrelet habitat within this network is expected to be sufficient to provide for stable, well-distributed populations in spite of catastrophic disturbance events.

- **Comment:** The statement that wildfires will not occur at their natural rate is false. Because of the rapid growth of the population in the wildland/urban interface, fire suppression resources are often drawn to



populated areas at the expense of forest resources. Therefore, the likelihood of large fires is actually greater now than in the past.

**Response:** Lightning-caused wildfires will occur at their natural rate. However, fuel reduction strategies are integral components of fire management plans which will be developed at the watershed/landscape and province levels, and for Late-Successional Reserves and Adaptive Management Areas. These strategies will be designed to reduce fire intensity and spread rates. Fire suppression problems in the wildland/urban interface are beyond the scope of this SEIS and are most effectively addressed at the local level.

- **Comment:** Under Alternative 9, fire suppression efforts will be delayed due to road decommissions and/or closures.

**Response:** Increased travel time for ground transport of fire suppression resources is acknowledged. The effects of road closures can be offset by increased reliance on aerial fire suppression resources and by increased fuel management activities. Watershed analysis will address road decommissioning as well as fire history.

- **Comment:** The Final SEIS should include an assessment of the effects of potential wildfires originating on private land and spreading onto federally managed lands, as well as an assessment of the effects of those that escape from federal lands onto private lands.

**Response:** This type of analysis is not possible at the level of this programmatic SEIS. These effects may be considered in fire management planning at the watershed, landscape and province levels, and for Late-Successional Reserves and Adaptive Management Areas.

- **Comment:** Fire suppression efforts and costs are often shared on an interagency basis and apportioned on a percentage of ownership. The Final SEIS should determine what the effects of the alternatives would be on fire size and occurrence, and whether changes in these effects should cause a change in the way fire suppression costs and efforts are shared.

**Response:** These concerns cannot be addressed at the programmatic level of this SEIS. They may be addressed by interagency fire management planning efforts at the local level using the National Fire Management Analysis System (NFMAS).

- **Comment:** To more effectively assess and monitor the role of fire in the ecosystem, existing agency (federal and state administrative units) fire occurrence analyses should be expanded in scope and depth. A more complete fire occurrence data base should be developed to include both the federal and state fire reporting systems. This information will allow planners and managers to work cooperatively in the development of landscape scale ecosystem management plans.

**Response:** These concerns are outside the scope of this programmatic SEIS.

- **Comment:** The Final SEIS should include a detailed tradeoff analysis of the physical disturbances caused by fuel reduction and/or manipulation within the Late-Successional Reserves, and the benefit of that risk reduction. Rating stands by fuel loading, stocking density, and probability of surviving a wildfire event could be included in the analysis. More research is needed to demonstrate widespread use of prescribed fire that is consistent with resource management objectives and air quality standards.

**Response:** This type of analysis is too site-specific to be included in the Final SEIS. Fire management plans at the watershed or province level as part of the Late-Successional Reserve or province plans will

include these kinds of analyses. Tradeoff analyses, including fuels management options and the air quality effects of prescribed burning, will be included at the appropriate planning level when the computer-aided modeling tools are available.

- **Comment:** Province-level fire management plans should be developed to reduce the risk of loss of late-successional and old-growth forests by catastrophic fire. Strict guidelines and careful monitoring will be necessary. In roadless areas, prescribed burning should be accomplished without building roads. The protection of life and property should continue to be primary considerations. In the moist provinces, fire suppression guidelines should be revised to ensure consistency with ecosystem management objectives; however, risk reduction measures are not needed.

**Response:** Fire management plans will be completed at the watershed/landscape or province level, or as part of the Late-Successional Reserve plans. These plans will include the methods that are most appropriate for their specific geographic areas. Risk reduction measures will be considered where they are determined to be appropriate on a landscape-specific basis. Road building solely for the purpose of prescribed burning would be cost prohibitive. Protection of life and property, and the safety of fire management personnel, remain key objectives in the proposed fire management standards and guidelines (see Appendix B8).

## ROLE OF FIRE IN THE DRIER PROVINCES

- **Comment:** Alternative 9 does not address the risk of catastrophic wildfires in the drier provinces. Province plans need to contain fire management planning to address risk reduction, including the reduction of emissions through the use of prescribed fire under managed conditions, compared to wildfires which usually burn under adverse smoke dispersion conditions. Risk management methods should be selected on a site-specific basis using ecological research and scientific analysis of forest conditions. Reliance solely on silvicultural methods should be avoided, while relatively frequent, low-intensity underburning should be encouraged. Removal of large trees does not mimic natural low-intensity underburning, which would not typically damage older trees. Strategies which disturb the soil should be avoided. No single management strategy should be applied, even within a single physiographic province, because the patterns of natural fire regimes are highly varied across the landscape. There should be monitoring to ensure that prescribed fires are not causing unacceptable resource effects.

**Response:** These concerns are addressed in two new sections in this Final SEIS: Appendix B8, Fire Management Standards and Guidelines; and the Air Quality Analysis section in Chapter 3&4. Natural fire regimes may be quite varied across the landscape, even within a single province. Fire management strategies will reflect the needs suitable to local ecosystem conditions.

- **Comment:** The Draft SEIS refers to differences in the degree of risk of severe fire between the east and west areas of the California Klamath Province. The boundary between these areas is not defined. Evidence shows that the frequency and risk of high severity fires are high even for the western half of the province. Characteristics that differentiate the province from the more mesic forests to the north include species composition, stand structure, successional pathways, coarse woody debris accumulation, and historical levels of smoke emissions, all of which need to be addressed specifically in the Final SEIS. The disturbance regimes that are most important in determining the vegetation patterns in the drier forests are not the infrequent, severe stand-replacing fires emphasized in the Draft SEIS.

**Response:** The division of the California Klamath Province has been eliminated in the description of Alternative 9 in Chapter 2 of this Final SEIS in response to this concern. The different fire regimes of the drier provinces are recognized in the Air Quality Analysis section in Chapter 3&4. Additionally, Appendix B8, Fire Management Standards and Guidelines, allows for management consistent with those natural fire regimes. The other concerns in this comment are too detailed for explanation in this programmatic SEIS.

- **Comment:** Ecological process and function are identified in the Draft SEIS as being important to the development and maintenance of ecosystems. In the drier provinces, frequent low-to-moderate intensity fire is one of the more important ecological processes, and thus should be considered in the Final SEIS. Those who will implement the selected alternative need a reference resource containing detailed information on how this process would lead to more natural stand structures and other desired late-successional conditions, and how the desired conditions contrast with current forest conditions.

**Response:** The frequent low-to-moderate intensity fires in the drier provinces are recognized as a natural fire regime in this Final SEIS. Fire management planning at the watershed and landscape level can incorporate differences in natural fire regimes into fire management plans. Development of a reference guide for implementation is beyond the scope of this SEIS.

- **Comment:** Current descriptions of the characteristics of late-successional and old-growth forests in the drier provinces are probably not representative of pre-European late-successional and old-growth conditions. Current characterizations are usually based on stand conditions following many years of fire exclusion, and are therefore not representative of past long-term conditions. Appropriate descriptions need to be developed to avoid imposing unnatural restraints on the management of these forests, which would limit the ability to achieve long-term success.

**Response:** Characterization of natural vegetation associations and fire regimes will be completed at the landscape level as a component of watershed analysis. Fire management planning at the watershed and province levels, Late-Successional Reserves plans, and Adaptive Management Area plans will consider current ecosystem conditions as well as the range of natural conditions that may be desirable to retain or develop over time.

- **Comment:** The Draft SEIS explains that some of the drier provinces could benefit from a reintroduction of frequent, low intensity fire. Some portions of some of the provinces on the west side of the Cascade Range had a natural fire regime similar to these drier provinces. Explain why fire is excluded from forests west of the crest of the Cascade Range.

**Response:** Natural and prescribed fires are not excluded from the west side. The role of fire in the ecosystem is defined at the landscape level, and will be accounted for in fire management plans.

## GENERAL (INCLUDING THE NATURAL ROLE OF FIRE)

- **Comment:** Stand-replacing fire is a consequential ecosystem process throughout the range of the northern spotted owl. While the SEIS recognizes the role of fire in the dry provinces, it assumes that fire will have no consequence in the remainder of the planning area, in spite of the fact that most forests were created by fire.

**Response:** The role and history of fire in forest ecosystems throughout the planning area are addressed in the Final SEIS (see Chapter 3&4, Regional Introduction). The fire management standards and guidelines in this Final SEIS are based primarily on the relative risk of large scale, stand-replacing fires across all provinces and land allocations (see Appendix B8, Fire Management Standards and Guidelines). The level of fuels management for hazard reduction is commensurate with that risk, and is consistent with the land management objectives of each area.

- **Comment:** The Final SEIS should address the need to use prescribed fire in old-growth ecosystems for the long-term maintenance of the ecosystem. Alternative 9 does not acknowledge the role of large scale disturbances on the landscape. Some species are rare because of the lack of such disturbances. Some fires should be allowed to burn naturally, without human interference, in reserves west of the Cascade

Range. Fire has a valuable role in ecosystem management that cannot be duplicated by human-caused disturbances, especially within the Late-Successional and Riparian Reserves. Habitat and forest health could be enhanced with the appropriate use of prescribed fire.

**Response:** The Final SEIS contains two new sections to help clarify the role of fire in ecosystem management (see Appendix B8, Fire Management Standards and Guidelines; and Chapter 3&4, under Air Quality Analysis). Mitigation measures for some species that require fire for regeneration or habitat maintenance are identified in Chapter 3&4. Fire management plans will be completed at the watershed or province level, or as part of the Late-Successional Reserve plans.

- **Comment:** The FEMAT Report and Draft SEIS arbitrarily assigned an average 250-year natural fire rotation to the region. The methodology used assumed that fires are randomly located. These inaccuracies should be corrected, and the ecosystem and species assessments that followed should be reconsidered. Alternative 9 lacks an analysis of the pattern, intensity, and frequency of natural disturbances in forest ecosystems. There is no basis for the statement that only 12.5 percent of the reserve network will be disturbed every 50 years. The return interval of stand-replacing fire referred to in the Draft SEIS is actually 125 years, not 250 years. Underburning occurred every 43 years, on the average. In the drier provinces the stand-replacing fire frequency was 120 years, while in the moist provinces the stand-replacing fire frequency was probably about 400 years.

**Response:** Natural fire rotations may be highly variable among landscapes even within the same province, and are especially variable between the dry and moist provinces. The projections of forest development in Chapter 3&4 of the SEIS use a simple set of parameters to estimate the relative amount of late-successional forest in Congressionally Reserved Areas, Administratively Withdrawn Areas, and in Late-Successional Reserves in Oregon and Washington among alternatives over the next 150 years. For these purposes, an average 250-year stand-replacing natural fire rotation was estimated for all forest types across the planning area. Under the fire management standards and guidelines, fuel hazard reduction would partially reduce the risk of severe fire. However, this risk would never be eliminated entirely. Therefore, a 400-year severe disturbance frequency was estimated for all forest types across the range of the northern spotted owl. Over a 50-year period, one-eighth (or 12.5 percent) of the land area could be expected to be affected by a stand-replacing disturbance event. It should be emphasized that these averages are used for general regional planning, and that detailed fire management plans will use the best available landscape level fire regime information.

- **Comment:** The application of island biogeography principles does not account for the dynamic nature of forests of the Pacific Northwest. Large scale natural disturbance events will destroy large blocks of Late-Successional Reserves, especially in the drier provinces, and exacerbate potential island effects. However, the Assessment Team apparently assumed that large reserves could withstand fire events for a sufficient length of time to allow development of adaptive management practices to reduce fire risk. Therefore, due to the risk from fire, the number and size of Late-Successional and Riparian Reserves should be increased.

**Response:** The analyses in this SEIS relied more upon landscape ecology than on island biogeography. The occurrence of natural disturbance events is anticipated and is not expected to cause a decrease in late-successional forests in Late-Successional and Riparian Reserves over the next 150 years. The probability of high severity disturbance events in the drier provinces is expected to decrease as a result of active fire management, including fuel reduction and underburning where appropriate. It is also recognized that disturbance events are important natural processes of the landscape and have a role in ecosystem management.

- **Comment:** Baseline information for the history and current status of old growth is inadequately and inaccurately represented. The lack of information in the Draft SEIS on the fire and logging history

discredits the descriptions and assessments of naturally-functioning systems. The fire history information is incomplete and many documents, such as ethnographies, diaries, historical accounts and General Land Office plat maps, are not included in the analysis or in the bibliography.

**Response:** The broad planning area addressed by this SEIS precludes the use of detailed, site-specific fire history and land-use history information. This type of information will be used, to the extent that it is available, in landscape or watershed-level analysis.

## FIRE EFFECTS

- **Comment:** The needs of all species will be adequately served if ecosystems are managed to emulate the historical environment. An example would be an environment subject to catastrophic events that produce vast areas of early-successional forests.

**Response:** The historical record of forests includes active and effective fire suppression efforts since 1910. Natural, pre-European settlement fire regimes differ considerably from those of the historical period. Although affected by catastrophic disturbance events, late-successional forests were previously more widespread during both the historical period, and before European settlement. The alternatives attempt to increase the amount of late-successional forests by maintaining current stands, and allowing early-successional stands to develop into late-successional forests.

- **Comment:** The effects of slash burning are not the same as the effects of natural fires, because slash burns generate much more heat than wildfires.

**Response:** The two types of fire may have markedly different effects. However, the amount of heat generated by wildfires may exceed that generated by a slash burn. The characteristics of each type of fire (the fire behavior) determine effects on the ecosystem, and can vary greatly across the landscape. A cooler ground fire of prolonged duration can have more severe effects on various organisms, including some tree species, than a hot but rapid fire.

- **Comment:** The mitigations listed for some species groups, such as mollusks, arthropods, and fungi, will severely restrict or curtail the restoration of fire to fire-dependent ecosystems. The terrestrial section does not recognize the different fire regimes throughout the range of the northern spotted owl.

**Response:** The SEIS clearly identifies two broad classes of fire regimes, one common to the moist provinces and the other to the dry provinces. Further identification of fire regimes and the role of fire at the landscape level will be delineated in watershed and province-level planning, and in Late-Successional Reserve and Adaptive Management Area plans. Some species will require mitigating actions to protect them from fire, while mitigation for other species may actually require the use of prescribed fire.

- **Comment:** Intensive burning, such as the use of prescribed fire for site preparation, should be eliminated because it is detrimental to many species of late-successional associated fungi.

**Response:** Generally, prescribed fire prescriptions for site preparation will need to be modified from those previously used to meet objectives for retaining coarse woody debris, snags, and green trees. Prescribed fire prescriptions can also be adjusted where there are late-successional species that are sensitive to fire. In some cases, it may be necessary to preclude the use of prescribed fire, as determined on a site-specific basis.

- **Comment:** Alternative 9 fails to analyze the potential effects of fuel accumulation and distribution, and should address the risks of wildfire in greater detail. Fire behavior and its potential effect on the desired

forest structure should be modeled at the landscape level. Management options and mitigation measures to lower fire risk should be considered and fully disclosed.

**Response:** Appendix B8, Fire Management Standards and Guidelines, has been added to clarify discussions of fuel management, prescribed fire use, and fire suppression. Additional analysis of fire management direction at the landscape level will be addressed in watershed/landscape-level analysis and province-level planning, and in Late-Successional Reserve and Adaptive Management Area plans. Fire behavior analysis is typically quite site-specific, although some general analysis is possible at the landscape level.

- **Comment:** The 1987 fire season in northern California is commonly remembered as a catastrophe. The burns, however, generally created a mosaic of habitat. A majority of the burned areas were only lightly burned, and late-successional forests were least impacted by the burns. Therefore, the reserves should not receive as much restorative management as proposed in the Draft SEIS. The forests that were here at the time of European settlement were apparently healthy without any human intervention.

**Response:** The 1987 fire season, which occurred near the beginning of a long drought, was marked by a large number of wildfires occurring simultaneously in northern California and southern Oregon. A large number of fires occurred in the wildland/urban interface and required many fire suppression resources. The fire season was also exceedingly long. Some fires did burn with varying intensity and severity, while others burned at one extreme or the other. Those forest stands that had large fuel accumulations and/or a dense undergrowth of shade-tolerant species tended to have more severe burns. Currently, large stands in northern California and southern Oregon are experiencing drought-stress and an increase in the number of dead or dying trees. This mortality is due to the combination of climate and overstocking. Restoration will occur in certain areas under the conditions specified in the SEIS. Finally, the forests that were present at the time of European settlement were certainly modified by the American Indians who lived in the region for millennia, thus these forests were not free from human intervention.

- **Comment:** The history of the Douglas-fir forests of the Pacific Northwest is one of fire, followed by even-aged stands of Douglas-fir, followed by fire again. This natural process is best simulated by planned sustainable harvest followed by burning and replanting. An alternative that follows this regime should be considered in order to provide both forests and products.

**Response:** This pattern of fire and regeneration may be applicable in some locations. However, there are more examples of fires that replace only part of the previous stand, or that are predominantly low intensity, understory fires. Even in fires that are periodic and fully stand-replacing, a large amount of coarse woody debris (such as snags or logs) typically remains to fulfill ecological functions in the succeeding stand. Timber harvest removes a large amount of biomass from the site. Slash burning may remove a considerable amount of the remaining biomass, depending on the conditions of the prescribed burn. While this may be an appropriate management strategy on some sites within some land allocations, it clearly does not meet the ecosystem management objectives for all sites and land allocations.

## AIR QUALITY

- **Comment:** The Draft SEIS does not assess the potential air quality impacts from prescribed burning. There is no discussion of consistency with state smoke management plans or compliance and conformity with state implementation plans. The Clean Air Act provisions concerning Prevention of Significant Deterioration, National Ambient Air Quality Standards, and visibility protection of Class I areas are likewise neglected. Another and greater concern is the potential impact on airsheds that are already in nonattainment status. The Final SEIS needs to fully discuss and disclose potential impacts,

seasonality of impacts, alternative fuel treatment options, monitoring, and smoke dispersion from lower intensity underburns.

**Response:** An Air Quality Analysis section has been added to Chapter 3&4 of this SEIS in response to this concern.

- **Comment:** Disclosure of air quality effects should be included in the Final SEIS. This should include a departure from previous forest management practices, including the increased reliance on prescribed underburning. Management activities can be used in some cases to reduce the risk and effects of major catastrophic events and to accelerate the development of desirable ecosystem conditions. While it is recognized that prescribed fire may be important to ecosystem health, compliance to existing regulatory issues must be addressed. Clear implementation direction should be provided in the Final SEIS and/or subsequent planning levels to ensure that management decisions reflect an acceptable range of natural disturbance events, habitat type representation, and successional stages. Both past and potential events should be addressed.

**Response:** An Air Quality Analysis section has been added to Chapter 3&4 of this SEIS in response to this concern.

- **Comment:** The Final SEIS should include: (1) an assessment of the need for burning, compared to alternative treatments; (2) quantification of the acreage to be burned; (3) a description of the type(s) of burns proposed; (4) a description of emission reduction measures; (5) quantification of emissions of regulated pollutants (PM10 from prescribed burning in the planning area); (6) a description of the applicable regulatory requirements, including smoke management plans; (7) a qualitative discussion of air quality impacts that focuses on new or increased impacts on downwind communities, and visibility impacts in Class I areas; and (8) modeling of downwind concentrations of pollutants to document compliance, if a suitable model is available prior to completion of the Final SEIS.

**Response:** An Air Quality Analysis section has been added to Chapter 3&4 of this SEIS in response to this concern.

- **Comment:** Slash burning causes air pollution and destroys the organic matter that aids in moisture retention.

**Response:** The Air Quality Analysis section in Chapter 3&4 of this SEIS addresses the basis for using prescribed fire in ecosystem management. In particular, the emphasis has shifted from higher intensity prescribed fires in clearcut harvest units ("slash burns") to other types of prescribed fire to meet a variety of ecosystem management objectives.

## AMERICAN INDIAN USE OF FIRE

- **Comment:** The use of prescribed fire should follow what American Indians practiced in the region for millennia. These methods should follow the seasonality, intensity, duration, and frequency of burning that peoples of indigenous tribes developed to suit the natural, complex assemblages of species over long periods of time within each site or ecotype. Local information from Indians as well as ethnographies should be considered rather than relying solely on fire scars, which typically would not record light underburns. Without an understanding of the burning objectives and strategies of American Indians, it is impossible to reconstruct past conditions throughout most of the planning area. Artificially high fuel loadings found in many forests today, however, may dictate an alternative interim strategy to reduce fuels before American Indian burning patterns can be implemented.

**Response:** Various characteristics of a fire regime, including season of a burn, intensity, duration (both at the site and the course of the fire), frequency, and scale, are all important variables to consider when developing fire management plans. However, this type of information is site or landscape specific, and can only be considered at the watershed, province, Late-Successional Reserve, or Adaptive Management Area levels. It may not always be possible to determine American Indian objectives for burning in specific areas, thus information may need to be collected from other sources such as similar and adjacent areas or from biological or physical records. The land-use objectives of American Indians may not be identical to the ecosystem management objectives of this SEIS. Furthermore, decades of fire suppression and other management practices have changed vegetation types and increased fuel loading, especially in the drier provinces. The Final SEIS clarifies some of the considerations that will be included in the development of fire-management plans.

- **Comment:** The FEMAT Report and the Draft SEIS ignore the importance of the use of fire by native peoples. At the time of European settlement, American Indians were the dominant force responsible for creating and maintaining forest ecosystems in the region.

**Response:** The extensive use of fire by American Indians is addressed in various sections of Chapter 3&4 of the SEIS.

## FIRE SUPPRESSION AND PRESCRIBED FIRE OPERATIONS

- **Comment:** Wildfires are more difficult and dangerous to suppress in areas where snags and other coarse woody debris are abundant and well distributed across the landscape. The safety of firefighters is compromised when medium to large-sized snags exceed three per acre. Snags and logs increase the difficulty of fire suppression because they contribute to spot fires and decrease the rate at which firelines can be constructed by firefighters. This may result in larger fires under some conditions.

**Response:** The safety of firefighters is a primary concern during both fire suppression activities and the use of prescribed fire. Appendix B8, Fire Management Standards and Guidelines, addresses these concerns and the use of Resource Advisors to assist fire managers in making decisions during wildfires. Fire suppression strategies may need to be modified as a result of safety hazards, and under certain conditions fires may become larger. Over time, it is expected that prescribed fire management may assist in fire suppression by removing hazardous fuel accumulations. Furthermore, these issues may be addressed in advance of wildfire occurrences in fire-management plans.

- **Comment:** Underburning as a fuel reduction technique is difficult to implement when large amounts of coarse woody debris and snags are retained. Prescriptions will be narrow, requiring multiple treatments on a given site. The most likely time of year to conduct underburning is in the spring and early summer when fuel moisture conditions are optimal, yet this coincides with the nesting period of spotted owls.

**Response:** This concern has been addressed in the Air Quality Analysis section of Chapter 3&4 and in Appendix B8, Fire Management Standards and Guidelines. The operational difficulty of conducting prescribed burns is acknowledged. The interdisciplinary approach of ecosystem management will facilitate recognition of spotted owl nesting sites; wildlife biologists will provide information to avoid negative impacts to spotted owls.

- **Comment:** Fuelbreaks are useful as anchor points and holding lines when conducting prescribed burns, yet are of limited value as a fire control strategy. For example, when fire crews can be positioned on the fuelbreaks during the course of a fire, they become more useful in fire suppression. However, with the added demands of fire suppression resources in the wildland/urban interface, crews may often not be available for monitoring and control actions during a fire. Therefore, it is imperative that large areas of the forest be managed in a manner that allows these areas to survive wildfire without the benefit of direct fire suppression concentration.



**Response:** In response to this concern, the fuel management emphasis of the Final SEIS has been clarified. The objective is to produce large areas of reduced fuels rather than narrow fuelbreaks. This strategy is also more compatible with other ecosystem management objectives, such as maintaining connectivity.

## NATURAL DISTURBANCES OTHER THAN FIRE

- **Comment:** The SEIS does not address the risk associated with blowdown. Timber harvest around Late-Successional Reserves should be reduced to protect peripheral areas from wind damage.

**Response:** The distribution and size of Late-Successional Reserves enable stands to tolerate disturbance events. For more discussion on this topic see Chapter 3&4, under Projections of Forest Development in Late-Successional and Old-Growth Forests Over Time.

- **Comment:** The SEIS does not address forest health related concerns of decay and insect infestation that threaten the ecosystem.

**Response:** This SEIS addresses many aspects of ecosystem health. Decay and insect infestation and other forest health concerns are addressed in discussions on restorative silviculture and prescribed underburning in several sections, including Appendix B2, Ecological Principles for Management of Late-Successional Forests, and Appendix B5, Recovery Plan Standards and Guidelines.

- **Comment:** The full range of expected disturbance processes (seismic, landslide, fire, flood, and drought) need to be described for the planning area, as well as their impacts on each of the alternatives. Each of these disturbance processes has the potential to affect species with small populations.

**Response:** The distribution and size of Late-Successional Reserves enable stands to tolerate disturbance events. For a general discussion of disturbance, see Chapter 3&4, Regional Introduction and Description of Terrestrial Forest and Aquatic Ecosystems. For effects on the ecosystem, see Chapter 3&4, Projections of Forest Development in Late-Successional and Old-Growth Forests Over Time; and Appendix B5, Recovery Plan Standards and Guidelines.

## Silviculture

The following comments and responses address probable sale quantity (PSQ), silvicultural activities in reserves and the matrix, other silvicultural alternatives, and miscellaneous concerns about harvest rotation, thinning, growing trees, and salvage.

### PROBABLE SALE QUANTITY (PSQ)

- **Comment:** The land allocations and standards and guidelines for the alternatives, when added to those in Forest and District Plans, leave only a fragmented matrix for regulated, sustained timber harvest that is technologically and economically inoperable.

**Response:** These concerns were recognized in the calculation of probable sale quantity (PSQ). An assessment of inoperable lands based on technical feasibility was done and inoperable acres were factored into PSQ calculations (Johnson et al. 1993). Also, areas farther than 2 miles from an existing road were considered to be economically infeasible. While timber sales are expected to remain economical overall, some sales and harvest of low value forest products may become economically infeasible. The projected increase in timber prices (FEMAT Report, Table VI-10, p. VI-21) will tend to offset increases in sale costs. Currently, "below-cost sales" within the range of the northern spotted owl are very rare and are expected to remain so, especially given the projected increase in stumpage values.

- **Comment:** The level of timber sales in the short term is stated to differ from long term sustainable levels due to the time required to prepare sales that conform with the chosen alternative. Please clarify the reasons for this expected delay.

**Response:** The timber volumes presented as the PSQ are the long-term sustainable level of harvest. In the first years after an alternative is adopted, timber sale quantities will likely be substantially less than the calculated sustainable level due to a number of factors:

1. Timber sales in spotted owl habitat cannot be sold until court injunctions (in *Seattle Audubon Society v. Lyons*, *Lane County Audubon Society v. Armstrong*, and *Portland Audubon Society v. Babbitt*) are lifted. Additional litigation on this decision, on related biological opinions, or on projects could cause additional delay.
2. The agencies will need time to design timber sales that conform to the new land allocations and standards and guidelines of the selected alternative. Agency resources will be strained during this period due to recent reductions in force, efforts to begin the Regional Interagency Ecosystem Committee and other interagency groups, and efforts to design and implement watershed assessments. The watershed restoration projects and other non timber projects will also need to be staffed by the agencies.
3. Timber sales in key watersheds must await the completion of watershed analysis. Timber sales in non-key watersheds are restricted in that roads cannot be constructed through riparian reserves until a watershed analysis is completed. Watershed analysis procedures must be refined and agency staff trained.
4. Before timber sales can be designed, the boundaries of riparian reserves and other land allocations must be established.
5. Salvage or thinning in Late-Successional Reserves must be based on development of an approved plan for the Reserve.
6. Timber sales offered by the Forest Service must await a 30-day public comment period on the NEPA document, a 45-day appeal period of the timber sale decision, and a 45-day appeal processing period. Timber sales offered by the BLM must await a 30-day comment period on the NEPA document, a 30-day period for filing of a notice of appeal following the decision on the protest, and if an appeal is filed a stay is requested, there is an additional 30-day period to consider the stay requests.
7. Additional procedures may be required by the Endangered Species Act for some timber sales. Timber sales may need ESA consultation where they may affect northern spotted owls, marbled murrelets and other listed species. Conferencing may be required for any proposed listing or designation of critical habitat. Timber sales in coastal areas will need to await the completion of surveys for marbled murrelets, which may take 3 years or more.
8. Required surveys for species listed in Appendix B4 and B11 must be completed.

- **Comment:** The PSQ should be reduced from 1.2 billion board feet to 750 to 800 million board feet per year to compensate for years of overcutting. A probable sale quantity (PSQ) of 1.2 billion board feet is not sustainable.

**Response:** Calculation of PSQ is based on existing forest inventories and growth projections and reflects past harvesting and reforestation activities. PSQ is calculated for all alternatives under a nondeclining yield constraint, which means that the sale level must be able to be maintained indefinitely without a decline in any decade, and must not exceed long-term sustained yield capacity.

- **Comment:** The SEIS should make it clear that the calculation of any probable sale quantity is not consistent with managing ecosystems. The estimates of available timber should not be used as a management goal.

**Response:** Probable sale quantity is an estimate of how much timber volume can be harvested on a sustained-yield basis from lands classified as suitable for timber production. A sustainable, predictable sale level is one objective of a balanced ecosystem management plan.

- **Comment:** The PSQ should reflect all the volume that may be harvested and not just that from "regulated" lands in the matrix.

**Response:** PSQ, however, is based only on timber yields from suitable lands in the matrix and in Adaptive Management Areas where the objectives of managing the land include the production of timber yields. Harvest from unregulated lands, such as Late-Successional Reserves, is not reflected in the PSQ because the harvest is not planned on a regular or sustained basis. Harvest in these areas occurs to further the objectives of the land allocation. The SEIS indicates that an additional volume of 100 to 170 million board feet per year might be obtained from thinning, salvage, and other treatments to areas other than those managed for a regulated, sustained yield of timber. Probable average annual sale quantities (Tables 3&4-43 and 3&4-44) are net volumes and do not include "other wood". Other wood is the volume of cull (wood that is decaying or too crooked for processing), submerchantable size material, or other products not considered as merchantable and not normally part of allowable sale quantity calculations. Historically, other wood has accounted for about 10 percent of the total harvest volume from timber suitable federal lands in the planning area. Figure 3&4-16 does include an additional 10 percent of PSQ as other wood.

- **Comment:** The Draft SEIS preferred alternative PSQ of 1.2 billion is not realistic for many reasons: (1) roughly 1 million board feet of the 1.2 billion is cull; (2) matrix lands in Key Watersheds cannot be cut before a watershed analysis is complete; (3) surveys for the marbled murrelet are not complete in Zones 1 and 2, and additional activity centers may be discovered on matrix lands; (4) the designated Riparian Reserves cannot be altered and roads may not be constructed through them without completion of watershed analysis; and (5) the matrix lands are highly fragmented by fingers of Riparian Reserves, thus making many of these areas infeasible for timber harvest.

**Response:** The PSQ for Alternative 9 in the Final SEIS is 958 million board feet. An additional 10 percent of "other wood" (cull, submerchantable material, and other products) was added to the 958 million to reflect the historical average of "other wood" sold in timber sales (total volume 1.1 billion board feet). The 10 percent of "other wood" is from matrix lands. It is true that the need to do watershed analysis and marbled murrelet surveys prior to selling timber lends uncertainty to the PSQ, and this is acknowledged in the SEIS. The possibility that fragmentation of the matrix by Riparian Reserves would affect PSQ was considered by the Assessment Team and an operability analysis was done. The suitable land base was reduced for calculation of PSQ as a result of this analysis (see Table 8 in Johnson et al. (1993) for percentage reductions by administrative unit). Determination of the extent of the Riparian Reserves will be based on the results of watershed analysis.

- **Comment:** Harvest yields should not exceed the lesser of biological sustainability or market demand. Constant analysis of biological and economic factors are needed to ascertain appropriate harvest levels.

**Response:** The 10 alternatives considered in detail in this SEIS were developed to provide for late-successional forests and the species associated with them, and to produce a predictable and sustainable level of timber harvest. Analysis of ecological and economic factors (primarily in terms of timber harvest levels) were used in determining probable sale quantities. Further analyses will be done in the course of developing annual sale programs and during preparation of individual timber sales. Information from monitoring and evaluation will be used to adjust future plans as needed.

- **Comment:** The inventory of standing timber must at least remain constant on areas outside reserves. Timber resources should be grown and not simply harvested.

**Response:** Lands in the matrix and in Adaptive Management Areas for which timber production is scheduled will be harvested and reforested on a sustainable basis. Over the long term, net growth will exceed harvest and inventories will accumulate.

- **Comment:** It is inappropriate to compare the projected harvest levels for the 10 alternatives to harvest levels of the 1980's. Harvest levels for the decade of the 1980's are overestimated because 9 billion board feet of timber was sold twice and therefore counted twice. Removing this amount leaves a decadal average of 2.7 billion board feet per year.

**Response:** Projected harvest levels for the alternatives in the SEIS are compared to the actual harvest levels of the 1980's and not to sale levels. Harvest volumes are reported only once, when the harvest occurs.

- **Comment:** The use of probable sale quantity (PSQ) rather than allowable sale quantity (ASQ) does not meet the objective of a predictable and sustainable level of timber harvest.

**Response:** One objective of the alternatives is to produce a stable and predictable harvest level. However, Johnson et al. (1993) stated that the goal of a predictable and sustainable harvest level will be difficult to reach under most of the alternatives. The laws governing management of federal lands require protection of threatened species and their habitat. While harvest levels are planned at sustainable levels, the term "probable sale quantity" is used to acknowledge the uncertainty in the calculations.

- **Comment:** The PSQ should be based on "net cruised" volumes, not on "gross cruised" volumes.

**Response:** PSQ is based on "net" conifer volumes. Reported volumes do contain a 10 percent addition, in some cases, to reflect the historical level of cull, submerchantable material, and other products (other wood) included in timber sales from suitable lands. Where this 10 percent is included, it is noted as an addition to the PSQ. The PSQ of 1.1 billion board feet for Alternative 9 (Final SEIS) includes this 10 percent of other wood.

- **Comment:** The requirements of the Forest Plans and BLM Resource Management Plans to meet visual quality and other management objectives should be included in calculations of PSQ.

**Response:** These Forest and District Plan requirements are included. In calculating PSQ, the land allocations and standards and guidelines of a given alternative were overlaid on current plans or draft plan preferred alternatives. Therefore, the effects of management objectives in these plans, such as visual quality, are reflected in the calculation of PSQ.

- **Comment:** If Adaptive Management Areas are intended to serve local small businesses, short and long-term strategies for project development in these areas should be designed to produce some level of consistent timber harvest of specific log types with timely delivery.

**Response:** A consistent, sustainable level of timber harvest that is compatible with local conditions and needs is an objective of many of the Adaptive Management Areas. These areas are intended to be demonstration areas of how timber-dependent communities might be sustained by resources on federal lands. Local businesses will have the opportunity to participate in developing management strategies for the Adaptive Management Areas.

- **Comment:** The continual division of the federal forests into two portions, one half for commodities and one half for preservation, will result in no late-successional forests.

**Response:** The history of land allocation in the federal forests since the 1960's has been one of continual additions to Wilderness and administrative withdrawals from timber production. Currently, 48 percent of the forested lands on federal forests in the planning area are classified as late-successional forests

(Johnson et al. 1993). Under Alternative 9, for example, less than 20 percent of the total acres on federal forests and approximately 15 percent of the acres of late-successional forests are available for regulated, sustainable timber production

- **Comment:** Forest Service harvest levels for the 1980-89 period are not record highs. Average harvest levels of the 1960's and 1970's were higher than during the 1980's and should be used as the base years for analysis of consequences. Timber-dependent workers and communities are being impacted because of high cuts in the past relative to sustained yields.

**Response:** The decade of the 1980's best reflects the harvest levels that are relevant today, although those levels are less than those of the 1970's. Harvest levels for federal forests are calculated on a nondeclining, sustained-yield basis and have not been higher than sustainable levels in the past. However, when the amount of land available for production of timber products or the objectives of management (and the resulting standards and guidelines) on these lands change, then allowable sale levels also change.

- **Comment:** The timber inventory system used by federal forests should be documented and results made available to the public.

**Response:** The inventory system and growth models are documented and are available to the public. The results of forest inventories (both the data and summary reports), as well as growth projections, are also available at unit offices or at BLM State or Forest Service Regional Offices.

- **Comment:** The FEMAT Report and the Draft SEIS do not contain data on current or historical timber inventories for the federal forests of the region. Therefore, it is impossible to determine if proposed harvest levels are sustainable.

**Response:** The inventories and growth projections for the federal forests are not presented in this SEIS but are available at unit offices or at BLM State or Forest Service Regional Offices.

- **Comment:** Probable sale quantity is presented at such a broad geographical scale that evaluation of impacts on specific areas or counties is impossible.

**Response:** Probable sale quantities are presented by National Forest and BLM District in Table 3&4-44 of this Final SEIS and in Johnson et al. (1993). PSQ for the various units is subject to revision during amendment of unit plans.

- **Comment:** It is improper to claim that existing Forest Service management plans significantly overestimated the amount of timber available for harvest, and that these plans prescribed harvest levels that could not be sustained. Harvest levels in previous plans were sustainable, given the land base allocated to the production of timber. National Forest Management Act (NFMA) planning regulations require timber harvest schedules to be calculated under "nondeclining, even-flow" constraints.

**Response:** The objectives of the alternatives considered in this SEIS, as reflected in their land allocations and standards and guidelines, are generally different from those in current plans and draft plan preferred alternatives. One result is a change in PSQs.

- **Comment:** Among the factors limiting the first decade ASQs for Forest Plans is the fact that the National Forests have an unbalanced age-class distribution. Under the nondeclining harvest constraint, withdrawing a large number of additional acres for Late-Successional and Riparian Reserves will exacerbate the effects of this unbalanced age-class distribution.

**Response:** It is true that withdrawals will exacerbate these effects. The calculation of ASQ for Forest or District plans or PSQ for the alternatives is a function of many variables including the age-class distribution on the forest.

- **Comment:** The PSQ for Alternative 9 is significantly understated. The yield equates to an average of approximately 260 board feet per acre per year. Based on previous estimates of growth and yield for suitable acres in the Pacific Northwest Region of the Forest Service, fully stocked stands on average sites are capable of producing 95 cubic feet per acre per year or approximately 450 board feet per acre per year. Based on this data and allowing for a 15 percent reduction in mean annual increment for green tree retention, fully stocked stands should be capable of producing 80 cubic feet per acre per year or approximately 382 board feet per acre per year. This would yield a PSQ of approximately 1.56 billion board feet per year from the suitable lands in the matrix. Other silvicultural treatments could raise yields considerably. Final decisions about PSQ levels should be based on forest-by-forest analysis and projection as required by both NFMA and FLPMA planning processes.

**Response:** The PSQ for an administrative unit is the result of the interaction of many variables. In general, PSQ depends on the number of acres allocated to sustained-timber production; the current inventory, growth, and age-class distribution on the acres allocated; and the standards and guidelines that apply. Not all lands in the matrix are suitable and not all suitable lands are managed for full yields. Suitable lands include land where timber yields are planned on a sustained yield basis but at low levels compared to the potential of the site because of considerations for other resource values such as visual quality and wildlife habitat. Also, long-term sustained yields are often higher than first decade PSQ because of existing age-class distribution, slow growth rates of older stands, and other reasons. The PSQ for the alternatives are presented by administrative unit in Johnson et al. (1993) and in this Final SEIS in Table 3&4-44. PSQs are subject to revision during amendment of unit plans or completion of draft plans.

- **Comment:** Timber harvest should be scheduled on units larger than National Forests and BLM Districts.

**Response:** Determination of allowable sale quantities is required by the National Forest Management Act for established National Forests. The Oregon and California Lands Act (O&C Lands Act) authorized the establishment of sustained-yield units for the BLM. Also, PSQ would not necessarily increase due to an increase in scheduling options on larger areas because constraints on harvest rates in watersheds for visual and water quality reasons would still apply.

- **Comment:** Explain how a program that proposes to harvest only a fraction of the current wood growth and less than 10 percent of the wood-growing potential of the land can meet the requirement of the Multiple-Use Sustained-yield Act that directs the Forest Service to manage National Forests on a sustained-yield basis. Sustained yield is defined as a "high-level", regular periodic output of the various renewable resources of the National Forests without impairment of the productivity of the land.

**Response:** The land allocations and standards and guidelines of the alternatives in this SEIS were developed to meet the objectives established at the President's Forest Conference. The alternatives provide for different balances among forest values while meeting all of the objectives to some degree. This is what is required under the Multiple- Use Sustained- Yield Act.

- **Comment:** The harvest level of the 1980's is reported as 5.6 billion board feet in one place in the Draft SEIS and in other places as 4.5 billion board feet Please clarify this.

**Response:** The text in the Final SEIS has been clarified. The 5.6 billion board feet applies to federal forests in the area evaluated for social and economic effects. Social and economic data are available by

county so the study area included entire counties that are only partially within the range of the northern spotted owl. Harvest levels therefore are reported from some federal forest lands that are outside the range of the northern spotted owl. The 4.5 billion board feet reflects harvest levels from federal forests that are within the range of the northern spotted owl.

- **Comment:** The reduction in PSQ between Alternative B of the 1992 Final Environmental Impact Statement on Management for the Northern Spotted Owl and Alternative 7 in the Draft SEIS is not well explained.

**Response:** The reasons for the reduction are explained in Johnson, et al. The primary reasons are a reduction in land base due to more acreage being added to designated conservation areas for northern spotted owl, to greater protection for late-successional species and stream habitat in new draft Forest Plans in Region 5 and BLM District Plans and to reductions in PSQ based on Forest Service experience in implementing the Chief's ecosystem management policy.

- **Comment:** PSQs are based on unproven coefficients for silvicultural practices and on total production which leads to overestimation of sustainable harvest levels.

**Response:** Standard techniques employed by the federal forests were used to calculate PSQs under the various alternatives. Current forest inventory data was used. Inventories are updated on a regular basis as part of Forest and District Plan monitoring and to provide information for new or revised plans. Formulas used to project growth are based on research and empirical information from forest inventories. Total production is not included in PSQ calculations. The PSQ reflects net volume and does not include cull or submerchantable-sized material or tree species considered generally unmerchantable, such as hardwoods.

- **Comment:** Alternative 9 should not provide federal subsidies to increase harvest levels on American Indian tribal lands in order to make up for reduced harvest levels from the federal forests.

**Response:** The harvest levels from tribal and Indian owned lands is beyond the scope of this SEIS. The management of these lands, including the level of harvest, is a matter determined by tribal councils.

- **Comment:** The Federal Government should not plan on meeting the demand for wood products by increasing harvests from eastside forests because of reductions in supply from the forests within the range of the northern spotted owl.

**Response:** Harvest levels on federal forests outside the range of the northern spotted owl were not considered in this SEIS.

- **Comment:** The PSQ cannot be considered stable and predictable unless the land management agencies are committed to an adequate level of funding.

**Response:** The funding level of the agencies is determined by yearly budgets developed by the administration and approved by Congress. Funding for the land management agencies is outside the scope of this SEIS.

## SILVICULTURAL ACTIVITIES IN RESERVES

- **Comment:** Salvage in the reserves should be encouraged to support local economies and provide raw materials for public use. The definition of "salvage" in the Draft SEIS is too narrow and leaves no opportunity for salvage of endemic mortality.

**Response:** Salvage in Late-Successional Reserves is allowed in all alternatives except Alternative 1, but the objectives of the reserve must be met. Snags and large down logs are important components of late-successional forests, and salvage of endemic mortality should not remove these components. Guidelines for salvage of dead trees are adapted from the Final Draft Northern Spotted Owl Recovery Plan (USDI unpub.).

- **Comment:** The age-based limitation on thinning in Late-Successional Reserves should be changed, given the wide variety of forest types, site productivity and ecosystem conditions found on federal forests within the range of the northern spotted owl.

**Response:** The general ecological basis for forest management is discussed in Appendix B2, Ecological Principles for Management of Late-Successional Forests, of this SEIS. The Late-Successional Reserves are designated to provide late-successional forest habitat where natural processes and functions are the primary factors in forest change. For example, under Alternative 9, the 80-year limitation on thinning applies to forests west of the Cascade Range. The mature stage of stand development in Douglas-fir stands west of the Cascade Range typically begins between 80 and 140 years, depending on site conditions and stand history. As a working definition, all forests with dominant overstory trees at least 80 years old are considered late successional. East of the Cascades and in the Klamath Province, ecological differences, including the increased risk of fire, were considered. Silvicultural guidelines for these provinces are adapted from the Final Draft Northern Spotted Owl Recovery Plan (USDI unpub.).

- **Comment:** The chosen alternative should specify the thinning specifications to be applied in Late-Successional Reserves.

**Response:** The thinning prescriptions to be applied will be developed by local interdisciplinary teams to meet the objectives of the reserves and will be subject to review by the Regional Ecosystem Office. The great variety in the ecosystems and forest conditions precludes use of a single prescription in all cases.

- **Comment:** The Draft SEIS failed to address the increased risk of catastrophic loss in Late-Successional Reserves due to wildfire, storm damage, disease and insect infestations, or other natural disasters. If the land in protected reserves is not replaced by disturbances such as fire, the structure and composition will likely change to something that has not existed in the past. An independent assessment of risks should be made.

**Response:** The Late-Successional Reserves are designated to provide late-successional forest conditions as a result of natural processes. The possibility of disturbance, such as fire, is recognized and considered to be a part of the natural functioning of these ecosystems. However, the Guidelines to Reduce Risks of Large Scale Disturbance in Appendix B5 have been revised to state that activities in older stands may also be undertaken in Late-Successional Reserves in provinces other than those east of the Cascades if levels of fire risk are particularly high. However, changes due to other factors, such as climate change or the introduction of an exotic insect or disease, will tend to produce forests with new and different structures and species composition.

## SILVICULTURAL ACTIVITIES IN THE MATRIX

- **Comment:** Salvage and thinning should be limited to areas in the matrix that have been previously logged and then only with the approval of independent scientists who have determined that these activities will improve habitat for old-growth dependent species.

**Response:** Under all alternatives, a variety of silvicultural treatments other than thinning and salvage are available for use in the matrix in order to achieve all of the objectives of the alternative. Forests



protected in reserves and other withdrawn areas will provide for the maintenance or enhancement of late-successional forest ecosystems.

- **Comment:** The silvicultural method of "thinning from below" should be used on lands outside reserves. It would reduce fire hazards and provide an alternative to clearcutting.

**Response:** Thinning from below is one of the silvicultural methods that will be used.

- **Comment:** To grow timber beyond the age of the culmination of mean annual increment (CMAI) is probably not economical. Alternatives should be considered with harvest rotations of about 80 years.

**Response:** Extending the rotation age beyond CMAI can help achieve other resource objectives. Development of late-successional forest conditions usually occurs beyond the age of the CMAI. Also, the premium price for larger logs with clear wood may make rotations beyond the age of the CMAI more economical.

- **Comment:** Timber harvest in areas adjacent to reserves should be reduced so as not to damage the entire ecosystem.

**Response:** The land allocations and standards and guidelines in the alternatives are intended to provide for late-successional forests and the species associated with them. The standards and guidelines in the alternatives and direction in current plans and draft plan preferred alternatives are designed to prevent damage from timber harvest and to maintain elements of late-successional forests across lands suited for timber management in the matrix.

- **Comment:** Clearcutting should be stopped and selective cutting should be used. This will prevent erosion and the muddying of streams.

**Response:** The harvest method selected for a given stand is based on site-specific analysis by an interdisciplinary team to meet the objectives for the area. Given the ecological diversity in the federal forests, limiting harvest to any single method in Forest or District Plans is not recommended. The analysis required to specify harvest method requires a level of detail inappropriate for this programmatic SEIS.

- **Comment:** Matrix lands should be managed on rotations that are based on fire history.

**Response:** Harvest rotations are chosen to meet standards and guidelines designed to achieve stated objectives, and apply only to those parts of the matrix where regulated, sustained harvests of timber are planned. Ecological conditions, including fire history, are considerations in determining rotations, as are stand growth, desired products, and economics.

- **Comment:** Alternative 9 prescribes even-age management and clearcutting, with 15 percent retention of green trees, in the matrix. Management using the even-age system is not consistent with the intended function of the matrix. The silvicultural system that should be used in the matrix is uneven-age management that retains all species. The maximum age of trees should be set at 250 years or the maximum age of each species found in the native, old-growth forest. If this standard and guideline is not adopted for all matrix lands, then green-tree retention in harvest units should equal 30 percent or more of the volume in the harvest unit.

**Response:** The silvicultural system to be used on matrix lands, where regulated yields of timber are planned, is not specified under Alternative 9, and requires a level of detailed analysis that is inappropriate for this programmatic SEIS. The Assessment Team recognized that a variety of

silvicultural treatments were necessary to meet the great variety of ecological conditions found throughout the range of the northern spotted owl. Forest or District Plans consider the silvicultural systems to be used and project plans develop prescriptions for site-specific cases. Standards and guidelines for Alternative 9 do require retention of green trees in harvest units in the matrix to provide fragments of late-successional forest and biodiversity.

- **Comment:** Retention of 15 percent of the volume in harvest units will lead to the perpetuation of disease (e.g., dwarf mistletoe, laminated root rot), making reestablishment of trees, especially of desirable species, difficult or impossible. Land managers need to be able to manage for desired conditions and not be constrained to follow a mandated prescription.

**Response:** The objective of green-tree retention is to provide late-successional forest structures in the matrix. Forest disease is considered part of the late-successional forest condition. The layout of harvest units and the choice of species for reforestation are possible solutions to preventing the spread of disease to other parts of the stand. Where such solutions are not possible, proposals outside the standard and guideline may be considered on a site-specific basis by the Regional Ecosystem Office.

- **Comment:** Green trees left in groups and singly in the matrix will be isolated from other late-successional stands. Their effectiveness as components of a late-successional forest will be reduced because of small size and the resulting edge effect.

**Response:** The objective of green-tree retention on suitable lands in the matrix is not to provide for fully functioning late-successional forest stands but to provide for biological legacies and late-successional components.

- **Comment:** There is no biological justification for the regionally-specific guidelines for green-tree retention in the matrix.

**Response:** The standard and guideline for green-tree retention is designed to provide a minimum of late-successional forest structures on lands suitable for timber production within the matrix.

- **Comment:** The SEIS should specify the spatial pattern of harvest that may take place in the matrix and the prescribe selection priorities with regard to types and ages of forest.

**Response:** Spatial patterns at the watershed level and priorities for harvest at the project level require detailed analysis that is inappropriate for this SEIS. Forest and District Plans include standards and guidelines for spatial patterns and priorities for stand selection at the forest or landscape level. These standards and guidelines are considered during watershed analysis and during implementation following project-level planning. Also, given that the majority of the landscape, on average, is not available for timber harvest (less than 20 percent in Alternative 9), the opportunity to influence patterns is reduced.

- **Comment:** Modify Alternative 9 to provide for the retention of snags and coarse woody debris in the matrix after timber harvest.

**Response:** The standards and guidelines for retention of snags and coarse woody debris in the matrix were modified under Alternative 9 in the Final SEIS (see Appendix B11 for details).

- **Comment:** The matrix standards and guidelines for northern California are inconsistent with the concept of ecosystem management. To use a single rotation of 180 years for conifers and 100 years for hardwoods fails to recognize the great variety of forest types and conditions in northern California. A

more appropriate approach would be to focus on structural control. This would focus on end results (desired forest structure) rather than the means of how to get there. The Forest and District Plans have rotations that were set to achieve management objectives for various land allocations. These varying rotations should be taken into consideration.

**Response:** In the FEMAT Report and the Draft SEIS, the 180-year rotation on lands in the matrix that are to be managed for regulated and sustainable timber harvests was applied only to National Forests in northern California under Alternative 9. Based on comments received, a comparative analysis was done that considered the effects on forest structure and the number of acres in late-successional condition under the 180-year rotation, compared to the rotations outlined in the Draft Forest Plans. The acres of forest in various seral stages currently found in the northern California National Forests were listed and then projections were made over a 150-year planning period. This analysis indicated little difference in the amount of acreage in each seral stage over time as a result of the 180-year rotation. Based on this analysis, the 180-year rotation standard and guideline no longer applies to National Forests in northern California. The rotations in Forest Plans are to be applied instead. This approach is consistent with that taken for rotation lengths on other federal forests. Rotations in Forest Plans are variable to accommodate the variety in forest ecosystems and scope of management objectives. The 100-year rotation for hardwood forests under Alternative 9 was also dropped in deference to Forest Plan standards and guidelines. The Forest Plans do not include a regular harvest of hardwoods. Therefore, hardwood volume is not included in the calculation of PSQ.

## OTHER SILVICULTURAL ALTERNATIVES

- **Comment:** An alternative that would manage all forested land outside Congressionally Reserved Areas on a rotation of 250 to 300 years should be considered. This alternative would produce and maintain more acres of late-successional forest than any of the alternatives considered, and would also produce more timber. Additionally, thinning throughout the extended rotation would produce a substantial annual harvest.

**Response:** There is much debate over how best to perpetuate late-successional forest ecosystems. Some scientists advocate active management while others prefer to rely on natural processes. The alternatives considered in this SEIS are based on a network of reserves with the objective of protecting late-successional forest conditions and the species associated with them. In these reserves, "natural" conditions, patterns and processes are to be allowed to operate with a minimum of human intervention. Regulated, sustainable timber yields are planned only from suitable lands within the matrix and, for Alternative 9, Adaptive Management Areas. Research will continue to focus on this question. Also, some of the lands within Adaptive Management Areas may be used to test a long rotation approach.

- **Comment:** A minimum 180-year timber rotation should be applied to all nonreserve lands. A harvest rotation of 100 years or less will not produce old-growth forests.

**Response:** The reserve system is designed to provide a high likelihood of maintaining and enhancing late-successional forest ecosystems. The majority of forested lands (more than 80 percent in Alternative 9) are in reserves or withdrawals. In addition, retention of green trees in cutting units, snags and down logs in the matrix, and the location of Riparian Reserves will provide some elements of late-successional forest structure throughout the federal forests. Given these and other protective measures, it was not necessary to also specify extended rotations on nonreserve lands. Also, the objective in the matrix is not to provide fully functioning late-successional forest stands but to provide biological legacies and late-successional components.

- **Comment:** An alternative should be considered that would provide sustainable harvest levels for matrix lands and leave the reserves entirely to natural processes.

**Response:** Alternative 1 in this SEIS essentially proposes this management strategy.

- **Comment:** A gap analysis should be done and an alternative designed that will minimize fragmentation of remaining late-successional forests. A new PSQ should be calculated based on this analysis.

**Response:** The arrangement of late-successional forests across regional and provincial landscapes was considered in designing the alternatives. In Alternative 9, for example, Late-Successional Reserves combined with Riparian Reserves, Congressionally Reserved Areas and Administratively Withdrawn Areas amount to more than 80 percent of the forested lands on federal forests. Outside reserves and withdrawals, approximately 65 percent of the land in the matrix is available for the sustained production of timber products. On these lands where a sustained harvest is planned, standards and guidelines provide for the retention of late-successional forest fragments. These land allocations and standards and guidelines are considered to be sufficient to provide for late-successional forest conditions.

- **Comment:** The amount of timber that can be harvested should be regulated as a function of percent of inventory.

**Response:** The complexity of the issues, the variety of species, and the diversity of the ecosystems necessitate a more complex approach to the calculation of harvest levels than percent of inventory (younger trees, for example, grow faster than older ones). The calculation of PSQ and the use of the volume of timber harvested as a planned activity is a "volume control" technique used to regulate harvests so that yields are sustainable over time.

- **Comment:** An alternative should be considered that would establish areas to be managed under the concept of "ecoforestry" for sustained yields. The basic concept of "ecoforestry" is that the forest is left standing. Harvest is limited to trees that are being crowded out of a naturally-developing stand. The prescription is called "natural selection ecoforestry" and leaves to natural processes the selection of the trees to be harvested each year. This leads to a maximum wholeness and the most resilient and productive state of the forest possible, as well as economic returns.

**Response:** There is considerable debate over the ability to perpetuate late-successional forest ecosystems by managing stands. Monitoring the validity and effectiveness of the standards and guidelines for reserves and matrix lands, coupled with the adaptive management process, will permit modification as implementation progresses, subject to review by the Regional Ecosystem Office. Should Alternative 9 be selected, the concept of "ecoforestry" may be suitable for trial in an Adaptive Management Area.

- **Comment:** Kenaf, a plant similar to hemp, is three to five times more efficient than wood for producing fiber per acre per year. On those lands that have already been harvested and where future timber production is planned, growing kenaf should be considered.

**Response:** An alternative to introduce exotic plants to produce fiber in lieu of wood products on federal forests is beyond the scope of this SEIS.

- **Comment:** Federal forests are already dominated by trees less than 9 inches in diameter (6.1 million acres or 30 percent), and the vast majority of these acres were regenerated after clearcutting. Overall, 41 percent of federal lands are dominated by these young stands and by "nonforest" areas (3.8 million acres) which may include clearcuts. Additional harvest should be delayed or restricted to preserve late-successional forests and management opportunities.

**Response:** The current and projected amounts of the various forest seral stages was considered in developing alternatives that would meet all of the objectives for the federal forests. The forest was

classified into seral stages for analysis (Johnson et al. 1993). Four of the stages were considered late-successional forest in their entirety. These four stages comprise over 8 million acres (48 percent) of the forested lands administered by the Forest Service and BLM. Of this acreage of late-successional forest, less than 17 percent occurs on lands considered suitable for timber management under Alternative 9 and the current plans and draft plan preferred alternatives. The seedling and sapling seral stages (average diameter of 9 inches or less) represent 21 percent of forested acres. This includes brush and grass, sparse conifers and hardwoods, as well as seedlings and saplings. These stands originated from natural processes as well as timber harvest. "Nonforest" areas are those incapable of growing forests and do not include recently harvested clearcuts; nor are they included in the total of lands capable of growing forests. The small conifer stage makes up the remaining 31 percent of the forested lands.

- **Comment:** The history of the forests of the Pacific Northwest is one of fires, followed by even-age stands, followed by fire again. This natural process is best simulated by planned sustainable timber harvest using clearcuts or shelterwood cuts followed by burning and replanting. An alternative that follows this process should be considered to provide both forests and wood products.

**Response:** The best way to perpetuate ecosystems is a subject of debate among scientists. The alternatives considered in this SEIS rely heavily on a system of reserves where natural processes will generally be allowed to proceed without human interference. However, some management is proposed in the reserves to achieve or maintain desired conditions. Matrix lands are to be managed for a variety of resource objectives. The choice of silvicultural system and harvest prescription on matrix lands is based on management objectives and site-specific conditions.

- **Comment:** The domestic demand for timber can be met by harvest on private forest lands alone. An alternative should be considered that prohibits all timber harvest from federal forests.

**Response:** The domestic demand for timber products cannot be met by private lands alone. Analysis indicated that private forest landowners can be expected to increase harvest as a result of reductions in harvest from federal forests, but only enough to make up for a fraction of the volume lost. Demand for timber products will be met by imports or by substitute products. Also, timber production is one of the mandates of the federal forests and changing it would require congressional action.

- **Comment:** Additional alternatives based on current theories of ecology should be considered in the SEIS. Since the mid-1970's, theories of community ecology have shifted from concepts of succession and steady state climax forest to the recognition of constant change in forests ecosystems. The differing theories of forest ecosystem process and function lead to different approaches to forest management. Alternatives based on the "constant change" theory should be considered as well as alternatives based on the "steady state" concept. The steady state theory has led to alternatives based on a system of reserves where natural processes are allowed to function with a minimum of human interference. The steady state theory is not proven and information has accumulated, especially in the past two decades, that makes it questionable. There is no evidence that a system of large reserves will maintain old growth or any other "natural balance" of species or processes. Given the uniqueness of each community, there is no reason to believe the present forest or other areas will remain or grow to a single "old-growth" condition through preservation as stated in the SEIS on page 3&4-39.

The constant change theory, in contrast, leads to proactive landscape management for a diversity of ecological values. Because nature encompasses a variety of conditions, resource managers and conservationists should be required to analyze a situation carefully and then choose which "natural" conditions to promote. Landscape management would maintain or create desired structures, patterns, and processes. The objective would be a fluctuating balance of all structures and processes which are naturally found over large landscapes. Landscape management recognizes the need to manage for all components of the ecosystem, not just those associated with late-successional forest conditions. Each

forest structure and process is important for some species, and all must be maintained in the landscape for biodiversity. Currently, many landscapes contain imbalanced stand structures and there is a need, which forest managers should meet, to increase the amount of endangered species habitat rather than simply maintain present amounts.

Active landscape management should be used to mimic natural processes to achieve desired conditions and to avoid or mitigate the effects of large disturbances. Unmanaged reserves, in contrast, will be at high risk of loss to fire and protection costs will be high. Such costs should be considered in evaluating the alternatives. Alternatives that provide cheaper and less risky methods to produce and maintain late-successional forests should be considered. Such an alternative would also address social and economic concerns.

Social and economic values should receive more consideration in the alternatives. A system of reserves tends to exclude people, especially local people, from obtaining benefits from the forest and therefore tends to alienate them. The landscape management approach recognizes that human well being is important not only to humans but to the long-term sustainability of forest landscapes. Removal of wood and other products would be a byproduct or additional benefit of a more proactive and more cost effective landscape management approach.

**Response:** There is controversy in the scientific community regarding theories of ecosystem process and function. Therefore, scientists with alternate points of view were invited by the Assessment Team to present and discuss alternatives. Among these scientists was Dr. Chad Oliver, who met with the Assessment Team on May 21, 1993, and presented a strategic framework for sustainable ecosystem management based on the constant change theory.

As a result of these discussions and suggestions, the Assessment Team considered alternatives that would have taken a more active approach to forest management. Out of a total of 48 alternatives considered, 10 were chosen for analysis (FEMAT Report, Chapter III). All 10 alternatives that were considered in detail lean heavily toward the steady state theory; it is described as the theoretical basis of the alternatives, see (Appendix B2, Ecological Principles for Management of Late-Successional Forests). The Assessment Team concluded that these 10 alternatives had the highest probability of meeting all the objectives given to the team at the President's Forest Conference.

The concept of a system of reserves that minimized disturbance by human activity was chosen as the most probable means to insure the perpetuation of late-successional forest conditions and the species associated with them. This approach was influenced by a consideration of the mix of conditions on forests throughout the range of the northern spotted owl. Early stages of forest succession are well represented on lands in other ownerships in the region and are likely to remain so. It was recognized, however, that other scientifically credible theories of forest ecology exist and that decisions about ecosystems must ultimately be made in a state of uncertainty. Each of the 10 alternatives that were considered in detail do contain elements that are based on the constant change theory. The alternatives vary in the amount of acres allocated to reserves and to the matrix and in the degree of active management proposed in the various land allocations to achieve desired conditions.

The general approach in the alternatives presented in this SEIS is to rely on a system of reserves and withdrawals (comprising more than 80 percent of federal forests under Alternative 9), and to permit some management in the reserves, especially in those provinces where disturbance rates have historically been higher. Also, some forested land is allocated to the matrix where more active management may take place. The concept of adaptive management, both in designated areas and overall, is another means of recognizing the uncertainty in current knowledge and the need to constantly monitor, learn, and change. Proactive management to maintain or produce late-successional forest structures may be appropriate in some AMAs. Based on the results of monitoring late-

successional reserve conditions, more management may be considered desirable. Province plans will consider such issues in the future.

The alternatives considered in this SEIS are in fact a mix of the two theories. Both theories are incorporated in the alternatives even though the analysis and discussion was weighted toward the steady state theory. The steady state theory, and its component of large reserves, was considered as the less risky approach for management of federal forests, given the current proportion of late-successional forest ecosystems in the region.

## OTHER SILVICULTURAL COMMENTS

- **Comment:** Monitoring required under the selected alternative should include evaluation of timber harvest volumes by land allocation. Also, the monitoring reports should be made available to the public.

**Response:** Detailed monitoring of timber harvest volumes and acres is current practice and monitoring reports are available to the public.

- **Comment:** Teams should be set up to determine which areas can be logged with the least impact on the environment. Also, regional reforestation teams should be established that would be responsible for determining the most economical and environmentally efficient way to reseed harvested areas.

**Response:** Prior to the decision to harvest and reforest, site-specific inventories and environmental analysis are conducted to determine the most efficient and environmentally sound locations and methods. An interdisciplinary team recommends harvest methods to ensure that reforestation will be successful. Also, reforestation following timber harvest is required by law.

- **Comment:** Deforested areas should be reforested under the selected alternative.

**Response:** It is the intent under all alternatives to reforest all deforested lands by either natural seeding or through artificial means by planting or seeding. Exceptions may occur where current plans and draft plan preferred alternatives, or the results of watershed analysis, indicate that certain areas should remain as openings.

- **Comment:** Harvesting trees from managed forests may deplete some soil nutrients that are required for growing healthy trees. More fertilization will be required to grow trees if harvesting takes place.

**Response:** There is considerable scientific information on the needs of forest trees for soil nutrients, the rate of nutrient cycling in forest ecosystems, and the amount of nutrients removed by harvesting trees or parts of trees. Nearly all of the nutrients in forest trees occur in the stems and needles or leaves. The boles (trunks) of trees contain a small percentage of the nutrient capital in a forest ecosystem; therefore, harvesting the boles of trees has a small effect. This small loss is replaced by natural processes. Also, standards and guidelines in all of the alternatives prescribe leaving some snags and down logs, and fertilization is considered a part of forest management.

- **Comment:** Neither the SEIS nor the FEMAT Report adequately considered Port-Orford-cedar (its economic value or the threat to it from introduced root disease) in developing or analyzing alternatives.

**Response:** The effect of reserves on the protection of Port-Orford-cedar is described in the Forest Service's Final Northern Spotted Owl EIS (USDA FS 1992) which is supplemented by this SEIS. Also, an interregional team has been established to coordinate efforts to ensure the continued survival of Port-Orford-cedar within its native range. An action plan has been developed and implementation has begun (USDA unpub.).

- **Comment:** There is no basis for the assumption in the FEMAT Report that natural plantations and plantations established after harvest are fundamentally different and will not achieve the same late-successional forest conditions. This theory should not be part of the analysis of the alternatives.

**Response:** The ecological basis for forest management is discussed in Appendix B2, Ecological Principles for Management of Late-Successional Forests, of this SEIS. The theory holds that forests undergo succession following a disturbance or "resetting event" until a final stage is reached. The forest remains in this final stage, the "shifting-gap stage", until another resetting event such as a wildfire or blowdown occurs. Each successional stage of a given forest type is described in terms of the composition and structure of the vegetation. The plants present at each stage of succession establish and develop conditions that lead to the next stage with its own composition and structure. Predictions of forest development are based on the classification of the forest type and the current successional stage. Given this theoretical basis, the fact that plantations do not have the same history of disturbance or the same species composition and structure as a natural forest, leads to the prediction that the final stage may not be the same as a natural forest.

- **Comment:** Herbicides have no place in forest management and should be specifically banned in the Final SEIS.

**Response:** Management direction for the use of herbicides is already covered in agency manuals and handbooks, regional guidance for vegetation management (USDA FS 1988a,b) and Forest Plans, and will be considered and analyzed in the environmental analysis for projects where their use is possible. A reanalysis of specific silvicultural and vegetation management tools is outside the scope of this SEIS.

- **Comment:** The proposed reductions in timber harvest levels under Alternative 9 pose the threat of introducing an exotic insect or disease into our forests by allowing or promoting the importation of logs and lumber to meet the demands of the Pacific Northwest and the rest of the United States. Also, there may be undesirable effects in other countries where timber harvest may increase to meet the demand. It is estimated that 1.5 million acres of Siberian forest would have to be cut to yield the same amount of wood as 100,000 acres in the Pacific Northwest.

**Response:** The United States has been and will continue to be a net importer of softwood products. The SEIS acknowledges that reductions in federal timber supplies will result in some increase in supply from private lands and that the remaining needs will be met by product substitution or by imports from other countries and other sections of the United States. The details of preventing the importation of insects or diseases via imported wood products or the possible consequences of increased harvesting in other countries is beyond the scope of this SEIS.

- **Comment:** There does not appear to be any analysis of the tradeoff in amount or quality of dispersal habitat between the 50-11-40 rule for matrix lands and the Riparian Reserves and green tree-retention standards and guidelines for Alternative 9. This should be displayed.

**Response:** The effects on PSQ of the Riparian Reserves, the green-tree retention options and the 50-11-40 rule are provided in Johnson et al. (1993). Table 7 in Johnson's report provides the percentage of the land base in Riparian Reserves under each of the reserve scenarios; Table 8 notes the factors used to modify PSQ based on green tree retention standards; Tables 14 and 15 provide PSQ per acre of suitable lands in board feet and cubic feet, respectively; and Table 23 contains a comparison of PSQs for three alternatives with and without the 50-11-40 rule. The biological assessment discusses the effectiveness of the 50-11-40 rule as compared to the Riparian Reserve strategy with retention of green trees in harvest units for northern spotted owl dispersal.

- **Comment:** Discuss sugar pine management and the need to protect apparently rust-resistant individual trees.



**Response:** The management of sugar pine is provided for in Forest Service and BLM directives and in Forest and District Plans. There is a long history of efforts by federal, state, and private organizations to prevent the loss of the sugar pine, and other white pines, to an introduced rust disease. The alternatives in this SEIS do not change existing plans or projects to manage and protect sugar pine or other white pines. However, under all alternatives except 7, active management to maintain sugar pine would tend to focus on matrix lands where access is available and vegetation management is planned. Reliance on natural processes in Late-Successional Reserves may result in the reduction or loss of sugar pine in these areas. Supplemental planting of rust-resistant sugar pine in disturbed areas in Late-Successional Reserves may be required to maintain the species in the reserves.

- **Comment:** The selected alternative should not reward arson by permitting salvage of burned areas. Also, no green trees should be removed in salvage sales following fires.

**Response:** A proposal to deny the sale of salvage resulting from an illegal act is beyond the scope of this SEIS. The question of the inclusion in salvage sales of trees that have been fire killed but which may still have some green foliage at the time of harvest requires detailed analysis that is inappropriate for this programmatic SEIS and is deferred to site-specific planning.

- **Comment:** Research from a small geographic area is inappropriately applied to broad geographic areas. Research results from an experimental forest in western Oregon should not be applied to areas with dissimilar forest conditions. Additional studies are required to assess the effects of new forest management techniques in other ecosystems. Also, effects of established forest management practices, such as thinning and salvage, need to be evaluated to determine the effects on late-successional and riparian species.

**Response:** Management standards and guidelines and predictions of vegetation responses were based on the best information available at the scale for which this programmatic SEIS applies. Refinement and incorporation of more site-specific research and other information will occur through province and watershed planning efforts, as well as through the adaptive management process.

- **Comment:** Clearcutting and even-age management does not maintain biodiversity and therefore should not be practiced on federal forests.

**Response:** Clearcutting and even-age management mimic, in many ways, natural processes and do not necessarily lead to a lack of biodiversity. Even-age conditions are very common in natural or unmanaged stands in some forest types; Douglas-fir and lodgepole pine are examples. Also, biodiversity should be considered at multiple scales. Clearcutting leads to early-successional conditions and the multitude of species associated with this seral stage. When considered at the landscape or watershed level, if all or most of an area is in later seral stages, clearcutting may lead to an increase in biodiversity in that landscape. The ecosystem management approach plans and provides for all species and seral stages, but not on every acre all the time. The choice of harvest methods and silvicultural systems is best left to local interdisciplinary teams that can integrate management directions and standards and guidelines with ecosystem conditions.

- **Comment:** Uncertainties about thinning timber stands should be disclosed in the SEIS. If the results of thinning are uncertain, then thinning should not be allowed in the reserves but only in the matrix, and probably only in the Adaptive Management Areas.

**Response:** There is debate among scientists about the benefits of thinning and this is recognized in the SEIS. The SEIS concludes, however, that the existing information warrants the use of thinning in some situations. There is a great deal of information on the effects of thinning on stand structure and growth. The uncertainty lies in the lack of information on the possible effects on other species, not in known

detrimental effects. Also, there is information to predict the effects of not thinning on forest conditions. The known risks of not thinning were considered to be greater than those associated with acting on less than complete knowledge.

## Roads and Roadless Areas

The following comments and responses address roads and roadless areas on federal lands within the range of the northern spotted owl. (For the purposes of this SEIS, "roadless areas" are considered to be those portions of inventoried roadless areas on federal forest lands that still meet the criteria used for the Roadless Area Review and Evaluation [RARE II] process.)

- **Comment:** There should be no logging or road building permitted in any existing roadless areas on lands administered by the Forest Service within the range of the northern spotted owl. These areas serve as terrestrial refugia or anchors, and are the last areas of sufficient size to support the full range of ecosystem processes. Many of these areas are ecologically diverse, located in pristine regions, and are important for retention or restoration of healthy fish, wildlife and plant species. Frequently, roadless areas also have unstable soils and are prone to landslides.

**Response:** Depending on the alternative, from 5 to 25 percent of the existing roadless areas are located within the matrix and have suitable and available timber for harvest. These figures do not include Riparian Reserve acreage. Riparian Reserves restrict both timber harvest and road construction. Over 50 percent of these roadless areas are within Key Watersheds where road construction is prohibited. All roadless areas will be subject to watershed analysis prior to any management activity, as will all new roads in or across Riparian Reserves. These analyses will consider soil stability and landslide potential. Because of these and other protections identified in this SEIS, along with the overall strategy of reserves and withdrawn lands, the analysis determined that the ecosystem and the species dependent on it would be protected throughout the planning area.

- **Comment:** Roads should not be permitted through old-growth forests. Roads are often a major cause of stream sedimentation and impacts to fish, water quality, old-growth habitat, and many terrestrial wildlife species. Either no new roads should be built or the number of logging access roads should be limited. The distance between access roads and rivers and streams should be restricted and watershed analysis must be conducted to address road design problems. There are no specific standards and guidelines which prohibit new roads in reserves. A program to reduce roads should be part of the selected alternative. Road closures should stop vehicular access and focus on total obliteration through ripping, regrading, seeding and planting where appropriate.

**Response:** A variety of factors related to roads were considered in the evaluation of ecosystems and species. The alternatives vary in the amount of road restrictions and restoration provided, and an array of choices is available for selection by the decision makers. New road construction across or within Riparian Reserves requires watershed analysis prior to implementing the action. Possible impacts from roads are addressed by Riparian Reserve standards and guidelines, watershed restoration goals for road repairs and removal, and existing standards and guidelines in current plans and draft plan preferred alternatives. Additionally, Key Watershed objectives emphasize reductions in road mileage and prohibit road construction in inventoried roadless areas within Key Watersheds. Standards and guidelines concerning roads management in Riparian Reserves can be found in Appendix B6, Aquatic Conservation Strategy. Standards and guidelines for road construction and maintenance in Late-Successional Reserves have been added to this Final SEIS and can be found in Appendix B7, Late-Successional Reserve Standards and Guidelines. Because of these and other protections identified for the alternatives, along with the overall strategy of reserves and withdrawn lands, the analysis

determined that the overall ecosystem and the species dependent on it would be protected. This analysis showed further restrictions are unnecessary at this time and would reduce other management opportunities.

- **Comment:** The preferred alternative should consider ridgetop roads in key unroaded areas. Midslope roads and stream crossings are not desirable in Key Watersheds, however, ridgetop roads have little if any impact on streams. This would improve fire protection and allow increased salvage of catastrophic fire mortality by helicopter. The maximum helicopter yarding distance is 1 to 1.5 miles from a landing.

**Response:** Developing new roads, including ridgetop roads, in roadless areas within Key Watersheds poses a risk to aquatic and riparian habitat and may potentially impair achieving Aquatic Conservation Strategy objectives. Road construction in existing inventoried roadless areas within Key Watersheds is prohibited. Two miles is considered to be the economically operable distance for helicopter logging at today's lumber prices. There are no suitable acres for timber harvest in roadless areas within Key Watersheds that are farther than 2 miles from a road (Johnson et al. 1993). The amount of road restriction and restoration varies between alternatives, and this range is available for selection by the decision makers.

- **Comment:** The roadless acres in Key Watersheds that could be logged following a watershed analysis should be protected because the ecosystem education/recreation business depends on undisturbed areas and clean water.

**Response:** Road construction in existing inventoried roadless areas within Key Watersheds is prohibited. All roadless areas will require watershed analysis prior to logging. Restricting road construction in inventoried roadless areas within Key Watersheds, and the resulting increase in helicopter logging, would increase the potential of these watersheds to retain high quality habitat and water, restore degraded watersheds, and serve as important refugia.

- **Comment:** Road closure programs should be mandated for all Late-Successional Reserves. If budgets will not allow large scale rehabilitation of roadbeds, then locked gates should be installed as well as other less expensive barriers to vehicular intrusion.

**Response:** Barriers to vehicular intrusion can be used on federal lands if closures help to achieve management objectives. Federal agencies are required to plan for reestablishing vegetative cover on roadways unless the road is necessary for future resource management activities, including recreational use.

- **Comment:** The SEIS needs an expanded analysis of the impacts of roads on terrestrial biodiversity. Roads are one of the most important components of the landscape. Currently, the many miles of roads result in high levels of disturbance and harassment of many wildlife species and are a major factor in reducing habitat quality.

**Response:** The existing and likely future roads associated with the various alternatives was one of the many factors considered during the species assessment panel process. Roads and their effects on old-growth associated species are reflected in the outcomes displayed under the various alternatives. A separate analysis that specifically addressed possible road impacts was unnecessary because it was incorporated into the more comprehensive analysis. Current plans and draft plan preferred alternatives include site-specific analysis of road impacts. Future watershed and project-level planning will also address these concerns in more detail.

- **Comment:** The Draft SEIS cites roads as being one of the primary management-related factors affecting sediment delivery to streams, but does not analyze the effects of roads on aquatic systems.

**Response:** The road network and its management-related effects, along with the restrictions for road building within Riparian Reserves and Key Watersheds, are discussed in Chapter 3&4 of this Final SEIS. The analysis is reflected in the assessment outcomes for fish in Chapter 3&4.

- **Comment:** Decommissioning existing roads to allow new road construction within Key Watersheds would simply replace old problems with new ones, and would not mitigate the effects of roads on aquatic habitat quality.

**Response:** This Key Watershed standards and guidelines are just one factor to consider when planning new roads. Any planned new roads within Riparian Reserves must meet the standards and guidelines for roads listed in Appendix B6, Aquatic Conservation Strategy, and watershed analyses must analyze the impacts of new road construction within Key Watersheds and Riparian Reserves. These standards and guidelines and planning processes require federal land managers to determine the influence of each road on the Aquatic Conservation Strategy objectives. Under the Aquatic Conservation Strategy, new roads must minimize long-term negative effects on existing riparian and aquatic habitats.

- **Comment:** Many areas designated as reserves have extensive road networks that need to be obliterated. The proposed thinning and salvage operations will prevent or delay necessary road obliterations.

**Response:** The watershed analysis process and watershed restoration program under the Aquatic Conservation Strategy are designed to address effects of roads on watersheds and riparian areas. The influence of existing roads and the selection of roads for obliteration will be determined by watershed analysis. The watershed restoration program will be developed following the watershed analysis. Many roads are expected to become obsolete and may be obliterated as funds for future road maintenance are reduced. In addition, proposed thinning and salvage operations can only occur if they are beneficial to the creation of late-successional forest conditions.

- **Comment:** Many respondents requested additional protection for specific roadless areas in Alternative 9, especially in the Siskiyou National Forest.

**Response:** The general issue of designating all roadless areas as Late-Successional Reserves is addressed elsewhere in this appendix. Public comments which identified specific roadless areas were reviewed on a case-by-case basis to determine if the recommendation would better meet the objectives of this SEIS. A process was established to review all public comments and incorporate land allocation boundary changes into the Final SEIS. Approximately 91 percent of inventoried roadless areas are designated as Late-Successional Reserves, Administratively Withdrawn Areas, Riparian Reserves, or are located in Adaptive Management Areas in Alternative 9. All but two inventoried roadless areas in the Siskiyou National Forest have been designated as Late-Successional Reserves in this Final SEIS. Additional restrictions on roadless areas in Alternative 9 were considered but found to be unnecessary for meeting the needs of late-successional forest related species. Standards and guidelines of current plans and draft plan preferred alternatives apply where they provide greater benefits for late-successional and old-growth related species. In addition to these constraints, Riparian Reserve standards and guidelines apply to matrix lands. The alternatives vary in the amount of restrictions placed on roadless areas and provide an array of alternatives available for selection by the decision makers.

- **Comment:** The Draft SEIS focuses on decommissioning roads as a means to reduce sediment delivery to streams and does not describe the contribution of less ambitious means.

**Response:** Appendix B6 of this SEIS describes an array of measures to reduce sediment delivery to streams from roads. These standards and guidelines address a range of measures from full decommissioning, to the development and implementation of a road management plan.

- **Comment:** Many respondents commented that either additional or all roadless areas should be protected and added to Late-Successional Reserves. Roadless areas protect the ecosystem functions and processes. These areas tend to have fragile soils and are often at the headwaters of important river systems.

**Response:** The total system of withdrawn and reserved areas, along with their specified standards and guidelines, meet the need to protect the overall ecosystem while providing for other management opportunities. The alternatives vary in retaining greater or lesser amounts of inventoried roadless areas because different amounts of Late-Successional Reserves are designated. This range of choice is available for selection by the decision maker. See also the Roadless Areas section in Chapter 3&4.

- **Comment:** There are areas that are currently roadless that have been placed in matrix or Adaptive Management Areas, in contrast to areas that have been harvested and had roads constructed that have been placed in Late-Successional Reserves. Adjustments should be made in these cases to take advantage of the current conditions of these areas.

**Response:** The system of designated areas (e.g., withdrawn, reserved, Adaptive Management Areas, and matrix), Key Watershed designations, and standards and guidelines were designed to meet both the current and future needs of species and ecosystems. To meet future needs for key species, assure overall ecosystem maintenance, and provide other resource opportunities, some areas were designated that do not currently achieve the objectives for these areas.

- **Comment:** The Draft SEIS does not provide acreages for roadless areas within each land allocation, especially roadless areas open for logging in the matrix.

**Response:** Table 3&4-47 has been added to the Final SEIS to provide a comparison of roadless acreages within each land allocation to address this concern.

## Other Environmental Components and Resources

The following comments and responses address lands, minerals, recreation, other forest products, and grazing.

### LANDS

- **Comment:** Standards and guidelines that require locating hydroelectric facilities outside Riparian Reserves conflict with federal laws and regulations.

**Response:** The Aquatic Conservation Strategy does not require that all hydroelectric facilities be located outside Riparian Reserves. Appendix B6, Aquatic Conservation Strategy, of this Final SEIS contains the Aquatic Conservation Strategy, including the requirements and recommendations for hydroelectric facilities in Riparian Reserves. Also, Forest and District Plans provide direction for the management of other resources including energy siting, which is not addressed in this programmatic SEIS.

- **Comment:** The SEIS should address nontimber resources, such as geothermal resources, hydropower, or pipeline rights-of-way, in reserves on federal forests lands .

**Response:** Standards and guidelines for management of other resources in Riparian and Late-Successional Reserves have been clarified in the Final SEIS in Appendices B6 and B7, respectively. The land allocations and standards and guidelines proposed in the alternatives do not preclude other

resource uses. However, any use proposed in Late-Successional Reserves, or in any other designated area, would need to meet the management objectives for the area, and would be subject to review by the Regional Ecosystem Office.

- **Comment:** All streams and creeks that have “outstandingly remarkable values” should be protected as Wild and Scenic Rivers.

**Response:** The designation of Wild and Scenic Rivers is beyond the scope of this SEIS. However, Riparian Reserves are established adjacent to all streams and creeks under all the alternatives except Alternative 7. Riparian management in Alternative 7 is based on withdrawals and standards and guidelines in final and draft Forest and District plans.

- **Comment:** Land exchanges between federal agencies and private landowners should be permitted when the exchange would benefit both parties and both parties agree to it, even if Late-Successional Reserves are involved.

**Response:** Land exchanges involving Late-Successional Reserves will be considered when the exchange would provide equal or better late-successional forest conditions than the current situation, and would have to be assented to by all parties.

## MINERALS

- **Comment:** Withdrawal of areas from mineral entry for locatable, saleable, and leasable minerals is not appropriate.

**Response:** The SEIS defers to existing legislation and regulations. The discussion on minerals management in the Aquatic Conservation Strategy in Appendix B6 of this Final SEIS provides additional clarification and guidance for agencies to develop a procedure to mitigate environmental effects in Riparian Reserves. This SEIS does not withdraw from mineral entry areas of locatable, saleable, and leasable minerals. While locatable minerals will continue to be available, there will be more attention given to management of surface resources affecting late-successional and riparian habitat. Saleable minerals are sufficiently common so as to be generally available outside reserved areas or available without significantly affecting Aquatic Conservation Strategy objectives. Leasable minerals will be, as they are now, subject to case-by-case review that considers all environmental factors. Designations intended to reserve habitat for late-successional forest ecosystems will complicate minerals management, and potentially eliminate some low value mining opportunities.

- **Comment:** The Draft SEIS does not meaningfully assess the possible effects of the alternatives on mining. Clarify the constraints that may be placed on mining.

**Response:** The standards and guidelines for management of resources other than timber have been clarified in Appendix B of the Final SEIS. Standards and guidelines for management of other resources in Riparian Reserves are clarified in Appendix B6, and those for Late-Successional Reserves are clarified in Appendix B7. The guiding principle regarding mining activities in Late-Successional Reserves is to minimize the detrimental effects to late-successional habitat.

## RECREATION

- **Comment:** The SEIS does not address noise as a separate effects category. Noise from aircraft, vehicles, and other mechanical devices, as well as human-caused noise, disturbs both wildlife and people and should be addressed the same as other effects.

**Response:** Noise is addressed in the SEIS in Chapter 3&4. Noise tends to be related to levels of human activity, and inferences about noise levels may be drawn, with some caution, from proposed activities. Areas with motorized access will tend to be more noisy than areas without developed access.

- **Comment:** Recreation, tourism, fisheries, water quality, air quality, and special forest product industries would be enhanced by proposed levels of habitat protection. This enhancement should be recognized as a possible economic gain.

**Response:** Sufficient data do not exist at this time to quantify the relationship between the level of habitat protection and the amount of economic benefits associated with these resources. The narratives in the SEIS state that a relationship exists, but cannot be quantified at this time.

- **Comment:** The alternatives addressed in the SEIS will cause off-road vehicle users to lose access to many of their favorite roads and areas.

**Response:** Closure of forest roads to meet Late-Successional Reserve and Aquatic Conservation Strategy objectives may reduce access to all motorized forms of recreation under all alternatives addressed in the SEIS. The supply of recreation settings with little development, little management activity, and no motorized access would be increased, however, by the closure of forest roads. Considerable research and analysis would be required to determine if the designation of areas managed primarily for late-successional forest conditions would increase or decrease off-road vehicle use.

- **Comment:** The SEIS fails to consider the impacts of the alternatives on recreation and tourism. No analysis was done to determine if adequate stands of trees or facilities for recreation and tourism are provided.

**Response:** The SEIS does not attempt to specify facility needs and forest conditions for recreation use. The SEIS provides direction for the management of the federal forests to provide for late-successional forest structures and the species associated with them. The SEIS supplements current plans and draft plan preferred alternatives which have considered recreation resources in greater detail.

- **Comment:** There is not enough Wilderness to meet demands for recreation. An alternative should be considered that creates more Wilderness.

**Response:** Creation of Wilderness is a Congressional responsibility and, as such, is beyond the scope of this SEIS.

- **Comment:** The SEIS does not analyze the potential benefits of increasing user fees for recreational use of the forests. User fees should be established that would compensate for the opportunity cost of not using the forest for other purposes such as timber harvest. Selling conservation easements would be another alternative.

**Response:** Institution of recreation user fees and selling of conservation easements are beyond the scope of this SEIS.

- **Comment:** A ski run cannot be built or mitigated because the Riparian Reserve standards and guidelines for recreation facilities prohibit crossing intermittent and ephemeral streams. However, ski runs are dictated by the lay of the land and must eventually be linked by crossing intermittent or ephemeral streams. Explain whether existing facilities will be permitted to continue.

**Response:** Standards and guidelines for recreation management in Riparian Reserves have been clarified in the Final SEIS in Appendix B6. New recreation facilities within Riparian Reserves, including

ski runs, trails, and dispersed sites, should be designed "to not prevent meeting" Aquatic Conservation Strategy Objectives, now and in the future. Construction of a new ski area or expansion of an existing ski area that may affect Riparian Reserves, even if an environmental impact analysis has been completed and approved, will require a determination that the new facility will not prevent meeting the Aquatic Conservation Strategy objectives. Existing recreation facilities and operations within Riparian Reserves will need to be evaluated to ensure that these do not prevent, and to the extent practicable contribute to, attainment of Aquatic Conservation Strategy objectives. Where these cannot be met, relocation or closure of the facility will be required.

- **Comment:** Ski areas should be given first priority as watershed analysis sites. Funding should be provided to the agencies to complete the analyses within 5 years.

**Response:** This SEIS identifies Key Watersheds as priority sites for analysis because watershed analysis is required to develop watershed restoration programs.

- **Comment:** The effects of Late-Successional Reserves on ski areas and recreation resorts is not adequately addressed in the SEIS. Explain how existing ski areas will be affected.

**Response:** Standards and guidelines for multiple-use activities (other than silviculture) in Late-Successional Reserves have been expanded in Appendix B7 of this Final SEIS. Existing developments, such as ski areas or resorts, may remain and maintenance activities may take place. However, development of new facilities that may adversely affect Late-Successional Reserves will not be permitted unless they will provide significant public benefits. Proposals will be considered by the Regional Ecosystem Office on a case-by-case basis where adverse effects can be minimized and mitigated.

- **Comment:** Driving for pleasure is the number one recreational use of our National Forests. Increasing the amount of primitive and semiprimitive recreation areas that are without road access is not likely to increase recreational use of the federal forests. An aging population and a population with less time to spend per visit does not lead to an increased demand for unroaded recreation. The advantages of increasing nonmotorized recreation opportunities, at the expense of motorized opportunities or opportunities that require vehicular access, are based on estimates of values per visit (the average willingness-to-pay); the reliability and validity of such estimates is uncertain. Also, nonmotorized recreation is allowed on roads and trails where motorized recreation is permitted but the reciprocal is not true. The Draft SEIS underestimated the amount of land available for nonmotorized recreation by not considering this fact.

**Response:** Estimates of recreation demand are based on four sets of demand projections: projections by the BLM; the Forest Service's updated 1995 RPA Assessment; and the Comprehensive Outdoor Recreation Plans for both the States of Oregon and Washington (Swanson and Loomis unpub.). Use of data based on demand surveys is a recognized technique for making such projections. Motorized recreation is not decreased by increasing the area available for nonmotorized use; only the area available for motorized use is decreased. It is true that nonmotorized recreation was not considered as available on roaded areas. Nonmotorized recreational experiences, by definition, are not compatible with motorized use.

- **Comment:** The analysis does not reflect the increased risk of large scale disturbance due to fire or the loss of forest health in Late-Successional Reserves and the subsequent effects on visual quality and recreational opportunities.

**Response:** The risk of fire and other disturbances in Late-Successional Reserves was recognized and is considered part of the natural processes that are to be allowed to operate within the reserves. Visual quality, in terms of a naturally appearing landscape, is not necessarily adversely affected by natural



disturbances such as fire or losses due to insects and disease. However, the Guidelines to Reduce Risks of Large Scale Disturbance in Appendix B5 have been clarified to state that activities in older stands may also be undertaken in Late-Successional Reserves in other provinces (those not east of the Cascades) if levels of fire risk are particularly high.

- **Comment:** Standards and guidelines should permit selling hazardous or fallen trees in campgrounds or other recreation sites within Late-Successional Reserves. This is the safest and most cost efficient means of dealing with these problems.

**Response:** Sale and removal of hazard trees and other standard maintenance work is permitted on recreation sites within Late-Successional Reserves. Appendix B7 of this Final SEIS includes clarification of standards and guidelines for Late-Successional Reserves.

- **Comment:** The Mt. Hood ski areas are listed as Administratively Withdrawn Areas with no overlapping classifications. To be consistent, other permitted ski areas should be redesignated as Administratively Withdrawn, with no overlapping classifications.

**Response:** The location of Late-Successional Reserves was determined by the location and condition of late-successional forests, the range of wildlife species and the location of individuals, distance from other reserves, location of Key Watersheds, elevation, and other factors. No effort was made in delineating Late-Successional Reserves to either include or exclude ski areas. However, the SEIS acknowledges that an existing ski development reduces an area's ability to contribute to Late-Successional Reserve objectives. Therefore, in this Final SEIS, the designation has been changed to Administratively Withdrawn Areas for all existing developed, permitted ski areas. Riparian Reserve standards and guidelines, however, still apply to ski areas.

## OTHER FOREST PRODUCTS

- **Comment:** The standards and guidelines for Late-Successional Reserves should contain provisions for harvest or collection of special forest products, such as post and poles, shakes, boughs, fruits and berries, forest greens, mushrooms, and Port-Orford-cedar wood for arrows.

**Response:** Standards and guidelines for multiple-use activities other than silviculture have been expanded in the Final SEIS and are found in Appendix B7, Late-Successional Reserve Standards and Guidelines. In general, nonsilvicultural activities that are neutral or beneficial to the creation and maintenance of late-successional forest habitat are permitted.

- **Comment:** The supply of special forest products, such as floral greens, Christmas ornaments, and wild edible mushrooms is not likely to increase under the alternatives when compared to the current situation. The harvest or collection of many special products complement rather than compete with timber production. Also, harvesting special products requires road access. As a result of these factors, the overall level of activity in the special forest products industry may be reduced rather than increased under the alternatives when compared to the current situation.

**Response:** Effects to special forest products resulting from forest conditions would vary between alternatives; the relationship between levels of habitat protection and the economic benefits associated with each of these resources was not quantified. Road closures will reduce the amount of land accessible to motorized access for management and harvest of these resources. Also, where activities are extensive and the effects on late-successional forests may be significant, restrictions may be appropriate. Clarification of standards and guidelines for management of special forest products in Late-Successional Reserves is provided in Appendix B7 of the Final SEIS.

- **Comment:** Forest products should be harvested from all vegetation in the forest. These products should be those that were historically “harvested” by fire. The desired forest condition is that which existed prior to European settlement when the only factors that influenced the forest were fire, wind, insect and disease, sunlight, water, and American Indians. Harvesting vegetation that fire once removed will maintain a healthy forest in the desired condition.

**Response:** The Late-Successional Reserves are designated to provide and maintain late-successional forests primarily through the operation of natural processes. The harvest of forest products other than timber is permitted where the activity is neutral or beneficial to the attainment of late-successional forest habitats and the species associated with them. Harvest of special forest products is encouraged on matrix lands to provide for social and economic benefits and to help meet the management objectives for these lands.

## GRAZING/RANGE MANAGEMENT

- **Comment:** The SEIS does not analyze the effects of grazing on federal lands.

**Response:** The SEIS states in the Economy and Communities Section of Chapter 3&4 that modification of grazing practices on federal forests may occur under all of the alternatives. Although the effects to some grazing permittees may be significant, the Assessment Team concluded that the consequences to the grazing industry would be minimal because of the minor use of the federal forests in the planning area for grazing. The SEIS, which provides for late-successional forests and their associated species, supplements current plans and draft plan preferred alternatives that provide management direction for grazing on federal forests. Complete analysis of grazing management on the federal forests is beyond the scope of this SEIS.

## Land Allocations

The following comments and responses address land allocations and designations including Congressionally Reserved Areas, Late-Successional Reserves, Adaptive Management Areas, Managed Late-Successional Areas, Administratively Withdrawn Areas, Riparian Reserves, and the matrix. Key Watershed boundaries, boundary discrepancies, and Geographic Information System acreage are also discussed.

### GENERAL

- **Comment:** Explain which standard and guidelines take precedence when land allocations overlap.

**Response:** Standards and guidelines for Congressionally Reserved Areas must first be met. Next, Riparian Reserve standards and guidelines apply, and are added to the standards and guidelines of other designated areas. For example, where Riparian Reserves occur within Late-Successional Reserves, the more restrictive standards and guidelines of both designations apply. (Adaptive Management Areas allow for meeting Key Watershed and Riparian Reserve objectives in innovative ways after an Adaptive Management Area plan is developed and approved). Key Watershed designations may overlay any of the allocations (Late-Successional Reserves, Managed Late-Successional Areas, Adaptive Management Areas, Administratively Withdrawn Areas, or matrix). In this case, the standards and guidelines for the allocations apply, and the Key Watershed designation adds additional requirements. In most instances, current plan and draft plan preferred alternative standards and guidelines that are more restrictive or provide greater benefits for late-successional and old-growth related species are retained.

- **Comment:** The SEIS does not acknowledge the possibility that management direction for Congressionally Reserved Areas or Administratively Withdrawn Areas may not be consistent with the ecological objectives of the SEIS. The SEIS should clearly state the threshold standards and guidelines applicable to all withdrawn areas.

**Response:** Management direction for Congressionally Reserved Areas has been mandated by Congress and can only be modified by legislative action. Management of these lands follows the direction of the applicable legislation. Changes in legislated management direction are beyond the scope of this SEIS. Standards and guidelines of the current plans and draft plan preferred alternatives for Administratively Withdrawn Areas take precedence over the standards and guidelines of this SEIS when they are more restrictive or provide greater benefits to late-successional and old-growth related species than other provisions of these alternatives. This information is presented in greater detail in Introduction to the Action Alternatives in Chapter 2 of this SEIS. The analysis did consider the existing management direction for these land allocations.

- **Comment:** Some federal lands (e.g., National Wildlife Refuges and lands administered by the Department of Defense and the National Park Service) are shown on the maps that accompanied the Draft SEIS as Late-Successional Reserves or other allocations. The mapped allocations do not fully conform to their current management. Explain what management direction would apply on those lands.

**Response:** The total federal acres displayed in the Draft SEIS land allocation tables and maps were used by the Assessment Team to evaluate the existing situation. The direction in the Final SEIS proposes management only for lands administered by the Forest Service and the Bureau of Land Management within the range of the northern spotted owl. Management direction for other federally administered lands are addressed in the planning documents of the respective federal agency. The designation of lands other than those administered by the Forest Service and BLM has been changed from Late-Successional Reserves to Congressionally Reserved Areas in the tables in the Final SEIS to address this concern.

- **Comment:** Modification and adjustment of land allocation boundaries is not discussed in the SEIS. Explain when it is appropriate to add, delete, or modify land allocation boundaries. Discuss the criteria to be used and identify the decision makers.

**Response:** The present land allocations closely approximate those necessary for achieving plan objectives. Large scale boundary adjustments are not anticipated. Watershed analyses will provide information necessary to develop recommendations for changes in land allocation boundaries through land use plans. Decisions on proposed changes to land allocation boundaries will be subject to the NEPA process and associated opportunities for public involvement.

The Record of Decision for this SEIS will be signed by the Secretaries of Agriculture and the Interior. Changes in land allocation boundaries would be approved at the Regional Forester and State Director level as currently delegated, subject to review by the Regional Ecosystem Office.

- **Comment:** Adjustments need to be made to the eastern boundary of the northern spotted owl range to include more habitat suitable for the northern spotted owl.

**Response:** The boundary for the northern spotted owl range was established through regulation in the development of critical habitat for the northern spotted owl. The boundaries which were used in that exercise were those originally developed by the Interagency Scientific Committee and adjusted by the Committee on Late-Successional Forests in 1991. Adjustments of the boundaries, therefore, would constitute a regulatory change, subject to the NEPA process and associated opportunities for public involvement.

## STANDARDS AND GUIDELINES

- **Comment:** The Draft SEIS does not discuss how the Aquatic Conservation Strategy affects new proposals for constructing and operating new storage or hydroelectric facilities.

**Response:** The standards and guidelines in Appendix B6 focusing on Lands (LH-1 through LH-5) outline management of proposed new and existing storage and hydroelectric facilities within Riparian Reserves. Specific management actions will be considered under separate NEPA analyses. Compliance with the Aquatic Conservation Strategy will be considered at that time.

- **Comment:** The standards and guidelines for Riparian Reserves should not prohibit construction of new water supply facilities within Key Watersheds.

**Response:** The standards and guidelines for Riparian Reserves restrict construction of new water development proposals, within Tier 1 Key Watersheds, to those that maintain and restore riparian resources. For Tier 2 Key Watersheds and all other watersheds, the standards and guidelines do not 'require' maintenance and restoration of riparian resources but give 'priority emphasis' to maintaining and restoring riparian resources. In addition to the explicit language, all proposals will be reviewed in the context of the Aquatic Conservation Strategy objectives.

- **Comment:** The Aquatic Conservation Strategy standards and guidelines pertaining to instream flows and water development projects within Riparian Reserves are contrary to existing law for management of the Bull Run Management Unit.

**Response:** The Lands section of the Aquatic Conservation Strategy standards and guidelines has been revised to clarify the intent. The revised standards and guidelines reflect different management for all watersheds. Standards and guidelines for existing and proposed facilities within Riparian Reserves have also been clarified. The Aquatic Conservation Strategy standards and guidelines clarify direction for restoring and maintaining the physical and biological integrity of the riparian and aquatic ecosystems. Management activities within the Bull Run Unit would be governed by these standards and guidelines to the extent that they are within the constraints of existing law.

- **Comment:** The Aquatic Conservation Strategy would require changes in operations to existing water development facilities. For example, the standards and guidelines require existing storage reservoirs to release flows to restore downstream aquatic resources.

**Response:** In the case of existing facilities, proposals to expand and relicense hydroelectric projects and reissue permits will provide opportunities to review instream flow needs within the context of the Aquatic Conservation Strategy objectives. The standards and guidelines in Appendix B6 provide direction for agencies to recommend conditions which maintain and restore the physical and biological integrity of the riparian and aquatic systems. This will occur during the appropriate processes for reviewing operations of water development facilities. While the recommendations are not mandatory, the decision makers will frame the decision in the context of the Aquatic Conservation Strategy objectives.

- **Comment:** Riparian Reserve standards and guidelines make it difficult to operate and develop recreational use facilities such as trails and ski lifts.

**Response:** Riparian Reserve standards and guidelines require maintaining, operating, and constructing recreation facilities in a manner that contributes to attaining the Aquatic Conservation Strategy objectives. For existing facilities, this could result in changes in operations to meet Aquatic Conservation Strategy objectives.

## CONGRESSIONALLY RESERVED AREAS

- **Comment:** Areas proposed or being studied for Wilderness designation should have been included in this SEIS.

**Response:** Many wilderness study areas are currently included within reserves or Administratively Withdrawn Areas. To designate these areas as Wilderness would require congressional action and is beyond the scope of this SEIS.

## LATE-SUCCESSIONAL RESERVES

- **Comment:** Late-Successional Reserves should be permanently protected to retain this portion of our forest heritage for future generations, and to provide for the continued health of our planet. The Forest Service and BLM should not be allowed to eliminate them in the future.

**Response:** For analytical purposes in the SEIS, Late-Successional Reserves are considered to be long-term designations. They are intended to protect old-growth and late-successional forests and to allow the growth of younger forests to meet those characteristics, and thus provide a network of old-growth and late-successional forest habitat. There is no intent to eliminate any Late-Successional Reserve, as that would defeat the purpose of the network of reserves and the reserve itself. If a managing agency proposes a modification to a Late-Successional Reserve through the adaptive management process, it will be subject to review by the Regional Ecosystem Office.

- **Comment:** Late-Successional Reserves that protect all ecologically-significant old growth should be created. Management of these reserves should prohibit all activities related to logging such as salvage, thinning and road building which damage old-growth ecosystems, habitat and species. It remains to be seen whether old-growth conditions can be developed through silvicultural practices; the guidelines are unclear and there is no ecological foundation for it. As a result of ecosystem processes, the forest will undergo natural thinning and reach the same late-successional conditions without human intervention.

**Response:** Alternative 1 designates all ecologically significant areas of old growth as Late-Successional Reserves and precludes most silvicultural activities. Under the proposed alternative, thinning or silvicultural treatments inside reserves must ensure they are beneficial to the creation of late-successional forest conditions. The Regional Ecosystem Office will review and may develop criteria that would exempt some silvicultural activities from review. All alternatives restrict logging and salvage within Late-Successional Reserves—varying from full prohibition to some allowance (following review) for management to encourage late-successional conditions. The alternatives vary in retaining greater or lesser amounts of ecologically-significant old growth; this range is available for selection by the decision maker. Land allocations and the standards and guidelines would meet the need to protect the overall ecosystem while providing for other management opportunities.

The possible advantages and disadvantages of silvicultural treatments, including thinning in Late-Successional Reserves, are discussed in Chapter II of the FEMAT Report. While the decision to employ silvicultural treatments must be made in a circumstance of uncertainty, monitoring and the adaptive management process will permit future adjustments to these standards if they do not contribute to late-successional forest conditions. While young stands that originated after wildfire typically have greater structural diversity than replanted stands, conditions may still warrant thinning to accelerate the development of late-successional forest conditions. Other factors, such as overall forest health and the risk of large-scale disturbance (e.g. fire, disease and insect infestation outbreak) are also considered. This information is presented in greater detail in Appendix B7, Late-Successional Reserve Standards and Guidelines, in this SEIS.

- **Comment:** The Late-Successional Reserve system in the preferred alternative is not adequately protected and reserves are too small and scattered. There are many roadless areas, wilderness study areas, and areas that naturally regenerated after fires or windstorms that should be included in reserves. These are natural laboratories for studying how these complex ecosystems regenerate themselves and they will become old-growth forests if retained. The reserves indicated on the Alternative 1 map should be added to the preferred alternative because the ecological benefits of retaining large numbers of old-growth reserves outweighs the economic benefits that might be derived.

**Response:** The total system of withdrawn and reserved areas in the preferred alternative, along with the specified standards and guidelines, would meet the need to protect the overall ecosystem, while providing for other management opportunities. The alternatives vary in retaining greater or lesser amounts of ecologically significant old growth; this range is available for selection by the decision makers.

- **Comment:** The Alternative 9 reserve system in eastern Washington is not adequate to protect the northern spotted owl. There are occupied northern spotted owl sites that were designated as Managed Pair Areas in the Final Draft Spotted Owl Recovery Plan in the matrix.

**Response:** A system of Managed Late-Successional Areas has been added to Alternative 9 in the Final SEIS to address this concern. The objective of these areas is to produce and maintain an optimum level of late-successional and old-growth stands on a landscape scale. Certain silvicultural treatments and fire hazard reduction treatments are allowed to help prevent large catastrophic events such as high intensity, high severity fires, diseases, or insect epidemics. Additional discussion of standards and guidelines that apply to Managed Late-Successional Areas can be found in Chapter 2, in the section, Introduction to the Action Alternatives.

- **Comment:** The allocation of Late-Successional Reserves is not appropriate for federal lands designated as Open Space in the Columbia River Gorge National Scenic Area. The Late-Successional Reserve designation would not meet the level of protection provided by the National Scenic Area Management Plan.

**Response:** Existing standards and guidelines continue to apply where they provide greater protection than the selected alternative. Although the Columbia River Gorge National Scenic Area plan was not specifically listed as a "current plan" in the Draft SEIS, it will be considered in that category. This has been clarified in the Final SEIS. Those areas within the planning area that have been designated as Public Recreation and Agriculture in the National Scenic Area management plan have been changed to Administratively Withdrawn Areas within this SEIS.

- **Comment:** The Soda Mountain/Pilot Rock area in southern Oregon and northern California should be designated as Late-Successional Reserve under Alternative 9 to provide a corridor for long-term dispersal of genetic material between the Klamath Mountains and the Cascade Range.

**Response:** The area of concern has been proposed as the Cascade/Siskiyou Ecological Emphasis Area in the Medford District Resource Management Plan. The Medford RMP recognizes the unique botanical characteristics and provides direction to manage the area to maintain the biological corridor function. However, the area recommended for Late-Successional Reserve status is not capable of achieving late-successional characteristics. The area is comprised of brush fields, noncommercial forest land, and stringers of older forest in a random mosaic mostly located in Riparian Reserves.

- **Comment:** The allocation of Late-Successional Reserves is inconsistent with congressionally mandated objectives for the Quinalt Special Management Area within the Olympic National Forest. The

establishment of the Quinault Special Management Area by Congress was intended to provide the Quinault Indian Nation with a sound economic base. The Late-Successional Reserve designation will deny the revenue that Congress intended for the Quinault Indian Nation.

**Response:** The lands administered by the Olympic National Forest in the Quinault Special Management Area have been incorporated into the Olympic Adaptive Management Area in the Final SEIS to address this concern.

## ADAPTIVE MANAGEMENT AREAS

- **Comment:** Reduce or eliminate Adaptive Management Areas under Alternative 9. Designate all old growth in those areas as Late-Successional Reserves. Experimentation is too risky. Adaptive Management Areas should not allow increased timber harvest. No amount of habitat restoration and ecosystem research can mitigate the damage that increased timber harvest will cause to an already threatened ecosystem. (Alternately, some comments expressed the concern that Adaptive Management Areas are not extensive enough, especially in the dry-site physiographic provinces where the health of the forest is a problem.)

**Response:** The overall system of Adaptive Management Areas is well distributed geographically throughout the range of the northern spotted owl to minimize risk to the overall conservation strategy. The array of Adaptive Management Areas provides a balance between having a system of areas that is: (1) so large and diffuse that it lacks focus and has extensive management constraints because of its size and overall impact on regional conservation strategies; and (2) too small to allow for meaningful ecological and social experimentation. The land allocations and standards and guidelines under Alternative 9 meet the need to protect the overall ecosystem while providing for other management opportunities. Adaptive Management Areas are designed to be prototypes for methods to explore alternative cooperative ways of doing business between federal agencies, other organizations, local and state governments, and private landowners. The development of Adaptive Management Area plans is to be coordinated with the Regional Ecosystem Office to ensure compliance with the standards and guidelines of the selected alternative. If the decision makers decide that the risks associated with Adaptive Management Areas are too great, other alternatives exist for selection.

- **Comment:** Local communities are being misled into believing that there will be a sustainable harvest from Adaptive Management Areas, when in reality large portions of these areas are off limits.

**Response:** Each Adaptive Management Area has specific management objectives, as discussed in Appendix B3 of this SEIS. The mix of Congressionally Reserved Areas, Late-Successional Reserves, Administratively Withdrawn Areas, and Riparian Reserves that occur in Adaptive Management Areas will substantially limit some timber production opportunities. Most Adaptive Management Areas attempt to balance the creation and maintenance of late-successional forest and high quality riparian habitat with a sustainable timber harvest. Timber harvest levels must be consistent with the specific management direction for each Adaptive Management Area. Over the long term, maintenance of ecosystem health is essential to sustainable timber harvest.

- **Comment:** Clarify whether there are additional standards and guidelines that apply to the Adaptive Management Areas other than those stated in the SEIS.

**Response:** The standards and guidelines for Congressionally Reserved Areas and Late-Successional Reserves apply to Adaptive Management Areas when those areas are included within the Adaptive Management Area. For Riparian Reserves and Key Watersheds within Adaptive Management Areas, there is flexibility to achieve watershed condition objectives in a manner different than that described

for other areas, and to conduct established research projects within riparian zones. There is no matrix inside Adaptive Management Areas. For the remainder of the area, standards and guidelines are to be developed to meet the objectives of the Adaptive Management Area consistent with the selected alternative. Further, standards and guidelines in current plans and draft plan preferred alternatives must be considered during planning and implementation of activities within the Adaptive Management Area. These may be modified in Adaptive Management Area plans based on site-specific analysis. Coordination with the Regional Ecosystem Office is required for these areas.

- **Comment:** Many respondents suggested specific boundary changes to Adaptive Management Areas to exclude lands in adjacent drainages or nearby counties or to avoid multiple ownership patterns.

**Response:** The Adaptive Management Areas are designed to provide a diversity of biological challenges involving intermixed land ownerships and multiple social contexts. Innovation in integration of multiownership watersheds is encouraged among state and federal agencies, local communities, and private landowners to meet objectives of the selected alternative.

- **Comment:** Expand the boundary of the Applegate Adaptive Management Area to include the entire watershed. While this would add additional Late-Successional Reserves to the Adaptive Management Area, there would be no changes to the on-the-ground standards and guidelines.

**Response:** This change has been made in this Final SEIS to increase ease of administration, analysis, planning, coordination, and mapping. Because this proposal does not change the standards and guidelines for any designated lands, nor otherwise affect on-the-ground management or the effects discussed in the SEIS, the change has been incorporated into the SEIS.

- **Comment:** The Northern Coast Range and the Finney Adaptive Management Areas include large amounts of Late-Successional Reserves. These reserves may prohibit opportunities for active management, which will restrict the ability to meet Adaptive Management Area objectives.

**Response:** The Late-Successional Reserve designations for the Northern Coast Range and the Finney Adaptive Management Areas will be reviewed and may be modified in Adaptive Management Area plans. These plans must meet SEIS management objectives, which require restoration and maintenance of late-successional forest habitat and are subject to consultation with the US Fish and Wildlife Service under Section 7 of the Endangered Species Act. Coordination with the Regional Ecosystem Office is required.

- **Comment:** The Finney Adaptive Management Area has contradictory management objectives. It cannot provide both restoration of late-successional and riparian habitat and a stable timber supply.

**Response:** The text in the Final SEIS (Appendix B3) has been modified to state that the management objectives for the Finney Adaptive Management Area are to provide for the restoration of late-successional and riparian habitat components. The objective pertaining to management of a stable timber supply has been removed.

## RIPARIAN RESERVES

- **Comment:** There is no permanent level of protection for watershed, fish habitat, or fish populations under any of the alternatives because the Riparian Reserves can be reduced, if justified, through a watershed analysis.

**Response:** Watershed analysis will be conducted by trained specialists of applicable expertise. The process is designed to be a technically rigorous and scientifically-based process. As such, the



combination of trained specialists with defensible procedures reduces the potential for arbitrary and nondefensible outcomes. All adjustments to Riparian Reserves will be based on a combination of resource values and an analysis of risks to resources and will be subject to analysis and public review and comment through the site-specific NEPA process.

- **Comment:** One Riparian Reserve objective should be to develop the stand structure and plant communities representative of pre-European settlement conditions.

**Response:** The watershed-based approach of this SEIS, particularly the watershed analysis process, allows the land management agencies to tailor desired landscapes characteristics to specific watersheds based on river basin and/or province levels.

- **Comment:** Riparian Reserves are intended to serve as travel corridors for old-growth dependent species. Any areas containing larger trees within Riparian Reserves are of special value and, because of their rarity, should be given special consideration and protection from road building, thinning and salvage.

**Response:** Connectivity/Diversity Blocks and dispersal and travel corridors within and between Riparian Reserves will be considered during watershed analysis. The value of existing forest structure, relative to the objectives for Riparian Reserves in a particular watershed, will be determined through the watershed analysis process and tiered to issues related to province or river basin planning. The watershed-based planning approach at the province, river basin, and smaller watershed level will consider the current landscape condition, relative to proposed actions, and set the context for desired landscape conditions.

- **Comment:** The Riparian Reserve system ignores the role of headwater and intermittent streams as a linked system with downstream fish-bearing streams.

**Response:** Riparian Reserves include intermittent and headwater streams and are linked with downstream fish-bearing streams. Chapter 3&4 of this SEIS describes the importance of maintaining linkages in stream systems within and between watersheds. The Riparian Reserve system establishes a management scenario to maintain the links between headwater and intermittent streams.

- **Comment:** The Draft SEIS does not define "unstable and potentially unstable" areas for inclusion within Riparian Reserves, nor does it describe the process for identifying these areas. Unless identified and mapped, Alternative 9 could pose unacceptable risks of landslides, as well as associated impacts to stream habitats resulting from land use activities on steep, unstable slopes.

**Response:** Riparian Reserves for intermittent streams must include associated unstable and potentially unstable areas. The prescribed Riparian Reserve widths will apply until the agencies complete watershed analyses. In addition, watershed analysis will describe critical hillslope, riparian, and channel processes necessary to delineate Riparian Reserves that assure protection of riparian and aquatic functions. Riparian Reserves will be adjusted, if determined necessary, based on the results of watershed analysis.

- **Comment:** The Draft SEIS does not justify the assumption that Riparian Reserves that are narrower than those prescribed in the standards and guidelines pose a greater risk to aquatic resources.

**Response:** Chapter 3&4 of this SEIS provides the rationale for adopting the prescribed Riparian Reserve scenarios.

- **Comment:** A number of respondents expressed concern that the Riparian Reserve widths are not

acceptable. Some comments stated that under the preferred alternative, the Riparian Reserve widths are not adequate and should be increased to maintain both high water quality and threatened fisheries habitat. Other respondents stated that the plan objectives could be met with narrower Riparian Reserve widths. And finally, a number of respondents stated that the interim Riparian Reserve widths should be made permanent, with no adjustments.

**Response:** Riparian Reserves are a major component of the Aquatic Conservation Strategy (Appendix B6 of this SEIS). The Riparian Reserves are designed to be large enough to protect the ecological values required by riparian-dependent resources. The Riparian Reserve widths are designed to provide a level of high quality fish habitat and riparian protection for associated species. Analysis of site-specific characteristics may warrant adjustments to Riparian Reserve boundaries, either wider or narrower, and will be based on scientifically sound reasoning and documented via the watershed analysis and NEPA processes. The watershed analysis process will provide the information necessary to develop recommendations for modifying Riparian Reserves. It also takes into account the location of critical hillslopes, riparian concerns, channel processes and other information necessary to delineate Riparian Reserves that meet Aquatic Conservation Strategy and terrestrial wildlife objectives. The area contained within adjusted Riparian Reserves for permanently flowing streams is expected to be similar to the area within the current Riparian Reserve network.

Proposed adjustments to Riparian Reserve boundaries are subject to review by the Regional Ecosystem Office. This office, along with the team of experienced and trained specialists that prepared the watershed analyses, will ensure consistency in the process and in the reasoning for adjusting Riparian Reserve boundaries.

The process used to designate reserve widths considered the context of total land withdrawn or reserved and other standards and guidelines. The total system of withdrawn and reserved areas, along with the specified standards and guidelines, would meet the need to protect the overall ecosystem while providing for other management opportunities. The alternatives have varying Riparian Reserve widths and levels of risk to the ecosystems associated with them. The three riparian reserve widths are available for selection by the decision makers.

- **Comment:** Stream and watershed protection should not be reduced in any watershed prior to watershed analysis, and the prescribed Riparian Reserve widths should be made permanent.

**Response:** Widths of Riparian Reserves for all watersheds apply until watershed analysis is completed, a site-specific analysis is conducted and described, and the rationale for final Riparian Reserve boundaries is presented. Areas within watershed basins may require wider or narrower Riparian Reserves than those prescribed in this SEIS. The width of Riparian Reserves necessary to protect the ecological integrity of intermittent streams varies with slope, soil, and rock types. Although Riparian Reserve boundaries may be adjusted on permanently flowing streams, the Assessment Team considered the prescribed widths to approximate those necessary for attaining Aquatic Conservation Strategy objectives. Post-watershed analysis Riparian Reserve boundaries for intermittent streams, however, are expected to be different from the existing boundaries. The reason for the difference is the high variability in hydrologic, geomorphic, and ecologic processes affecting intermittent streams. Thus, it is possible to meet Aquatic Conservation Strategy objectives with post-analysis reserve boundaries for intermittent streams that are quite different from those conforming to the definitions.

Post-watershed analysis Riparian Reserve widths may also differ depending on the objectives used for establishing the reserves. For example, Riparian Reserves necessary to meet terrestrial wildlife dispersal needs could be different than those necessary to meet Aquatic Conservation Strategy objectives.

Adjustments to Riparian Reserves must be based on scientifically sound reasoning and be fully justified and documented. If approved by the Regional Ecosystem Office, decisions on proposed changes to land allocation boundaries will be subject to the NEPA process and associated opportunities for public involvement. An expanded discussion can be found in Appendix B6, Aquatic Conservation Strategy.

- **Comment:** The Aquatic Conservation Strategy relies on reserves, including Riparian Reserves and Key Watersheds, rather than on an ecosystem structure and function approach.

**Response:** Riparian Reserves are designed to be large enough to protect the ecological values required by riparian-dependent resources and provide for ecosystem structure and function. The Assessment Team used the prescribed restrictions on land uses within Key Watersheds and Riparian Reserves to assess effects to aquatic species and habitat. Implicit in that analysis is the assumption that habitat conditions within Riparian Reserves and watershed conditions will improve through time with implementation of the Aquatic Conservation Strategy. Full implementation of the Aquatic Conservation Strategy includes the watershed restoration program described in Appendix B6.

## MATRIX

- **Comment:** Descriptions of management on matrix lands focus on timber harvest. The need to manage the matrix for multiple values should be emphasized. Matrix acreage does not consider the smaller-scale existing Forest and District Plan constraints which are designed to protect or enhance site-specific visual and recreation opportunities, wildlife habitat, and water quality.

**Response:** All alternatives use the current plans and draft plan preferred alternatives as a starting point, or baseline. The standards and guidelines of current plans and draft plan preferred alternatives apply to all alternatives where they provide greater benefits to late-successional forest related species. (Refer to the section, Introduction to the Action Alternatives, in Chapter 2 for additional discussion and exceptions.) In addition to these constraints, standards and guidelines for Riparian Reserve land allocations apply within matrix lands in all alternatives except Alternative 7. For Alternative 7, riparian protection is provided by the existing Forest and District Plans.

## KEY WATERSHEDS

- **Comment:** The preferred alternative does not provide protection for Key Watershed refugia because new human disturbance is permitted. The Key Watersheds should be removed from the timber base, no scheduled timber harvest should be planned in these areas, and Key Watersheds must be managed as new, separate and distinct management units.

**Response:** The total system of Key Watersheds, along with Riparian Reserves and the specified standards and guidelines, will meet the need to protect the overall aquatic ecosystem while providing for other management opportunities. Any proposed new activities within Key Watersheds will be considered in the context of the Aquatic Conservation Strategy objectives. Watershed analysis will assist in setting the context for proposed management actions.

- **Comment:** The SEIS Team received hundreds of comments requesting designation of additional areas as Key Watersheds. The system of Key Watersheds does not include watersheds for all streams used by the 257 anadromous salmonid fish stocks at risk that inhabit waters flowing through federal lands within the range of the northern spotted owl. The Draft SEIS did not describe the rationale for selecting/including Key Watersheds identified in the Aquatic Conservation Strategy.

**Response:** While Key Watersheds are an important component of the Aquatic Conservation Strategy, they do not comprise the entire strategy. This issue is specifically discussed in Chapter 3&4 and Appendix B6, Aquatic Conservation Strategy, of this SEIS.

The Key Watershed network incorporates streams used by 176 of the 257 at-risk fish stocks inhabiting federal lands. The network does not always include entire watersheds where the fish stocks occur, but includes streams or stream segments within the watersheds containing habitat that is important to the life history of the fish. The network is intended to serve as current or future refugia for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species. Riparian Reserves and other standards and guidelines are considered adequate to protect fish stocks outside Key Watersheds.

Biologists and resource managers of the Forest Service and BLM, along with other individuals knowledgeable of Pacific Northwest anadromous fish, were included in the process to identify the Key Watersheds. The Forest Service and BLM prepared maps showing the distribution of anadromous fish or other fish species and identified the best existing habitats. Additionally, each National Forest and BLM District identified watersheds that had the highest potential for restoration. A regional map was prepared based on the input from the two agencies. The review of the regional map evaluated the distribution of the watersheds relative to each other, distribution within major drainage basins, and the distribution relative to private and state lands. Individuals knowledgeable about the basins reviewed the regional map before deciding on the final 164 watersheds. Professional judgement was used to determine if the system of Key Watersheds appeared to be adequate in terms of amount and distribution of habitat to meet Aquatic Conservation Strategy objectives. Reeves and Sedell (1992) provide a more comprehensive discussion on the function of and the theory supporting the Key Watershed network.

- **Comment:** Expand the Bull Run Management Unit boundary to include the Little Sandy drainage. Designate the Little Sandy drainage as a key watershed, and change the matrix land allocation to Late-Successional Reserve to preserve water quality and quantity for future expansion of the City of Portland's municipal water source.

**Response:** Changes to the Bull Run Management Unit boundary must be designated by Congress, and thus are outside the scope of this SEIS. The Little Sandy drainage has been incorporated into the Bull Run Tier 2 Key Watershed in the Final SEIS. The current vegetation component is not characteristic of late-successional habitat and therefore remains in the matrix. Riparian Reserves and other standards and guidelines are considered adequate to preserve water quality and quantity.

- **Comment:** The Sweet Creek and Three Rivers Tier 1 Key Watersheds on the Siuslaw National Forest do not meet the criteria for key watersheds and should be dropped. Bailey Creek, North Fork Beaver Creek, and Upper Fiddle Creek are watersheds with high priority protection and restoration needs which should have been designated as Tier 1 Key Watersheds.

**Response:** These changes have been made in the Final SEIS. The map which accompanies the Final SEIS reflects this change and applies to all alternatives.

## ADMINISTRATIVELY WITHDRAWN AREAS

- **Comment:** Administratively Withdrawn Areas should be changed to Congressionally Reserved Areas to provide permanent protection for important resources. Administratively Withdrawn Areas may be reclassified by the agencies; this leaves little confidence that the selected alternative will achieve its stated goals.

**Response:** This proposal would require congressional action and is outside the authority of the agencies and the scope of this programmatic SEIS.

- **Comment:** Forest and District Plan land allocations and standards and guidelines should be reexamined in light of the system of reserves proposed in the SEIS alternatives.

**Response:** Land allocations and standards and guidelines in current plans and draft plan preferred alternatives were considered as the starting point, or baseline, for development of the alternatives. As such, the Forest and District Plan land allocations are an integral part of the alternatives presented in this SEIS.

## OTHER

- **Comment:** The large-scale maps which accompanied the Draft SEIS are not drawn to a fine enough scale to make site-level determinations. The scope of reserved lands should be stated in narrative form in the SEIS to provide the federal agencies the specificity needed to make on-the-ground management decisions.

**Response:** The maps that accompanied the Draft SEIS are a product of the Interagency Geographic Information System (GIS) data base. This data base provides an inventory of digital spatial data for over 50 layers of information covering federal lands in Washington, Oregon, and northern California and represent boundaries located in operational detail for all alternatives. The data are available and were utilized by all Forest Service and BLM offices in the preparation of this Final SEIS. This data can be displayed at any scale desired. The data base can be updated and revised as new data is collected to allow the agencies to manage the landscape in accordance with the direction in the selected alternative.

- **Comment:** The mapping of late-successional forests is inaccurate and not reliable for adequately assessing ecosystem impacts. In particular, the satellite-derived data does not include information on coarse woody debris. Furthermore, the resolution of the data was reduced to cells of 40 acres, which obscures the amount of forest fragmentation that actually exists.

**Response:** These data are suitable for mapping the distribution of forest stands and for analyzing the effects of the alternatives on the distribution in this programmatic SEIS. Higher resolution data, including forest conditions and characteristics, will be used in watershed/landscape analysis. While errors of data reduction can show either more or less of a characteristic than actually exists in a given cell, they are expected to average out over large geographic areas.

- **Comment:** A process should be implemented to analyze land allocation changes. Due to the large number of public comments and short amount of time available, recommended changes in land allocations will not be adequately analyzed and implemented in the Final SEIS.

**Response:** A process was established to review all recommendations for land allocation boundary changes into the Final SEIS. This process involved categorizing and summarizing issues, consulting with local Forest/District expertise, obtaining Scientific Advisory Group assessment, and progressing through multiple decision making steps. After the decision was made to implement a recommended change, the Interagency Geographic Information Systems Analysis Team incorporated the boundary change into the database and generated new maps. The map accompanying this Final SEIS reflects land allocation changes.

## Economic

The following comments and responses address employment effects in wood products, pulp and paper, fisheries, recreation, and tourism; indirect and induced employment effects; and supply and demand for logs, wood products, and recreation.

### EMPLOYMENT EFFECTS IN WOOD PRODUCTS

- **Comment:** Employment projections for the alternatives are different than those projected in a number of other studies. The estimates of job losses made by economic analysts appear to be unreasonably low. The baseline for the economic analysis ignores job losses resulting from court injunctions that have halted timber sales for 2 years. Independent estimates project job losses of more than 80,000.

**Response:** The discussion of employment in the Economy and Communities section of Chapter 3&4 of the Final SEIS has been amended to more clearly identify indirect and induced employment effects.

The Draft SEIS made comparisons between 2 years (1990 and 1992) and projections associated with the alternatives for estimating job displacement in the wood processing industries. A comparison to the average employment levels for the 1985-89 period is added in the Economy and Communities section of Chapter 3&4 of the Final SEIS.

- **Comment:** The SEIS shows employment figures for 1970-1974 and 1985-1989. Employment statistics for 1992 should be used because they are more up to date.

**Response:** Timber employment statistics for 1990 and 1992 are provided in Chapter 3&4 of the Final SEIS and are discussed in more detail in the text.

- **Comment:** There is no consideration of timber jobs lost as the result of mechanization.

**Response:** Chapter VI of the FEMAT Report discusses the restructuring of the timber industry during the first half of the 1980's. The employment estimates used in the SEIS incorporate these changes. The SEIS also states that the next most likely technological change will be in the utilization of wood fiber that is becoming scarce in supply.

- **Comment:** The economic analysis should consider the probable change in log size and value and the types of wood products that may be produced as a result of the various alternatives. The SEIS considers the employment potential in secondary products to be improving, which is not correct. The size of timber that will be harvested will be small and not conducive to value-added processing.

**Response:** The SEIS, Chapter 3&4, states that the quality of available wood is likely to change. Manufacturers of secondary wood products that require high quality wood for molding and millwork, for example, may find raw materials in short supply. The decline in high quality wood will likely be greater than the decline in sale quantities as a result of smaller average tree size.

- **Comment:** There is no mention of the probable economic consequences that will result from the current lack of timber sales and the expected delay in offering new federal timber sales. The SEIS states that in the next 1 to 3 years, the outlook for sale levels is substantially less than the decadal average. There should be short-term harvest and employment impact estimates.

**Response:** The SEIS does state that the sale level is likely to be less than the decadal average reported for each alternative. This will probably occur due to the time required to prepare new sales that comply with the direction of the selected alternative. The short-term harvest level is a function of the required

timber sale planning process and, therefore, is not within the scope of this SEIS. However, the delay in sale offerings would be similar under all alternatives.

- **Comment:** Clarify whether the numbers in the Draft SEIS Table VI-16 represent decadal or annual employment. Calculating employment based on the historic and projected PSQ (using 6.4 timber jobs per MMBF in California) comes to 3590 jobs in 1990, 1,982 jobs in 1992, and 973 jobs for Alternative 9. When these are multiplied by 10, they do not match the figures in the table.

**Response:** The figures in Table 3&4-19 of the Final SEIS (Draft SEIS, Table VI-16, p. 3&4-126) are annual estimates of solid wood products employment based on harvest levels, plus job constants for the pulp and paper, and mobile home industries.

## EMPLOYMENT EFFECTS IN PULP AND PAPER

- **Comment:** The pulp and paper industry, which employs 27,000 people in primary manufacturing and an additional 40,000 people in paper converting plants within the range of the northern spotted owl, has not been included in the economic assessment. The projection of zero job loss in the pulp and paper manufacturing sector is unrealistic and not based on a valid economic analysis of this sector.

**Response:** Published employment statistics for 1990 identify approximately 28,000 jobs in the pulp and paper industries within the range of the northern spotted owl. This total includes 9,000 jobs in paper converting plants.

The Draft SEIS did not project changes in pulp and paper employment because it was assumed that this industry would have opportunities for replacement of raw materials. The Draft SEIS stated that these industries have the potential to gain raw materials from the use of alternative tree species and recycled paper, the ability to improve recovery processes, and the capability to use chips from redirected exports. Also, pulp is available on the global market. If none of the potential supply substitutes are available, the potential direct employment reduction is between 4,000 and 5,000 jobs.

## EMPLOYMENT EFFECTS IN FISHERIES

- **Comment:** The number of jobs lost in the fishing industry is seriously underestimated. From 1978 to 1992, some 40,000 direct and indirect jobs were lost as a result of loss of habitat. In addition, no attempt was made to include inland fisheries and sport fisheries for any of the three states.

**Response:** The historical fluctuations in the commercial fishing industries and sport fishing were summarized in the FEMAT Report, Chapter VI, and detailed in two reports prepared for the Assessment Team by Radtke and Davis (unpub. 1993a,b). According to these reports, significant adjustments have occurred in both the commercial fishing industry and sport fishing due to declining habitat, fluctuations in the numbers of fish available for harvest, low product prices, substitutes, and unfavorable ocean conditions. The SEIS, Chapter 3&4, also identifies the importance of commercial fishing industries, and coastal and inland sport fishing to the region. The SEIS states that the alternatives have little effect on these uses in the short term but project some positive effects in the future.

- **Comment:** The statement that fewer than 500 fishermen are directly employed in salmon fishing on the west coast is in error since it omits Puget Sound and Columbia River fisheries.

**Response:** A report prepared for the SEIS by Radtke and Davis (unpub. 1993a) identified the Puget Sound ports as the key locations for commercial fishing in Washington, and the Columbia River system as a major component of the salmon fishing industry in both Oregon and Washington.

- **Comment:** Employment in the commercial fishing industry is stated as 5,000 jobs. Many of these fishing jobs are part time. The actual number of licensed salmon anglers in Oregon alone is greater than the stated number of jobs in the commercial fishing industry.

**Response:** Licensed anglers reflect sport and recreational fishing activity and are not comparable to commercial fishing operators. Because many jobs in commercial fishing are part time, employment figures are provided in full-time job equivalents rather than numbers of jobs.

## EMPLOYMENT EFFECTS IN RECREATION AND TOURISM

- **Comment:** There is no discussion of jobs in commercial fishing or the economic contributions of tourism and recreation.

**Response:** The economic contribution of commercial fishing, tourism and recreation are discussed in the SEIS, Chapter 3&4, under Regional Employment.

- **Comment:** Explain the basis for the estimate of 50,000 to 80,000 full-time equivalent jobs directly attributable to forest-based recreation activities on lands administered by the Forest Service and BLM.

**Response:** The methodology described in the SEIS, Chapter 3&4, states that \$0.41 of every dollar spent on recreation or tourism activities can be considered employment income in the recreation or tourism-related industries. The SEIS identifies \$2.8 billion of annual expenditures related to recreation on lands administered by the Bureau of Land Management and Forest Service within the range of the northern spotted owl. Given an annual salary of \$20,000, this expenditure would result in over 55,000 full-time equivalent jobs.

## INDIRECT AND INDUCED EMPLOYMENT EFFECTS

- **Comment:** The economic analysis is seriously flawed because job loss estimates only include direct employment and ignore the support and service sectors. The indirect job losses in rural timber-dependent communities should be considered.

**Response:** As stated in the SEIS, the indirect and induced employment effects are approximately one job for every job affected within the timber industry. The discussion of employment in the Final SEIS has been amended to clarify the potential indirect and induced job losses.

## SUPPLY AND DEMAND FOR LOGS AND WOOD PRODUCTS

- **Comment:** A historical period is needed for comparison of changes in lumber prices and for changes in the price of the average home.

**Response:** Chapter VI of the FEMAT Report uses 1990 timber prices as the basis for comparison and makes projections for the period 1995 through 2040. The price of a home is also compared to that of 1990, with a projection for 1995.

- **Comment:** The aquatic discussion anticipates increased participation from nonfederal landowners to protect aquatic resources. This seems to be inconsistent with the SEIS assumption that nonfederal harvest levels will not be reduced, but rather short-term increases in harvest levels due to increased market values will occur.

**Response:** An increase in timber production on nonfederal lands does not necessarily reduce participation by landowners in the protection of aquatic resources. Increased timber value may make protection of



other values more feasible by either increasing the land base used for the production of forest products, or by including management practices that previously were not economically feasible. An increased land base disperses activity and, therefore, a change in management practices may result in less impact on aquatic resources.

- **Comment:** The alternatives ignore national and global consequences of increased demand for wood and paper products. As prices for lumber and paper products increase, consumers will be forced to pay more and utilize energy-intensive and nonrenewable resources.

**Response:** National and global consequences of increased demand for wood and paper products were explicitly modeled using the Timber Assessment Market Model (TAMM) to estimate the wood fiber supply and price projections used in the SEIS. As stated in Chapter 3&4 of the Final SEIS, consumers will have to pay more for wood products in the decades ahead. The causes of these price increases stem from supply and demand considerations that are beyond to scope of this SEIS.

- **Comment:** Other timber-producing nations are positioning themselves to fill the market niche resulting from declines in Pacific Northwest timber production. Canada has increased production, Siberia is actively soliciting buyers, and third world countries are increasing harvest levels. The resulting environmental impacts of a reduced timber harvest in the Pacific Northwest will be adverse on a global level.

**Response:** Information on the locations, timing and magnitude of potential harvests necessary to estimate environmental impacts in other parts of the world is not available.

- **Comment:** The assessment area used in the SEIS to evaluate the economic and social effects of the alternatives fails to reflect the full range of effects of increased demand for timber supplies. Long haul distances may result in effects outside of the area considered.

**Response:** The SEIS does identify many of the effects of reduced timber supplies in the social and economic study area, including harvest responses from other ownerships and price shifts. The economic and social study area includes all counties that have any area within the range of the northern spotted. At this time, the potential shifts in log flow patterns are unknown, both within and outside the social and economic study area.

- **Comment:** The economic analysis should include the effects from a reduced timber supply on both private and federal timberlands.

**Response:** The harvest levels for private lands and other nonfederal lands are estimated using TAMM (Haynes et al. 1993), and displayed in Table 3&4-14 of Chapter 3&4 of this Final SEIS. Also presented are the predicted economic impacts resulting from changes in timber supply from all ownerships.

- **Comment:** For the period 1986 through 1991, predictions based on TAMM indicated that forest industry harvests were increasing when in reality they were decreasing.

**Response:** The forest industry harvest projections were in error and TAMM has been corrected. This correction caused shifts in other statistics estimated and presented in the Draft SEIS, yet the overall ranking of the alternatives and the magnitude of the differences between the alternatives remains the same.

- **Comment:** The harvests projections based on the economics-driven TAMM are quite different from those found in recent timber supply studies, based on inventory and growth, which were prepared by the States of Oregon and Washington. The forest industry harvest projections, therefore, overemphasize short-term economic considerations and do not take into account the forest industry's long-term objective to maintain sustainable harvests.

**Response:** Historically, the forest industry's long-term sustainability objectives have not appeared as even-flow harvests in the short term. Economics appear to play a more central role in decisions to harvest private lands.

- **Comment:** The forest industry harvest projections do not take into account harvest regulations imposed by the state and federal governments.

**Response:** The empirical basis of TAMM reflects existing state harvest regulations in the Pacific Northwest. The effects of federal controls are assumed to be transitory. This means that Federal Government requirements, such as U.S. Fish and Wildlife Service spotted owl guidelines, do not require acres to be removed from the timber base but harvest objectives for a specific site may be shifted in space and time.

- **Comment:** A Canadian timber supply analyst projects that Canadian timber harvests will decrease, thus adding to the U.S. lumber shortage.

**Response:** The analysis presented in this SEIS assumes that recent harvest reductions in British Columbia are a localized west coast phenomenon.

- **Comment:** Resource Information Systems, Inc. (RISI) estimates that the annual harvest removals in the southeast will decline during the 1990's and into the next decade and not increase as projected in the TAMM analysis.

**Response:** The data and assumptions used in the RISI projections have not been made available.

- **Comment:** Table VI-11 in the Draft SEIS contains an error that affects the discussions of future private harvest responses. The display of the private timber response to decreases in federal harvest levels is larger than it should be when compared to historical harvest levels.

**Response:** The error has been corrected and the table depicting nonfederal timber harvest response to decreases in federal harvest levels has been adjusted accordingly in the Final SEIS (Table 3&4-14).

- **Comment:** The domestic demand for timber can be met by private forest lands alone. An alternative should be considered that prohibits all timber harvest from federal forests.

**Response:** The United States has been, and is expected to continue to be, a net importer of softwood forest products. This means that the current domestic demand for timber is not being met by private and public supplies combined. Alternative 1 approximates timber harvest prohibition on federal lands within the range of the northern spotted owl by limiting harvest to 12 percent of the land, and is available to the decision makers for selection.

- **Comment:** The SEIS implies that lumber prices will not increase appreciably in the future, but states that market forces will provide the incentive to manage private forest lands.

**Response:** The SEIS states that reductions of federal timber availability do spur price increases for timber regionally, but the projections for changes in lumber prices nationally are minimal. The increase in timber value will provide a greater economic return to timber owners and will motivate investments in timber management.

- **Comment:** Economic considerations should include realistic projections of commercial need for lumber and fiber for the entire nation.

**Response:** Projections of lumber and wood fiber demand for the U.S. were made using TAMM. Minimal price increases in lumber were predicted nationally as a result of reduced supply from federal forests in the Pacific Northwest.

- **Comment:** The SEIS fails to adequately consider the societal value of wood. The extraction of wood products from the planning area is essentially treated as a residual by-product in the planning effort.

**Response:** Maintenance of a sustained yield of renewable natural resources, including timber, is a key part of the purpose and need of the proposed action (see Chapter 1). The objectives include: "....attain the greatest economic and social contribution from the forests of the region and meet the requirements of the applicable laws and regulations, including the Endangered Species Act, the National Forest Management Act, [and] the Federal Land Policy and Management Act....". The requirements of these laws and their implementing regulations are explicit about the need to protect wildlife, and therefore constrain the amount of timber production available under the alternatives. In addition, the SEIS projects the probable amount of timber that will be harvested under each alternative to enable the decision makers to consider the value associated with provision of wood fiber from federal forests in their decision.

- **Comment:** Policies that deal with taxation, exports, and the economic organization of timber and forest product industries need to be changed. Removing the tax subsidy that encourages raw log exports would assist workers and communities in making the transition to a more diversified economy. The Forest Resources Conservation and Shortage Relief Act of 1990 invites the Departments of Agriculture and the Interior to advise Congress about whether wood chips, pulp, and cants should be included in the definition of "unprocessed timber" and, therefore, be subject to export restrictions. The FEMAT Report did not address this subject.

**Response:** Trade, including export restrictions, is addressed in the FEMAT Report in Chapter VI under Additional Policy Considerations. Taxation and export policies are outside the scope of this SEIS.

- **Comment:** The net effect of export restrictions on minimally processed materials such as wood chips, pulp, and cants would not be a mere substitution of mill jobs for longshore jobs as stated in the FEMAT Report. The adverse economic consequences of Alternative 9 will not be mitigated unless export restrictions include minimally processed materials.

**Response:** The FEMAT Report states that there is apt to be a substitution of mill jobs for longshore jobs due to log export restrictions, and that the net effect upon jobs is uncertain. The report does not address the potential impacts from additional export restrictions on minimally processed materials. Issues concerning trade, including new export restrictions, are outside the scope of this SEIS.

## SUPPLY AND DEMAND FOR RECREATION

- **Comment:** The SEIS gives little consideration to the economic contribution or importance of winter recreation.

**Response:** The impacts on existing developed winter recreation activities are not expected to be significant. The impacts of additional winter recreation facilities will be examined on a case-by-case basis as identified in the SEIS, Chapter 3&4, and in Appendices B6 and B7.

- **Comment:** Hunting is a major economic factor which the SEIS fails to include in the economic analysis.

**Response:** Hunting is a component of recreational uses of public lands, and is not identified separately in the SEIS. None of the alternatives presented are expected to have adverse impacts on hunting.

- **Comment:** The value of the recreation emphasis of Alternative 1 should not have increased because there is already a surplus of semiprimitive nonmotorized land. Recreation opportunities that are in deficit supply (such as "roaded natural" and "roaded modified rural") should be shown as increasing in value if there is a shortage.

**Response:** The total value of the recreation emphasis of Alternative 1 increases because there is a projected increase in the demand for semiprimitive nonmotorized recreation. The value per visit does not change, but an increase in demand (more visits) leads to the increase in the total recreation value for the alternative.

- **Comment:** Explain how the dollar per acre value of recreation in the FEMAT Report is determined.

**Response:** The value per acre of recreation is taken from a report titled "The Role of Nonmarket Economic Values in Benefit-Cost Analysis of Public Forest Management Options," (Swanson and Loomis unpub.) which was prepared for the Assessment Team. The value per acre was determined by estimating the value of all visits during 1990 by activity type within the each Recreation Opportunity Spectrum (ROS) class, and then dividing by the total acres in each ROS class. The values are presented on a per-year basis.

## GENERAL COMMENTS

- **Comment:** The SEIS fails to assess impacts on tribal fisheries, economies and employment. No mention was made of tribal fisheries upriver from the Bonneville Dam, nor of subsistence fisheries.

**Response:** None of the alternatives considered in the SEIS are predicted to have adverse impacts on tribal fisheries, economies, and employment although those individuals employed in nontribal industries may be affected.

- **Comment:** The SEIS must include cumulative economic and social impacts on an economy affected by other economic and structural changes, and whether or not the additional impacts may push communities over a critical economic or social threshold.

**Response:** The SEIS analyzes and displays the most recent economic information available to incorporate recent economic shifts. The data for alternatives are compared to current conditions as well as the recent past to identify cumulative changes. The social assessment discussion in the SEIS addresses the ability of communities to cope with change.

- **Comment:** The SEIS fails to review costs on a site-specific basis. The economic impact assessment should include county-level data to allow full disclosure of impacts and for designing mitigation measures.

**Response:** The programmatic nature of the SEIS precludes displays of data at the county level. Estimates of harvest reductions or restoration activities are not site specific enough to allow estimation of impacts at the county level.

- **Comment:** The SEIS discusses long-term impacts on ecosystems and the individual components but does not discuss more than a decade's worth of economic impact. The SEIS should discuss the long-term economic implications of the alternatives.

**Response:** The longer term projections of nonfederal harvest levels and timber prices are provided in the FEMAT Report, Chapter VI. The economic analysis emphasized the first decade because it is the time period within which the largest changes would occur.

- **Comment:** The potential cost of water filtration plants to provide pure water for domestic and industrial use should be considered in the analysis of the alternatives.

**Response:** A basic charge in developing the alternatives considered in the SEIS was that they be within the legal requirements of all applicable laws and policies. Therefore, all alternatives provide water quality equal to or above state and federal water quality standards. Although additional protection provided by the alternatives should be beneficial to surface water systems, it is not possible to identify and measure economic differences at the programmatic scale of this analysis.

- **Comment:** Accounting methods do not recognize the benefits of a sustainable forest. The depletion of natural resources is not subtracted from the gross domestic product or other national accounts, while the value of old-growth trees turned into lumber or exported as logs is reported on the credit side of the regional and national balance sheets.

**Response:** While it is true that current accounting methods do not recognize the value of public natural resources in national accounts such as gross domestic product, these values are recognized in laws and policies. The purpose of this SEIS is to identify alternatives that meet the needs of sustainable ecosystems and society.

- **Comment:** Watershed restoration and fisheries enhancement programs must be viewed as long-term conservation efforts and not just short-term employment programs. These programs should be self supporting if they are to last for decades. Economic self-sufficiency for these programs could be achieved by designing projects to include the selective removal of trees and other forest products that generate revenue. The revenue would then be used to fund the programs.

**Response:** Long-term conservation efforts, described in Appendix B3 of this Final SEIS, represent one possible method that may be used to finance the Adaptive Management Areas.

- **Comment:** The SEIS should deal with larger economic problems, such as the rate of consumption and the locations of the resources needed.

**Response:** Economic issues that are the result of consumption patterns and pressures of population growth are not within the scope of this SEIS.

- **Comment:** The description of the overall condition of the region is very inaccurate. The SEIS states that the economy of the region as a whole appears to be poised for growth. No mention is made of the thousands of jobs that have been, and are projected to be, lost in other industries.

**Response:** The regional projections for growth are statewide forecasts. These statewide projections, as described in the FEMAT Report, mask subregional and sectoral differences. It is important to note that those individuals filling new jobs will not necessarily be those that lost jobs.

- **Comment:** The analysis fails to consider environmental or economic costs and benefits from allowing timber sales to be purchased as temporary conservation easements. The same type of analysis should be made for other commercial uses of the forest as well.

**Response:** The potential for alternative funding sources and nontraditional fees for resources has been recognized. Funding proposals for the Adaptive Management Areas could identify experimentation in marketing resources for nonextraction purposes.

- **Comment:** Timber sales cost the Federal Government more than they return. There is no economic analysis concerning logging feasibility. It will not be economically feasible to harvest the small areas between the Riparian Reserves. The land allocations and standards and guidelines of the alternatives will lead to below-cost sales.

**Response:** Currently, below-cost sales within the range of the northern spotted owl are very rare. An economic screen was used on a sample basis to determine the areas of the forest that would not be economically accessible given riparian standards and guidelines (Johnson et al. 1993). The economics of logging feasibility generally require site-specific information to determine if a proposed project will result in a below-cost sale. This level of detail is not feasible or necessary in this region-wide analysis. It is assumed that the economic screen excluded potential below-cost sales.

- **Comment:** The values attributed to special forest products and other nontimber resources exaggerate their economic contribution. It is unrealistic to expect that recreation and fisheries initiatives will compensate for the reductions in forest industry employment.

**Response:** The SEIS identifies the existing values associated with special forest products and discusses the values and employment generated by recreation, tourism and fisheries. The SEIS also states that the alternatives are expected to have positive but nonquantifiable effects on these resources. The document does not state, or imply, that these resources can compensate for reductions in timber industry employment .

- **Comment:** The SEIS does not discuss the relative effects of the alternatives on different types of forest product companies.

**Response:** The SEIS identifies the impacts on the different forest products industries by general type such as pulp, paper, solid wood products, and secondary wood products manufacturing. It is not within the scope of this SEIS to identify impacts to individual companies or categories of companies.

- **Comment:** The SEIS should have included an economic analysis of the costs and benefits of constructing roads and harvesting the remaining old-growth forest habitat.

**Response:** The calculation of the costs and benefits of road construction require site-specific information that is beyond the level of detail appropriate for this programmatic SEIS and may be addressed at lower planning levels as the selected alternative is implemented.

- **Comment:** Recreation, tourism, fisheries, water quality, air quality, and special forest product industries would be enhanced by proposed levels of habitat protection and should be accounted for as a possible economic gain.

**Response:** The SEIS states that the alternatives will likely have positive effects on these uses. At this time, however, information is not available to quantify the relationship between habitat protection and the economic value of these resources.

- **Comment:** Any significant reduction in the timber volume available from federal forest must be accompanied by an increase in the percentage of timber available under the Small Business Administration timber sales set-aside program for the small companies most dependent on federal timber.

**Response:** Changes to the Small Business Administration set-aside program are not within the scope of this programmatic SEIS. Changes in the set-aside program are generally addressed at the local level.

- **Comment:** The availability, adequacy, and abundance of economic assistance and retraining opportunities for people affected by the changes proposed in the alternatives should have been addressed in the SEIS.

**Response:** Although economic assistance and retraining opportunities are issues in the affected communities in the Pacific Northwest, they are beyond to scope of this SEIS.

- **Comment:** The SEIS does not analyze the benefits of increased user fees. Some recreation uses require that tracts of timber be removed from harvestable inventory and this removal represents a cost to the public. Users should be required to offset these costs through fees.

**Response:** Increases in user fees is a policy issue and not within the scope of this SEIS. However, the potential for alternative funding sources and nontraditional fees for resources has been recognized. Alternative methods of marketing resources may be explored for some Adaptive Management Areas.

- **Comment:** The full impact of the alternatives on state and local economies has not been determined. An analysis of the losses in tax revenue, payments in lieu of taxes, and the additional social and welfare costs must be included in the SEIS.

**Response:** Chapter 3&4 of the SEIS discloses estimated effects on employment, federal timber receipts, and returns to local governments. Additionally, a social analysis was completed and is also summarized in Chapter 3&4.

- **Comment:** Timber and lumber prices have not subsided since the 20 percent price increase of 1990-92 as stated in the SEIS.

**Response:** Prices in 1993 started to subside somewhat, but the reduction was toward predicted levels of increase, not to historical levels.

- **Comment:** No attempt was made to assess the economic benefits of stream restoration.

**Response:** The SEIS states that the commercial fishing industry, recreation, and water quality are expected to be positively affected as a result of stream restoration, yet the magnitude and timing of these changes are currently unknown. Chapter 3&4 of the SEIS does identify the potential employment opportunities associated with stream restoration.

- **Comment:** The FEMAT Report does not contain an analysis of costs and benefits. Explain how the SEIS meets the NFMA planning regulations that require some consideration of net public benefits and costs.

**Response:** The SEIS describes the range of benefits and costs expected under each alternative. An evaluation of the consequences is presented for those values that can be quantified, such as timber harvest yields, employment estimates, revenues, and visitor days. Other values and costs are qualitatively discussed and relative amounts or levels provided. It is both the quantitative and qualitative discussions and displays that provide an indication of net public benefits. A quantitative analysis of all costs and benefits is not possible when dealing with the variety of values associated with forests.

- **Comment:** An independent scientific review states that Alternative 9 will cost \$693 million per year in lost timber revenue, \$209 million in lost returns to counties and \$728 million in lost revenues to federal, state and local governments.

**Response:** The SEIS displays potential revenues to federal, state and local governments such as total timber revenue losses approximating \$600 million and a net revenue loss of \$175 million, relative to 1990-1992. The SEIS also estimates a loss of \$185 million in local government shares. The independent review provides estimates that are higher than those identified in the SEIS, primarily because it uses a different time period for comparison.

- **Comment:** The analysis should show the economic impact on the consumer. In the short term, annual losses to consumers resulting from higher lumber prices will be about \$2.5 billion per year. In the longer term, a conservative estimate of losses to consumers is \$1.2 billion per year. The reduction in timber harvests from federal lands has, and will continue to drive, lumber prices and will further hinder economic growth throughout the nation. Explain why there are no perceptible differences among the alternatives in the average cost of a home.

**Response:** The SEIS states that federal harvest reductions spur price increases for timber stumpage. An upward trend in the softwood lumber wholesale price index is also noted, but it is mostly the result of changing market conditions which include supply and demand considerations beyond the scope of this analysis. The increase in national lumber prices is minimally affected by federal timber reductions resulting from the alternatives. The price of timber is predicted to increase under all alternatives and the price of lumber and wood panel products in the average house is expected to increase by 21.8 percent (FEMAT Report, p. VI-38) from an average of \$5,500 to \$6,700. However, this increase is small relative to the total price of the average home. The end result is that average home costs are expected to increase less than 1 percent. This increase is not projected to hinder national economic growth.

## Social and Community Effects

The following comments and responses address the social impacts to communities that would result from a reduced timber harvest, civil rights impacts, and labor and community assistance concerns.

### SOCIAL IMPACTS AND EFFECTS

- **Comment:** The SEIS needs to define the problems addressed in the social assessment, and the estimates of the probability or confidence assigned to the expected social outcomes.

**Response:** The social analysis in the SEIS assesses the social consequences to communities and people resulting from implementation of the alternatives. Probability and confidence estimates are very difficult to assess because each worker, family, and community reacts differently to change.

- **Comment:** The SEIS process generally fails to meet widely shared standards for social risk assessment or social impact analysis.

**Response:** The social and economic impact analyses, as reported in this SEIS, are consistent with NEPA and agency direction. As such, the analyses assessed, to the extent possible, the reasonably expected outcomes on a multistate (regional) and subregional scale. Because the assessment was based on the entire region, it was never intended to address all possible impacts on every worker, family, company, occupational group, or community.

- **Comment:** There was no analysis regarding the effects of the proposed constraints in riparian and wetland areas on water rights, grazing opportunities, the ranching community, or mining activities.

**Response:** Potential effects to grazing, range management, and minerals are addressed in The Other Environmental Components and Resources section in this appendix, and under The Economy and Communities in Chapter 3&4. While existing water rights are not impacted, future water rights may have some restrictions.



- **Comment:** Social and economic impacts were identified as key issues at the President's Forest Conference but they are not treated as such in the SEIS, especially the alternatives. There is no balance or equity for timber workers or communities; in fact, their "viability rating" is very low while viability ratings for birds and fish are high. The alternatives show a bias toward a biocentric approach without considering the human dimension.

**Response:** The alternatives provide for varying levels of timber production within the range of sustainable resources, existing laws, and agency direction. Alternatives with higher levels of timber harvest were considered, but were not given detailed consideration because they would not be implementable given the current interpretations of related laws, agency direction, and court decisions. Also, these alternatives would not be consistent with the purpose and need for the proposed action.

- **Comment:** The economic section in the SEIS indicates that the greatest impacts from a reduced federal timber harvest would occur in Oregon, while the social effects section, which was not linked to economic projections, indicates communities in Washington will be most affected. Please clarify this.

**Response:** The economics section discusses job and revenue changes (loss or gain), while the social section assesses the overall capacity of a community to absorb or respond to the expected economic changes. Projected economic effects on communities, as defined by early economic projections for Alternatives 1, 3, and 7, were used by the first rural community panel to estimate the magnitude of social effects on rural communities. The second social assessment panel considered another scenario—that of the historical situation with timber harvest levels from the high volume 1985-87 period.

- **Comment:** The social section does not fully analyze the social impacts of all the alternatives, especially Alternative 9.

**Response:** The social impacts were assessed in terms of the expected consequences of implementing any of the alternatives. The social assessment panels considered the historical situation (assumed to be the harvest levels from the Forest and District Plans for the 1985-87 period), Alternative 1 (low harvest level), Alternative 3 (increased harvest), and Alternative 7 (a "current" harvest level). The effects of the remaining alternatives were considered to be within the range of the alternatives analyzed and were extrapolated from results of the three that were analyzed in detail by the social assessment panels.

- **Comment:** Wood is highly valued not only by rural timber industry employees for jobs, but also by urban residents who are also "timber dependent" for housing, paper products, and fuel. These people and communities were not considered in the social analysis.

**Response:** Urban dependence on, and demand for, wood products was evaluated through wood products prices. Urban residents also use the federal forests for a variety of recreation pursuits. Trends indicate that as much as two-thirds of the new residents in the spotted owl region will settle in the larger urban centers along the I-5 corridor. This continuing trend will have implications for federal forest management in terms of an increasing demand by urban residents for recreation and scenic beauty, as well as a changing demand for wood products.

- **Comment:** The methodology for analyzing social risk did not provide a clear definition of the standards for assessing risk. The methods used in social assessment workshops to rate community consequences and community capacity did not use clear measurement standards and criteria. The presentation of results in tables and figures gives a false sense of quantitative rigor and objectivity; results are both misleading and difficult to interpret.

**Response:** The social analysis was based on the rural communities panel assessments of how communities and their leaders might respond today if faced with projected changes in levels of jobs and

natural resources products. As with any assessment, changing national, regional, and local conditions affect how a community responds. The analysis of social risk was assessed for the current situation, then projected for each alternative. These measures were not expected to be precise, rather to give a relative standard to assist the decision makers in a comparison of the alternatives. While other methods and measurement techniques might yield slightly different results, the overall results of the relative effects of the alternatives would be similar.

- **Comment:** The social analysis process that was used to predict community impacts and the ability of communities to respond was very subjective. Identify the experts.

**Response:** The social analysis process is documented in the FEMAT Report (pp. VII-49—50) and in the SEIS (Chapter 3&4). The nearly 100 panelists, whose names are in the administrative record for the FEMAT Report, came from a variety of state and local governments and American Indian reservations in the three states. The panelists who identified communities at risk were grouped, based on their specific and general knowledge, and on their state of residence.

- **Comment:** There is no information or analysis on how the timber-dependent communities have already adjusted to changes in conditions from the 1970's to present. Such information should include population shifts, timber harvest levels, jobs lost or gained due to cutbacks and mill improvements, dollars invested by mills in communities, unemployment rates, numbers of mills capable of handling old-growth timber, the current locations of sawmills, numbers of workers, distance driven to find work or log supply, total timber receipts, dependence on these receipts over time, and other factors.

**Response:** The SEIS (The Economy and Communities section in Chapter 3&4) and the FEMAT Report (Chapters VI and VII) address a number of these factors. General information about the ability to cope with change was added to a new subsection entitled "People Coping with Change" in Chapter 3&4 of this SEIS. The Assessment Team relied on a number of studies on timber dependence, and communities and counties in crisis, prepared by the Forest Service, BLM, and the three states. The situation today has changed from that reflected in those studies, the most current of which was released in late 1992. Today, fewer people are employed in the timber industry, more mills have closed, and communities have had to adjust to changing forest employment levels and cutbacks from tax limitation measures in California and Oregon. However, the data used by the Assessment Team was the best available at the time.

- **Comment:** The Final SEIS should identify specific communities at risk, if even at a subregional level.

**Response:** Specific communities, even counties, were not identified in the SEIS due to the sensitive nature of the assessments. However, an assessment of the effects on communities in broad areas within the impacted area is documented in the FEMAT Report in Appendix VII-C, and in the SEIS, Economy and Communities section, Chapter 3&4. Specific communities at risk are not identified, as this information could discourage investments, loans, and new businesses which are necessary for these communities to adapt to change.

- **Comment:** The SEIS underestimates the magnitude and significance of consequences for individuals, families and communities by focusing heavily on communities and the problems of adjustment.

**Response:** An SEIS section on People Coping with Change has been added to include additional information about impacts to individuals and families.

- **Comment:** Include the following topics in the discussion of the social effects of implementing the selected alternative: increased stress, the need to find work, changing jobs or receiving unemployment benefits, inadequate retraining for placement in lower paying replacement jobs, inadequate rural health care, increases in the number of impoverished families, rising teen pregnancy rates, increased drug and

alcohol abuse, increased physical abuse of women and children, overtaxed social support systems, increasing dependence on welfare, the decline of the "social fabric", loss of control and a sense of powerlessness, strong antigovernment sentiment, and the lack of attachment or trust in rural communities. While all of these effects, and more, are not necessarily inevitable consequences, there is an increased likelihood of them occurring in the future under any of the alternatives.

**Response:** Additional discussion has been added to the People Coping with Change section of the Final SEIS to highlight the variety of impacts that may occur.

- **Comment:** The social assessment did not critique or incorporate considerable work that was already done on the social and cultural impacts of reduced federal timber harvest levels.

**Response:** The social assessment used the most current, applicable, and available information associated with timber harvest levels. In addition, other types of impacts, such as those to commercial fishing, recreation, and harvesting or collecting other forest products, were evaluated.

- **Comment:** The historical section of the SEIS does not acknowledge that forests comprised the principal source of capital for building Pacific Northwest cities and towns.

**Response:** Additional information has been added to the Economy and Communities Overview section of the SEIS to clarify the historical relationship between forest products and the growth of the cities and towns.

## CIVIL RIGHTS IMPACTS

- **Comment:** The SEIS has an inadequate and incomplete civil rights impact analysis. The Forest Service requires this for any major federal action which affects 10 or more people.

**Response:** Forest Service direction states, "A civil rights impact analysis for environmental or natural resource actions is part of the social impact analysis package in a necessary environmental impact statement" (FSH 1709.11). The civil rights impact analysis is presented in the Economy and Communities section of Chapter 3&4. "Civil rights" is defined as "the legal rights of United States citizens to guaranteed equal protection under the law." (FSM 1705). Because no actual or projected violation of legal rights to equal protection is foreseen, no civil rights impacts are reported in the SEIS. The SEIS does, however, include additional information about expected impacts to American Indians.

## LABOR AND COMMUNITY ASSISTANCE

- **Comment:** While the SEIS analyzed the total impacts (positive or negative) on communities, counties, states, and the region, the proposal by the Employment Task Force (the Labor and Community Assistance Working Group), led by Peter Yu, mitigates negative impacts to workers, communities and businesses, and may substantially reduce impacts to these entities if fully implemented.

**Response:** The Labor and Community Assistance Working Group proposal involved recommendations to the Clinton administration for framing legislation to Congress, which is beyond the scope of this SEIS.

- **Comment:** More emphasis should be placed on retraining and on government subsidies for creative and innovative new forms of business and employment in rural communities.

**Response:** Retraining programs and government subsidies for businesses and employment are beyond the scope of this SEIS.

## American Indians

The following comments and responses address impacts to American Indian treaty rights, traditional cultural uses, and reservation lands as a result of changing resource uses, reduced timber harvest, and enhanced riparian and fisheries protection.

- **Comment:** The Federal Government's efforts to develop a scientifically sound, ecologically credible, and legally responsible plan for management of federal forests of the Pacific Northwest cannot be considered until there is an evaluation of the plan's potential to impair or restrict the treaty-reserved rights of American Indian tribes. These rights include the right to manage reservation lands and resources in accordance with tribal objectives, and the right to carry out activities and use off-reservation resources pursuant to provisions set forth by treaty and Executive order.

**Response:** This SEIS presents alternatives for scientifically sound, ecologically credible, and legally responsible management of federal lands that are highly responsive to American Indian rights. The SEIS will not impair or restrict treaty-reserved rights of American Indian tribes nor the management of tribal and Indian owned lands. The Forest Service and BLM have no intention of preventing American Indian tribes from maintaining Indian religious freedom or exercising treaty-reserved rights on federal forest lands. The text of the SEIS has been revised to address this concern.

- **Comment:** Inconsistent with its trust responsibility, the Federal Government adopted a process to develop the Draft SEIS that fails to provide a meaningful opportunity to involve American Indian governments, which were in fact excluded from and denied access to the Assessment Team. The process lacked active participation by those tribes affected. The SEIS lacked consideration of additional anadromous fish protection and rebuilding objectives in Key Watersheds and Adaptive Management Areas. As a result, the tribes are likely to lose significant resources.

**Response:** Opportunities for American Indian involvement began with the invitation to American Indian leaders to participate in the President's Forest Conference on April 2, 1993. The Assessment Team was largely comprised of scientific experts in all disciplines relevant to ecosystem management of lands administered by the Forest Service and BLM. There will be additional opportunities to participate in the implementation of the selected alternative, especially management of Key Watersheds and Adaptive Management Areas. The text of the American Indian section of the SEIS has been revised to reflect this.

- **Comment:** The SEIS should note that federally recognized tribes have standing as governmental entities, and exercise governmental authority over both persons and territory. Opportunities for tribal participation did not recognize the government-to-government relationships American Indian tribes share with the Federal Government.

**Response:** Tribal and Indian owned lands held in trust by the Federal Government are sovereign and therefore have a unique status. The American Indian section in the SEIS has been rewritten to include information about the unique government-to-government relationship between the tribes and the Federal Government and to clarify the role of tribes in future planning efforts for federal lands.

- **Comment:** The SEIS should note that among reserved treaty rights are those involving fishing, gathering, hunting, and grazing. Habitat, and therefore the environment, is critical to the protection of those rights.

**Response:** The American Indian section of the SEIS has been rewritten to address these uses.

- **Comment:** Substitute the phrase “tribal and Indian owned lands” for “tribal lands” throughout the SEIS.

**Response:** The American Indian section of the SEIS has been revised as recommended.

- **Comment:** The Final SEIS should identify and list the resources of importance to American Indian tribes, and include a complete evaluation of the environmental consequences to them under each of the alternatives considered. The Draft SEIS does not identify important American Indian resources, especially those recognized through treaty and subsistence uses on both reservations and off-reservation federal lands.

**Response:** Chapter 3&4 of the SEIS lists the resources of importance in the region, including those of interest to American Indian tribes. The purpose of this SEIS and its detailed analyses is to provide a complete evaluation of the environmental consequences of each alternative, including impacts to Indian tribes and subsistence uses. The section on American Indian Peoples and Cultures has been rewritten to emphasize that none of the alternatives will abridge or deny any American Indian rights or uses of natural resources. The management of resources on lands administered by the BLM and Forest Service is nevertheless within federal and, at times, state jurisdiction (such as for management of wildlife populations) and the agencies will manage these lands to protect both the resources and American Indian rights.

- **Comment:** Timber harvests on tribal and Indian owned lands are not controlled by the state timber practices acts or by state regulations. Please correct this in the Final SEIS.

**Response:** State timber practices and regulations apply to National Forest and BLM District actions, as well as to state and private lands. They do not apply to reservations or American Indian owned lands.

- **Comment:** The FEMAT Report and Draft SEIS are devoid of any analysis of tribal plans to rebuild the fish runs in the Columbia River.

**Response:** Tribal plans to rebuild salmon runs in the Columbia River are not affected by this SEIS, which places a high priority on protecting and restoring habitat used by salmon and steelhead within the range of the northern spotted owl.

- **Comment:** Some potential conflicts regarding tribal rights and use of natural resources are addressed briefly in the social section and then are not resolved.

**Response:** This SEIS pertains only to lands administered by the Forest Service and BLM. Physical access to lands administered by these two agencies cannot be denied but may be regulated under provisions of the American Indian Religious Freedom Act of 1978. Use of various resources, including mature cedar trees and various plant materials, are controlled by special-use permits or a memorandum of understanding with various tribes, in accordance with local land-use provisions. Under any of the alternatives, impacts to particular sites would be evaluated and mitigated to the extent possible in site-specific plans.

- **Comment:** The Assessment Team recommended initiating “interagency consultation and collaboration with tribes on programs sensitive to, and respective of, Native American spiritual beliefs.” Explain whether this applies only to recognized tribes or all American Indians regardless of whether they have any local ties to the land.

**Response:** All federally recognized tribes will be consulted during implementation of the selected alternative. Nonrecognized tribes or groups will be involved in the planning process, as with any interested group or individual.

- **Comment:** The SEIS should note that American Indians have occupied the Pacific Northwest region for perhaps 35,000 years or more. Various animals and fish play important roles in daily life and are central to the core values of American Indian society. Many plants, animals, and fish are used for subsistence, art, customs, ceremonies, and religious life. Changing any of these elements will have a profound negative affect on American Indian families, tribes, and reservations.

**Response:** The American Indian Peoples and Cultures section in Chapter 3&4 of the SEIS has been rewritten to include this information.

- **Comment:** In the context of treaty-reserved rights, conservation is defined as that which is necessary to maintain a reasonable margin of safety against extinction for the species at issue. However, American Indian tribes would assert that the margin of safety goes beyond species needs and must allow for harvestable populations of species adequate to meet tribal needs pursuant to provisions set forth by treaty and Executive order.

**Response:** The risk of extinction ("margin of safety") was taken into account in addressing the habitat needs of thousands of species and in designing the alternatives presented in this SEIS. Tribal needs set forth by treaty and Executive order are recognized; there is no intention to annul such provisions.

- **Comment:** The Draft SEIS does not provide a complete evaluation of potential impacts to tribal communities, economies, and culture under each of the alternatives. The analysis of effects to American Indians needs to be significantly strengthened. Tribal communities should be identified as "most at risk" in the economic and social consequences discussions under each of the alternatives. The Draft SEIS on page 3&4-131 states that a "preliminary review...regarding [American Indian] lands, rights, and uses was undertaken," but the results are neither discussed nor disclosed. In addition, there is no mention that different tribes will be affected differently.

**Response:** Indian reservations and communities were evaluated in the community analysis (preliminary review) effort. However, as with other communities within the spotted owl region, they were not specifically identified in the Draft SEIS. The American Indian Peoples and Cultures section of the SEIS has been revised to address these concerns.

## INDIAN RESERVATIONS

- **Comment:** The SEIS fails to assess what impacts the implementation of any of the alternatives would have on the management of tribal and Indian owned lands or tribal employment. Timber harvest on tribal or Indian owned lands must not be used as a means of mitigating for the impacts of past, present, and future management of state, private, or federal lands.

**Response:** The selected alternative will have no direct affect on tribal or Indian owned lands because the SEIS applies only to lands administered by the Forest Service and BLM. Although the Clinton administration has suggested that tribes increase their timber production to mitigate for reduced harvest on lands administered by the Forest Service and BLM, it is not the intent nor requirement of this SEIS to do so. Timber harvest level changes on tribal and Indian owned lands are decided by the tribes, the Administration, and Congress, and are outside the scope of this SEIS. In addition, implementation of the selected alternative, regardless of which alternative is adopted, will place no additional conservation burdens or mitigation measures on tribal or Indian owned lands. While tribal employment on Indian reservations would not be affected, American Indians employed by institutions, industries, and businesses dependent on federal timber harvest may be affected as timber-related jobs decrease in number.

- **Comment:** The SEIS analysis of impacts does not acknowledge the existence, powers, and responsibilities of tribal governments, nor does it recognize that Indian reservations are culturally distinct within the region, or that tribes have different public finance methods that might hinder their ability to mitigate the impacts of the selected alternative.

**Response:** Tribal governments do have different responsibilities and financial methods. These governments are not being asked to mitigate the impacts of the selected alternative. The text of the American Indian Peoples and Cultures section of this SEIS has been revised to acknowledge American Indian rights.

## AMERICAN INDIAN CULTURAL USES

- **Comment:** Traditional hunting and gathering rights have not been considered in designating the matrix. This lack of consideration and analysis will lead to severe impacts on big game and sacred areas.

**Response:** The management of the matrix under the alternatives is deferred to current plans and draft plan preferred alternatives, except as noted in the SEIS. Traditional hunting and gathering rights were considered in the development of these plans. Big game populations in the matrix may increase because these species tend to prefer edges of the forests where early seral forage and thermal cover are in close proximity. The creation of canopy gaps by natural disturbances, and the availability of forage in the matrix and on adjacent private lands, will also provide forage for big game species. Ground disturbances in the matrix will be greater than in the reserves, which may impact some American Indian sacred areas. Participation by the tribes in the planning processes, as well as on-the-ground searches for archaeological and cultural sites by agency specialists for site-specific projects and watershed analyses, should provide information to the agencies to avoid disturbance of previously unknown cultural sites and sacred areas. These measures are expected to minimize any impacts.

- **Comment:** The environmental analysis has not adequately addressed cultural and archaeological resources which require an adequate cultural inventory.

**Response:** The discussion of potential impacts on archaeological resources has been rewritten in the American Indian Peoples and Cultures section of Chapter 3&4. In addition, both the Forest Service and BLM have manual and handbook direction to inventory, analyze, and protect these resources according to existing laws and regulations, as well as to consult with the State Historic Preservation Officer (SHPO) for each state on projects. Individual cultural sites will be protected by site-specific plans, and will involve tribal consultation on any planned ground disturbance.

## AMERICAN INDIAN FISHERIES

- **Comment:** The discussion of commercial fisheries does not include tribal commercial fisheries on the coast, Puget Sound, or the Columbia River. There are over 3,500 tribal fishing operators in Puget Sound and the straits alone, and over 2,000 tribal fishing vessels in Puget Sound and the coast.

**Response:** The Commercial Fisheries Employment section of the SEIS has been modified to discuss American Indian fishing for subsistence and ceremonial purposes, and direct employment opportunities.

- **Comment:** The SEIS provides protection of fish resources to an assessment standard (60 to 80 percent) which will not ensure protection of treaty fishing rights. The long-term viability rating for anadromous fish in Alternative 9 ranges from 60 to 70 percent. This 30 percent reduction from the possible 100

percent compromises the tribes' treaty-reserved rights to harvest salmon in favor of minimizing reductions in timber outputs. This is not consistent with legal obligations because it does not provide for sustained harvest in perpetuity. To manage for a lesser level of viability, the Federal Government bears the burden of demonstrating that this level will satisfy the tribes' present and future living needs. There must be a clear intent to implement the federal trust responsibility to maintain harvestable fish populations under any alternative.

**Response:** All of the alternatives include components of the Aquatic Conservation Strategy. The intent of this strategy is to increase watershed protection and improve the stream habitat on federal lands upon which the fish depend. There are a number of important factors that this SEIS has no legal control over or mandate to resolve. For example, the number of salmonids leaving streams that drain lands administered by the Forest Service and BLM and reach the ocean is influenced by the actions of off-forest landowners and uses, including dams and hydroelectric projects that block or impede downstream migration. The number of returning salmonids is limited by commercial, sport, and American Indian fishing (the amount of catch for returning fish is set by the National Marine Fisheries Service, the states, and tribes), irrigation withdrawals that reduce water supplies, as well as natural predators in the ocean and along the rivers in federal forests. These factors play an important role in the number of salmonids that can be harvested by the various tribes under their treaty rights.

- **Comment:** Key Watersheds may not receive adequate protection for aquatic systems under Alternative 9. Protection of tribal fisheries was not considered when selecting Key Watersheds. All watersheds should be provided full protection for fishing.

**Response:** Regardless of whether a watershed is designated as a Key Watershed, the process for analysis of a federal watershed will involve a set of watershed assessment guidelines, which are being developed by the agencies. The presence of American Indian trust resources or traditional Indian fishing sites will be a factor in watershed analysis. Tribal and public involvement opportunities will arise as the assessments proceed.

- **Comment:** Declining salmon populations have led to decreasing opportunities for members of the Muckleshoot Indian Tribe. The SEIS does not adequately address the impacts of each alternative to salmon runs.

**Response:** Anadromous freshwater habitat is expected to improve under all alternatives except 7 and 8 (see Chapter 3&4). Tribes, states, and federal agencies will cooperate in the management of salmonid species.

## Legal and Process Issues

The following comments and responses address the requirements and processes of the Endangered Species Act (ESA), the Federal Advisory Committee Act (FACA), the Federal Land Policy and Management Act (FLPMA), the Multiple-Use Sustained-Yield Act (MUSYA), the National Environmental Policy Act (NEPA), the National Forest Management Act (NFMA), the Organic Administration Act (OAA), the Oregon and California Lands Act (O&C Act), the Forest and Rangeland Renewable Resources Planning Act (RPA), and other laws. This section also contains comments and responses addressing various elements of the SEIS, including the alternatives, mitigation measures, standards and guidelines, the Forest Ecosystem Management Assessment Team (FEMAT) and Draft SEIS process, the environmental analysis process, public involvement, relationship to other plans and EISs, the scope of this SEIS, agency authority, scientific uncertainty, budgets and funding, and editing.



## IMPLEMENTATION OF NEPA

### NEPA Process

- **Comment:** Alternative 9 is currently being implemented in the National Forests and being incorporated in plans—before the Final SEIS has been issued. It is doubtful that substantive changes to the SEIS have been considered.

**Response:** The Forest Service and BLM are examining the organizational structures, analysis, and management practices that would be needed to implement aspects of the alternatives. This staff work is consistent with NEPA because no actions have been taken which would have an adverse environmental impact or limit the choice of reasonable alternatives (40 CFR 1506.1(a)), and it does not represent a commitment to an alternative or predecisional implementation (40 CFR 1502.2(f)). No alternative has yet been adopted; such will not occur until issuance of a Record of Decision. The decision makers may select any of the alternatives, and planned activities will be modified as necessary to be consistent with the alternative selected. As a result of this work, the agencies will be in an improved position to quickly implement whatever strategy is approved in the Record of Decision for this SEIS.

- **Comment:** The alternatives are based on critical habitat designations which have been found to be illegal in recent litigation. Development of a Final SEIS should await resolution of that litigation.

**Response:** Critical habitat designations did not provide the basis for the formulation of the alternatives, nor did the viability panels rely upon critical habitat in making their assessments. An alternative which was originally considered by the Assessment Team included Critical Habitat Units, but was eliminated from detailed study (see the Chapter 2 section Alternatives Considered but Eliminated From Detailed Study). However, federal agencies must continue to ensure that their actions will not likely destroy or adversely modify critical habitat. Critical habitat designations are still in effect, despite the fact that designation for the northern spotted owl has been challenged in litigation which has not yet been finally resolved. Formal consultation on the preferred alternative with the U.S. Fish and Wildlife Service regarding critical habitat did occur, and is detailed in the Biological Opinion in Appendix G of this Final SEIS.

- **Comment:** There needs to be a NEPA process for implementation planning after an alternative is chosen.

**Response:** This SEIS represents the necessary NEPA analysis for each of the various planning documents, at various levels, that are to be amended by the proposed action (see Chapter 1, The Proposed Action). More site-specific NEPA analyses will occur for both local, site-specific project decisions and any decisions to make further changes to Forest and District Plans. NEPA documents prepared at the project level likely will tier to the programmatic analysis in this SEIS (see 40 CFR 1502.20).

- **Comment:** The watershed analysis process should operate under the regulations required by NEPA, and include full public involvement.

**Response:** Watershed analysis is an analytical process and is not subject to NEPA regulations. As such, watershed analysis is not a decision-making process subject to public disclosure and participation under NEPA. The watershed analysis process will, however, include informal public participation that will include various government and private organizations and interested citizens. The information and analysis generated by watershed analysis will be used in both local project and province planning efforts. These are steps which will involve the public through NEPA requirements.

## NEPA Requirements

- **Comment:** The Final SEIS should identify an environmentally preferred alternative.

**Response:** The environmentally preferred alternative or alternatives will be identified in the Record of Decision, as required by CEQ regulations for implementing the NEPA (40 CFR 1505.2(b)).

- **Comment:** Alternative 9 has been adopted by the President without any environmental analysis or public involvement.

**Response:** Alternative 9 was identified as the preferred alternative in the Draft SEIS, which described the environmental analysis of all the alternatives. Only after an alternative has been selected and identified in the Record of Decision will an alternative have actually been adopted. The decision makers can select any of the alternatives analyzed in the SEIS.

- **Comment:** The SEIS fails to thoroughly discuss the irreversible commitment of nonrenewable resources, as required by NEPA (40 CFR 1502.16).

**Response:** Of themselves, the alternatives make no commitment of nonrenewable resources; they comprise broad programmatic management direction under which such commitments can be made at a more site-specific level. The SEIS summarizes potential future effects related to nonrenewable resources in Chapter 3&4, under Irreversible or Irretrievable Commitments.

- **Comment:** NEPA requires agencies to include discussions of the possible conflicts between the proposed action and the objectives of state and local land use plans, policies, and controls for the areas concerned. Neither the Draft SEIS or FEMAT Report contains any such discussion.

**Response:** This information has been added to the Final SEIS. See the Conflicts with Other Plans section in Chapter 3&4.

- **Comment:** It appears that maps showing the locations of roadless areas were unavailable to the Assessment Team. Failure to consider roadless areas in the design of Late-Successional Reserves violates NEPA's requirements for the use of the best scientific information.

**Response:** Current maps of roadless areas were utilized by the Assessment Team when designing the Late-Successional Reserves, and are included in the administrative record.

- **Comment:** The SEIS fails to address the requirements of Section 101 of NEPA, Federal Government Responsibility, as required by the CEQ regulations (40 CFR 1502.2(d)).

**Response:** Each of the alternatives fully comply with the cited CEQ regulation. For example, to meet the requirements of Section 101 (42 USC 4331(b)), the SEIS alternatives:

- (1) "fulfill the responsibilities of each generation as trustee of the environment for succeeding generations" by maintaining and restoring the biological diversity of late-successional and old-growth forest ecosystems;
- (2) "assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings" by maintaining the health of the forest ecosystems and associated species within the planning area;
- (3) "attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences" by maintaining a sustained yield of natural

resources while maintaining the long-term health of the ecosystems;

(4) "preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice" by protecting cultural resources, respecting the rights of American Indian tribes, protecting unique and valuable old-growth ecosystems, and maintaining a variety of experiences and opportunities within the planning area;

(5) "achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities" by maintaining a sustained yield of timber and other forest products from the planning area; and

(6) "enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources" by maintaining forest ecosystems and specifying an ecosystem management approach to provision of wood products, other forest products, and other forest values.

## DECISION TO PREPARE A SUPPLEMENTAL EIS

- **Comment:** The President's Forest Plan involves a big change in forest management, and it should not be evaluated in a supplement to an EIS. The Draft SEIS is very different from the documents it supplements. It clearly represents a separate and distinct project with different goals and objectives, and should have been presented as an entirely new EIS.

**Response:** Because the selected alternative will supplement regional guides and land management plans which provide management direction applicable to the same planning area, it does not represent a separate and distinct project, and does not warrant a new EIS. In addition, to the extent that the SEIS addresses different alternatives from previous EISs, the SEIS contains all the components and analysis of a complete EIS.

## INTERDISCIPLINARY TEAMS

- **Comment:** Several respondents felt that the interdisciplinary teams (Assessment Team and SEIS Team) for this project did not adequately involve representatives from all related disciplines. In particular, respondents stated that the areas of cultural resources, economics, recreation, wildlife, botany, and mycology should have been better represented. Other respondents felt that the areas of silviculture and forest management were not adequately represented.

**Response:** The membership of the Assessment Team and SEIS Team included specialists from a wide variety of disciplines relevant to management of forest ecosystems. Specialists in cultural resources, economics, recreation, wildlife, and silviculture were members of both the Assessment Team and the SEIS Interdisciplinary Team. Botany and mycology were represented by specialists on the Assessment Team.

Forest management and silviculture specialists were also significant contributors to the Assessment Team and SEIS Interdisciplinary Team. Given the wide scope of the efforts and the array of requisite expertise, forest management and silvicultural expertise may not have appeared to be a major part of the effort—those disciplines, however, were well represented. See the lists of preparers in both the FEMAT Report and the SEIS for more information.

- **Comment:** The List of Preparers for the SEIS does not indicate that representatives from state fish and wildlife agencies were involved. There is an apparent lack of state involvement in this process. Explain how state agencies will be included in preparation of the Final SEIS.

**Response:** State agencies commented on the Draft SEIS during the 90-day public comment period. State agencies also provided input to the Interim Interagency Task Groups, which in turn provided information that was incorporated into this Final SEIS.

- **Comment:** Key members of the Assessment Team were not objective and advocated management of specific resources based on subjective assessments. The FEMAT Report analysis should be reconsidered and the Assessment Team's membership should be supplemented with experts representing a wider array of opinions.

**Response:** The range of alternatives was determined by the purpose and need statement (Final SEIS, Chapter 1), which reflects the President's mandate and principles as expressed at the April 2, 1993, Forest Conference. The Assessment Team members were selected to bring a wide array of experience and expert scientific knowledge to their effort. While it is true that some of the assessments made by Assessment Team members are based on estimates, they represent the best approximations available given current levels of knowledge. To assist with the species assessments, the Assessment Team members utilized many expert panelists, who provided a wider array of expertise. Also, the FEMAT Report was subjected to peer review. Finally, additional analysis of species was conducted in response to public comment, and for those species that did not achieve specified outcome likelihoods. The Assessment Team's analysis was reviewed and supplemented with additional mitigation measures.

- **Comment:** A number of the key experts that were listed in the SEIS did not participate in the Assessment Team's species assessment process. The opinions of these experts should have been considered.

**Response:** There were two species assessment efforts described in the FEMAT Report, and the experts listed include individuals from both assessments. The attempt was made to conduct the second assessment process with the same individuals who were involved in the first assessment, but some experts were unavailable. Those experts that could not participate in the second assessment did have the opportunity to comment on the process during the 90-day public comment period.

## **TIERING AND THE RELATIONSHIP TO PLANS INCORPORATED BY REFERENCE**

- **Comment:** NEPA requires that all connected actions be included in the environmental review. It appears that the SEIS has an incomplete list of references to documents and decisions that are to be tiered to the SEIS or that will be affected by this decision. Two examples are the proposal to regulate private lands and the EIS being prepared for the proposal to issue a special 4(d) rule.

**Response:** This SEIS does not tier to a proposal to regulate private lands, nor are any such proposals "connected actions" to the proposed action for this SEIS. The relationship of this effort to the proposal to issue a special 4(d) rule and other actions that may be affected by this decision are addressed in the Final SEIS. See the section in Chapter 3&4 on Cumulative Effects from Nonfederal Actions.

- **Comment:** The Draft SEIS incorporates by reference a number of other planning efforts that have not been subject to public review and comment, including PACFish (the Pacific Salmon Working Group), *A Conservation Strategy for the Northern Spotted Owl* (Thomas et al. 1990), *Alternatives for Management of Late-Successional Forests of the Pacific Northwest* (Johnson et al. 1991), Final Draft Spotted Owl Recovery Plan (USDI unpub.), and the *Viability Assessments and Management Considerations for Species Associated with Late-Successional and Old-Growth Forests of the Pacific Northwest: The Report of the Scientific Analysis Team* (Thomas et al. 1993).

**Response:** These documents were referenced, not incorporated by reference as suggested; lack of prior public review does not constitute a reason to not reference or consider them. Most of the above documents have been or will be subject to public review. The PACFish Strategy is still in the formative stages, and has not yet been adopted. *A Conservation Strategy for the Northern Spotted Owl* (ISC Report) (Thomas et al. 1990) was incorporated into the Draft Spotted Owl Recovery Plan (USDI 1992), which

was published and released for public review in April 1992. The spotted owl recovery planning effort did include public review and participation pursuant to 16 USC § 1533(f)(4). The Final Draft Spotted Owl Recovery Plan was made available to the Assessment Team and portions were included in the FEMAT Report and this SEIS. Portions of both the ISC Report and the Draft Spotted Owl Recovery Plan were incorporated into alternatives in the *Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests* (USDA FS 1992), which was published in draft (and final) form and was subject to full public review. The SAT Report is a biological analysis, not a planning or decision-making document, and is therefore not subject to NEPA public involvement requirements. It was, however, released in advance of the Draft SEIS to allow the public additional time to become familiar with the contents, and has been included in this Final SEIS as Appendix H. In addition to the public review described above, those portions of the above documents that were incorporated into the Draft SEIS were subject to public review and comment during the 90-day public comment period for this SEIS.

- **Comment:** It is impossible for a reviewer to discern what portions of previous related documents were used, and how this information may have been altered when incorporated into the SEIS. It is also difficult to discern the environmental impacts of those changes.

**Response:** The Assessment Team considered numerous previous efforts by the federal land management agencies to develop a strategy for management of habitat for the northern spotted owl and old-growth forest related species (see the FEMAT Report, Chapter III, Option Development and Description, for more information). How the previous related documents were used is addressed in the SEIS, Chapter 2, Elements from Previous Documents Incorporated into the Alternatives by the Assessment Team.

## SCIENTIFIC UNCERTAINTY

- **Comment:** The absence of concrete data and the reliance on professional opinion in the FEMAT Report reflects a lack of research and monitoring. Lack of data makes selection of Alternative 9, as currently proposed, a risky decision.

**Response:** Although the Assessment Team used the best information and research results available at the time, it is true that much information that would have been useful simply does not exist or is unusable in its current form. Nonetheless, NEPA acknowledges the inevitability of incomplete information, and the environmental analysis may be considered by the decision maker if the gaps in information are disclosed within the EIS (40 CFR 1502.22). See the Chapter 3&4 section on Incomplete or Unavailable Information.

The Assessment Team and the SEIS Interdisciplinary Team examined the data and relationships used to estimate the effects of the alternatives. There is a substantial amount of credible information about the topics addressed in this SEIS; the basic data and the central relationships are well established. The teams determined that, while the missing information would frequently add precision to estimates or better specify a relationship, the basic data and central relationships are sufficiently well established in the respective sciences, and filling those information gaps would not likely reverse or nullify understood relationships. Though acquisition of new information was considered, the teams determined that the new information was not essential for the decision makers to make a reasoned choice among alternatives.

Nevertheless, there clearly is some risk associated with moving forward under any alternative in the face of incomplete or uncertain information. This risk can be mitigated to an extent through the acquisition of additional information. But ultimately, the risk that a given action will not produce intended or expected results in the future is inherent in any human endeavor. The information

generated and compiled for the environmental analysis reflected in this SEIS is among the most and best ever assembled for a federal land-management planning process.

Notwithstanding the relative abundance of information upon which the analysis is based, it is acknowledged that a great deal of professional judgment was relied upon in assessing the effects of the alternatives. Contrary to the suggestion in the comment, however, this reliance is not a fatal flaw. First, the judgments generally are well informed, at least relatively speaking, given the data upon which they are based. Second, the judgments are of scientists who are among the foremost in their respective fields. Third, a degree of professional technical judgment is inevitable in evaluations and predictions made in the sciences primarily relied upon in conducting the assessment of effects in this SEIS.

There appears to be an implicit assumption in the comment that such sciences should produce precise or "certain" results. But this assumption fails to account for the fact that not all sciences share the same certainty of knowledge and predictive capability. That is, while some so-called "hard sciences" are more or less characterized by precise quantitative data, widely accepted theories, and research based on experiments capable of being repeated and conducted in controlled environments, the sciences utilized in this SEIS do not generally fall into such a category. Indeed, ecology, sociology, and economics generally are not as deterministic, are more complex (in large measure because they address living organisms vis-a-vis inanimate units), rely on more subjective assumptions, and ultimately yield less certain results than those normally possible in physics or chemistry, for example.

Finally, the alternatives analyzed in the SEIS each include an adjustment process (adaptive management) that provides for modification of habitat management should new information warrant a change in management (see Implementation under The Alternatives Section in Chapter 2, The Alternatives, Implementation). This adjustment process is guided by monitoring and research and provides the flexibility to adjust the management direction of the selected alternative in the future.

## GENERAL COMMENTS ON THE DOCUMENTS

- **Comment:** There was no Literature Cited section in the Draft SEIS.

**Response:** In the FEMAT Report, references are located at the end of each chapter. The Draft SEIS References section is located between the Glossary and the Appendices. The References section has been revised and updated in the Final SEIS, and additional reference lists have been added at the end of each appendix.

- **Comment:** Several respondents suggested edits to the FEMAT Report, citing incorrect numbers or phrasing, and other inconsistencies.

**Response:** All the information and analysis needed to understand the alternatives and their effects is displayed in this SEIS. Errors in the FEMAT Report that affect standards and guidelines or the discussion of effects have been corrected or clarified within the text of the SEIS as needed. Other edits, although they would clarify the FEMAT Report, are not needed to understand the alternatives or their effects, and are therefore not needed for the decision makers to make a reasoned choice among alternatives. Consequently, there are no plans to reprint a corrected or updated version of the FEMAT Report.

- **Comment:** The Draft SEIS does not provide detailed forest-specific information, making it difficult for an individual to discern the impacts of the alternatives on a specific area. The maps included with the Draft SEIS are imprecise and lack detail.

**Response:** The alternatives were developed to provide coordinated general management direction for the lands administered by the Forest Service and BLM within the range of the northern spotted owl, and thus do not provide site-specific information. More detailed maps of Alternative 9 have been available for review in the Public Reading Room at the Bureau of Land Management Oregon State Office in Portland, Oregon (until 30 days after the Notice of Availability for this Final SEIS), and may be reviewed at Forest Service and BLM field offices. There will also be opportunities to review site-specific information during subsequent planning processes which will occur as part of implementation of the selected alternative.

- **Comment:** The FEMAT Report and SEIS should be neutral concerning the promotion or rejection of proposed change. The documents actively promote change in federal forest management policy and criticize management decisions of the past. A more objective assessment needs to be done.

**Response:** This SEIS presents a factual discussion of environmental impacts. No changes to the FEMAT Report are contemplated.

- **Comment:** Consultations with managers and nonfederal scientists that occurred during the SEIS preparation efforts (draft and final) should be referenced to indicate substantive advice provided by these sources.

**Response:** These consultations are identified in those SEIS narratives that utilize the information provided by the consulted individuals. Other consultations are listed in the references section of the Final SEIS (which has been revised and expanded), and some consultation documentation is filed in the administrative record for this SEIS.

- **Comment:** The Assessment Team's predictions are based on laws, boundaries, and objectives that are assumed to be static. Our natural resource management laws have changed considerably over the past 10 to 20 years and there is a high likelihood that these laws, boundaries, and objectives will continue to change within the planning timeframe.

**Response:** Alternative development and analysis must comply with current laws and regulations. NEPA requires that environmental analysis be based on "reasonably foreseeable" future actions, and this is displayed in the SEIS. Future laws that significantly affect requirements, assumptions, or analysis in this SEIS may necessitate adjustments to the management direction reflected in the selected alternative.

Ecosystem management is an ongoing, adaptive process that changes as new information becomes available. The Regional Ecosystem Office, under the authority of the Regional Interagency Executive Committee, will continually review the status of the alternative selected in the Record of Decision and will be responsible for development, evaluation, and resolution of consistency and implementation issues. Through this process, implementation of the selected alternative will be adapted as new information becomes available.

- **Comment:** A separate summary should have been prepared and distributed to the public.

**Response:** Summaries appear at the front of both the SEIS and the FEMAT Report.

- **Comment:** The SEIS should be focused on managing demand for forest products, rather than responding to it.

**Response:** The management of demand for forest products is not within the authority of the agencies involved in this effort.

# The Alternatives

## Range of Alternatives

- **Comment:** The SEIS violates NEPA by failing to present a full range of alternatives, and should consider a wider range of scientifically-based alternatives. Too much attention is directed at a few species associated with late seral stages.

**Response:** NEPA requires the agency to explore and evaluate “all reasonable alternatives” which respond to the “underlying purpose and need” (40 CFR 1502.14(a) and 1502.13). The alternatives presented in this SEIS meet these requirements; and respond to the purpose and need defined in Chapter 1 of this SEIS. Note that many alternatives were initially considered, but were not given detailed analysis because they were not consistent with the purpose and need for the SEIS (see Alternatives Considered but Eliminated from Detailed Study in Chapter 2).

The purpose and need, as originally defined by President Clinton at the April 1993 Forest Conference, focuses on late-successional and old-growth forest ecosystems within the range of the northern spotted owl, and thus so do the alternatives. The objectives of providing for long-term health of the late-successional and old-growth forest ecosystems and the species associated with them, and minimizing adverse economic effects constrain the range of reasonable alternatives available for analysis. The SEIS Team presented and evaluated an adequate range of alternatives.

- **Comment:** The SEIS unlawfully excludes alternatives that could not be analyzed within the timeframes given to the Assessment Team by the Clinton administration.

**Response:** This SEIS Interdisciplinary Team did not exclude alternatives solely on the basis that they could not be analyzed within the established timeframes. Ten reasonable alternatives within the scope of the purpose and need of the proposed action were displayed in the SEIS. During the public comment period, a number of ideas for new or modified alternatives were suggested. These additional alternatives were given consideration and are addressed elsewhere within this appendix.

## General

- **Comment:** Explain why social and economic outcomes were not given as much consideration as wildlife concerns in developing the alternatives.

**Response:** Both the human and nonhuman components of the ecosystem were thoroughly considered in the development of alternatives. Chapter I of the FEMAT Report identifies the criteria used in designing the alternatives. The objectives stated, “attain the greatest economic and social contribution from the forests of the region and meet the requirements of the applicable laws and regulations, including the Endangered Species Act, the National Forest Management Act, [and] the Federal Land Policy Management Act . . .” The alternatives provide for economic and social needs while addressing the explicit requirements of these laws to protect wildlife.

- **Comment:** The alternatives should emphasize general goals for forest planning efforts to be adopted on a larger regional basis, and allow local planning efforts to be developed by citizens and agency and industry representatives who are familiar with local resources. The selected alternative should also include plans to assist local integrated planning efforts already underway.

**Response:** The alternatives were designed to provide programmatic management direction. There will be opportunities for local input into the location and nature of individual projects through the site-



specific environmental analysis process which will occur during implementation of the selected alternative. This is particularly true within the Adaptive Management Areas (Alternative 9), which would provide the greatest flexibility for management. There will be opportunities during watershed analysis and the site-specific planning efforts occurring subsequent to this SEIS for Forest Service and Bureau of Land Management resource managers to collaborate with local integrated planning efforts already in progress.

- **Comment:** While the Draft SEIS cites the inclusion of Adaptive Management Areas in Alternative 9 as one of only two clear reasons for selection of the preferred alternative, the FEMAT Report suggests that Adaptive Management Areas could be incorporated into any of the alternatives. If Adaptive Management Areas are critical to meeting the underlying needs addressed in the FEMAT Report and the Draft SEIS, then the Final SEIS should explain why they were not incorporated into the other alternatives.

**Response:** The preferred alternative (Alternative 9) is identified in Chapter 2 of the Draft SEIS as being the alternative "... that most closely offers the specific management direction that would put into effect the plan that President Clinton announced on July 1, 1993, titled 'The Forest Plan: For a Sustainable Economy and a Sustainable Environment.'" Note that identification of the preferred alternative does not constitute the adoption of the selected alternative. The decision makers will designate the selected alternative and the Record of Decision will provide the rationale for that decision. The decision makers may choose to incorporate Adaptive Management Areas into any alternative.

- **Comment:** Clarify the relationship between the BLM's Preferred Alternative in the Draft Resource Management Plans and Environmental Impact Statements (RMP/EISs), which were released in August 1992, and the BLM's subsequent Revised Preferred Alternative to the Draft RMP/EISs, to Alternative 7 and the comparison of alternatives in the SEIS.

**Response:** The chronological relationship of these documents is as follows: the Draft RMP/EISs, each with a Preferred Alternative, were released in August 1992. The public commented on these documents, including the Preferred Alternatives, during a 90-day public comment period. Those comments were analyzed and, in early 1993, the results were used to develop a Revised Preferred Alternative. This revision was intended to be developed into the Proposed Resource Management Plans and Final Environmental Impact Statements for the western Oregon BLM Districts.

However, work on the Revised Preferred Alternative was put on hold as a result of the President's Forest Conference in April 1993. After the Forest Conference, a draft of the preliminary and unpublished Revised Preferred Alternative was made available to the Assessment Team. The team used this draft Revised Preferred Alternative, in addition to other elements, to develop Option 7 in the FEMAT Report. This option became Alternative 7 in the Draft and Final SEIS. Additionally, a substantial portion of the unpublished draft Revised Preferred Alternative is published in this SEIS as Appendix B2.

The Assessment Team used the Revised Preferred Alternative during comparisons associated with Alternative 7. A reference in the Draft SEIS, Table III-1, pp. 2-47, contained an error regarding the Revised Preferred Alternative; this was corrected in the Final SEIS.

## The No-Action Alternative

- **Comment:** No consideration is given to the No-Action Alternative.

**Response:** The No-Action Alternative represents the management direction that was in place before April 1990 when *A Conservation Strategy for the Northern Spotted Owl* (the ISC Report, Thomas et al. 1990)

was released. Because of several court rulings and endangered species listings, pre-April 1990 direction could not be legally implemented today. For this reason, the No-Action Alternative was not considered to be a reasonable alternative (see the June 21, 1993, CEQ letter in Appendix C).

- **Comment:** The No-Action Alternative is incorrectly identified for lands administered by the BLM. The 1992 BLM Preferred Alternative should have been used, rather than the Management Framework Plans from the late 1970's and early 1980's.

**Response:** The 1992 BLM Preferred Alternative was not used because it does not represent current direction. A final decision for the BLM Draft Resource Management Plans has not yet been designated in a Record of Decision.

## Changes to Existing Alternatives

- **Comment:** The adaptive management process should be incorporated into Alternative 1, but without compromising Late-Successional Reserves.

**Response:** All alternatives include the adaptive management process. Adaptive Management Areas have only been incorporated into Alternative 9, but the decision makers have the option to decide to include them in any alternative.

## New Alternatives

**Introduction.** During the comment period many people and organizations offered ideas for new, different, or modified alternatives. These included suggestions for changes in the general management of lands administered by the Forest Service and Bureau of Land Management, site-specific changes to boundaries of land allocations, ideas for subregional forest management strategies, and suggestions for policy or legislative changes. Other respondents requested further consideration of alternatives that, in the Draft SEIS, were considered but eliminated from detailed study.

As noted in Chapter 1, this SEIS focuses on the purpose and need set out in the President's mission statement. Many of the suggestions to add or modify alternatives do not meet this purpose and need and/or are outside of the authority of the Forest Service or Bureau of Land Management. This SEIS responds to the need for management direction on late-successional and old-growth forests administered by the Forest Service and Bureau of Land Management throughout the range of the northern spotted owl. Requests to consider site-specific modifications or specific subregional management strategies are too limited in scope for inclusion in this programmatic SEIS, and may need to be remade in subsequent planning efforts at a more site-specific level.

Many of the suggested alternatives may be explored in other planning or planning-related efforts, such as adoption of or further amendment to Forest and District Plans, research and monitoring activities, development or adjustment of standards and guidelines, and the revision of federal laws. Finally, some of the suggestions for new or modified alternatives could not be addressed because they were not described in enough detail to allow for meaningful consideration.

- **Comment:** The SEIS Interdisciplinary Team should develop and analyze alternatives that would:
  - Establish permanent no-harvest areas
  - Preserve roadless areas
  - Restrict thinning and salvage
  - Increase riparian protection

- Expand road conversion programs
- Establish no more than one Adaptive Management Area per state
- Thin in previously managed stands only
- Add all LS/OG stands below 2,000 feet to reserve status
- Provide incentive systems to encourage all planning participants to use creative means to reach common goals
- Use less costly fire management techniques
- Link Wildernesses

**Response:** These suggestions were presented as cursory requests, and many lacked sufficient detail on which to base an alternative that would meet the purpose and need of this SEIS. Some of these suggestions are incorporated into specific alternatives, and the decision makers may select one of those alternatives, or incorporate elements from some alternatives into the selected alternative. Finally, many of these ideas are also addressed in this Final SEIS in the discussion of specific resources or environmental consequences, or are responded to in greater detail elsewhere in this appendix.

- **Comment:** The SEIS should be revised to include an alternative that incorporates the Revised Preferred Alternative of the BLM's Draft 1992 Resource Management Plan EISs, with whatever adjustments are necessary for lands not managed by BLM to achieve the overall goals stated by President Clinton at the close of the 1993 Forest Conference.

**Response:** Alternative 7 incorporates the BLM Revised Preferred Alternative with adjustments to generally meet the objectives and purpose and need of the proposed action. Additionally, Alternative 9 incorporates part of the BLM Revised Preferred Alternative (see Appendix B1 of this SEIS).

- **Comment:** A new alternative should be included that develops a two-pronged, complementary approach in which wood production is largely concentrated on some fraction of the federal land base, and managed separately from those committed to late-successional and old-growth forest management. By committing a relatively small portion of the more productive lands to intensive forest management, the remaining larger portion of federally managed forest lands could be effectively managed for other purposes and values.

**Response:** All areas have values and uses other than timber management. Each acre is part of a watershed and a viewshed, and is used for a number of different purposes by humans, wildlife, and organisms key to future productivity. The matrix standards and guidelines, and related standards and guidelines in existing Forest and District Plans, permit timber production consistent with other values.

- **Comment:** The Final SEIS should present alternatives that set aside significantly fewer Late-Successional Reserves than the current alternatives in order to provide the decision makers with a better array of information and choices.

**Response:** The Assessment Team considered alternatives with fewer Late-Successional Reserves in its initial analysis, and subsequently eliminated them from detailed study because they did not meet the five biological criteria developed from the objectives expressed in the letter of instruction to the Assessment Team from the administration. See Alternatives Considered but Eliminated From Detailed Study in Chapter 2. Additionally, the numerous alternatives displayed and analyzed in the EISs to which this SEIS is a supplement are available to provide more information to the decision makers.

- **Comment:** An alternative should be considered that prohibits timber harvest on federally managed lands.

**Response:** A no-harvest alternative does not satisfy the purpose and need for the proposed action, which includes maintaining a sustained yield of renewable natural resources, including timber, other forest products, and other forest values, and maintaining rural economies and communities as described in Chapter 1 of this SEIS. Alternative 1 most restricts programmed timber harvest by limiting it to 12 percent of the available land base.

- **Comment:** The SEIS Team should consider developing new alternatives that are based on ecological capabilities that focus on the quality of habitat rather than the quantity.

**Response:** The alternatives do focus on the quality, as well as the quantity, of habitat that supports late-successional and old-growth forest species.

- **Comment:** An alternative that reflects management under current plans and draft plan preferred alternatives, before the release of the 1990 ISC Report, should be included for reference purposes.

**Response:** The described alternative is the No-Action Alternative, which is addressed in Chapter 2, The No-Action Alternative. This alternative was not considered in detail because it does not constitute a "reasonable alternative" when evaluated against the purpose and need of the proposed action (see the June 21, 1993, letter from the CEQ in Appendix C of this SEIS). The effects of the No-Action Alternative can be approximated by effects displayed in Chapter 3&4 as "1980-1989 Average" or equivalent. Also, Alternative A in the 1992 *Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests* (USDA FS 1992), to which this SEIS is a supplement, displays the no-action alternative for lands administered by the Forest Service.

- **Comment:** Develop an alternative that offers more of a transition period for rural timber-dependent communities, even though it might require congressional legislation for adoption to make the alternative legal.

**Response:** Congress could enact legislation that would establish the suggested strategy. Such an alternative, however, would not be consistent with the purpose and need of this SEIS, which requires that the alternatives be designed to meet the requirements of existing applicable laws and regulations. Related to this effort, the Labor and Community Assistance Working Group (originating from the Forest Conference) is developing an economic development and assistance plan to address the concerns of timber-dependent communities.

- **Comment:** An alternative should be considered that places all roadless areas in reserves.

**Response:** Alternative 1 places all inventoried (RARE II) roadless areas in reserves.

- **Comment:** The federal land management agencies should be limited to presenting only one alternative in the NEPA process for environmental analysis and the public and private sectors should have the opportunity to provide their own alternatives. This would save agencies from trying to determine through scoping what the public and private sectors want.

**Response:** In compliance with NEPA requirements, this effort has considered ten reasonable alternatives in detail. Many of the alternatives initially considered were eliminated from detailed study because they did not meet the objectives, purpose and need, and/or legal requirements associated with this SEIS. Nonetheless, the public was given the opportunity to suggest new alternatives during the 90-day public comment period for the Draft SEIS. Finally, the suggested planning process is inconsistent with NEPA and the CEQ regulations implementing the statute.

- **Comment:** A baseline alternative should have been developed that reflects concern for local

communities and regional economies and shows the relative social and economic costs of the various alternatives.

**Response:** Alternative 7 is a baseline alternative and represents the likely management direction that would have been followed if the Forest Service and BLM had continued with their present land and resource management planning processes and if they had adopted the elements of the Final Draft Spotted Owl Recovery Plan (USDI unpub.). The social and economic analysis for this alternative is provided in Chapter 3&4 of this Final SEIS. In addition, the social and economic costs associated with each alternative were projected, including specific consideration of the relative vulnerabilities of particular local communities. The objectives of providing for late-successional and old-growth forest ecosystems and minimizing adverse economic effects constrain the range of reasonable alternatives. Alternatives were considered in the initial analysis that included higher levels of commodity production, but were not given further consideration. See Alternatives Considered but Eliminated From Detailed Study in Chapter 2 of this Final SEIS. Additionally, alternatives which include higher levels of commodity production are analyzed in the underlying EISs which are supplemented by this SEIS.

## Combination of Alternatives

- **Comment:** Various composite alternatives, which incorporate elements from two or more of the alternatives, were suggested. Two examples include:
  - Incorporate elements of Alternatives 1, 3, and 9 as follows. Late-Successional Reserves and Riparian Reserves would be designated as in Alternative 1. No thinning or salvage would be allowed in these areas. Adaptive Management Areas (as defined in Alternative 9) would be used, although there would be few acres for which activities would have substantial oversight. No timber management activities or road construction would be allowed in roadless areas. The 50-11-40 rule and the coarse woody debris provision from Alternative 3 would be included in the matrix standards and guidelines.
  - Develop an alternative that emphasizes environmental quality objectives (as in Alternatives 3 and 4) and social justice objectives that are not dependent on logging, as in Alternative 9. Retain the Adaptive Management Area concept and acreage of Alternative 9. Increase Late-Successional Reserve acreage and eliminate logging in Late-Successional Reserves for the next century. Preserve roadless areas. Riparian Reserves acres should be increased to more closely approximate those of Alternative 4. Reduce the acreage in the matrix to accommodate the above changes.

**Response:** The suggested composite alternatives would not be substantially different from, and are within the range of, the 10 alternatives presented, and therefore were not developed separately. The environmental consequences of such alternatives can be derived from the information about the alternatives from which the various elements were taken. The decision makers may choose to incorporate elements from other alternatives into the selected alternative.

## MITIGATION MEASURES

- **Comment:** Clarify whether the alternatives will include the mitigation measures that were recommended by the Assessment Team in the FEMAT Report. Address whether the mitigation measures cited in the FEMAT Report were assumed to be part of the alternatives when assessing environmental impacts.

**Response:** Many of the recommendations in the FEMAT Report were carried forward into the SEIS alternatives as standards and guidelines and will, to the extent that they are part of the selected alternative, be part of the implementation process. Other recommendations are already being followed,

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in accordance with requirements at the Forest and District levels. The remaining recommendations are available for incorporation into local planning efforts as appropriate. Only the required mitigation measures (not the recommended mitigation measures) in the FEMAT Report were considered to be part of the alternatives when assessing environmental impacts of the alternatives.

- **Comment:** Mitigation measures should be defined more clearly and have definitive minimums and maximums to protect the ecosystem and allow reasonable disclosure of the environmental impacts as required by NEPA. This information should include clear goals for the mitigation, and criteria to rate effectiveness and ability to implement the measures. The SEIS should also discuss whether additional mitigation measures, as noted in the FEMAT Report, are feasible.

**Response:** The sections pertaining to mitigation measures and standards and guidelines have been revised in this SEIS to address this concern.

## STANDARDS AND GUIDELINES

- **Comment:** Clarify whether the watershed analysis process will be able to alter the standards and guidelines of the selected alternative.

**Response:** The standards and guidelines of the selected alternative, as defined in the Final SEIS and Record of Decision, cannot be changed by watershed analysis. See Appendix B6 for more information on the watershed analysis process.

- **Comment:** The standards and guidelines associated with each of the alternatives need to be clarified in the alternatives description section of Chapter 2.

**Response:** The Final SEIS has been revised to clarify the standards and guidelines.

- **Comment:** Explain how Research Natural Areas will be managed in the Late-Successional Reserves.

**Response:** Certain Research Natural Areas are Congressionally Reserved Areas. Management of these lands will follow the direction of the applicable legislation or plans. Other Research Natural Areas are Administratively Withdrawn Areas. These areas are governed by standards and guidelines of the current plans and draft plan preferred alternatives and those of the Late-Successional Reserves. In cases where there are conflicts in direction, those standards and guidelines which the agencies determine are likely to provide greater benefits to late-successional and old-growth related species will apply. In addition, implementation of standards and guidelines for Administratively Withdrawn Areas must also be consistent with the intent of the administrative withdrawal. The management of Administratively Withdrawn Areas has been clarified in the Final SEIS.

- **Comment:** There are no standards and guidelines that address research in Late-Successional Reserves, and standards and guidelines for Riparian Reserves appear to inappropriately limit research. Research activities are necessary to test assumptions or to evaluate techniques for restoring or establishing conditions necessary for achieving Riparian Reserve goals and objectives. Standards and guidelines that permit appropriate research should be added for these areas.

**Response:** Standards and guidelines that address research have been added for Late-Successional Reserves in Appendix B7, and for Riparian Reserves in Appendix B6.

## SCOPE OF THE SEIS

- **Comment:** The scope of the SEIS should be expanded to include federally managed lands east of the range of the northern spotted owl, and to stipulate that no increase in harvest will occur on these lands to compensate for reduced harvest within the range.

**Response:** The ecological conditions in federally-managed lands east of the range of the northern spotted owl are sufficiently unique and distinct from those within the range that they were not included in the scope of the proposed action.

- **Comment:** Alternative 9 offers no protection for watersheds outside of the range of the northern spotted owl.

**Response:** Management of watersheds outside the range of the northern spotted owl is beyond the scope of the proposed action analyzed in this SEIS.

- **Comment:** A separate NEPA analysis should be done for aquatic ecosystem management. Aquatic species lack sufficient commonality with old-growth forest species and a separate NEPA analysis is warranted. NEPA analysis should be done for each affected rural county to evaluate environmental, social, and economic impacts resulting from aquatic ecosystem management.

**Response:** The Assessment Team and the SEIS Team were directed to use an ecosystem approach for developing a management strategy. Aquatic ecosystems are an integral part of the landscapes which encompass them, and thus it was decided not to separate them in the environmental analysis. Notwithstanding their integration into the whole, effects on aquatic resources within the range of the northern spotted owl were fully considered. Additional analysis of aquatic ecosystems will occur with future Forest and District planning efforts, watershed analysis, and site-specific projects.

## SUGGESTED CHANGES OUTSIDE AGENCY AUTHORITY

The following section addresses comments that suggest changes to the SEIS and other actions that are outside the authority of the Forest Service and Bureau of Land Management, as well as outside the scope of this programmatic SEIS.

- **Comment:** The President should sign an Executive order which permanently establishes the entire reserve system.

**Response:** Permanent withdrawals, such as wilderness designations, are outside the authority delegated legislatively to the agencies involved in this SEIS and would require congressional action.

- **Comment:** Some of the comments received suggested modifying current legislation to allow consideration of a greater range of alternatives or, as other comments suggested, to further limit the range of alternatives. Still other comments suggested modifying legislation to accomplish other purposes, such as protecting Wildernesses.

**Response:** One of the core purposes of the proposed action is to adopt, within existing legal and regulatory requirements, a revised management strategy for the federal late successional and old-growth forests within the range of the northern spotted owl. Thus modification of existing laws is fundamentally inconsistent with the purpose and need of the proposed action.

- **Comment:** Comments were received both supporting and opposing inclusion of sufficiency language in the Final SEIS or Record of Decision to limit or prevent potential appeals of the decision associated with this SEIS, and/or to limit the number of potential timber sale appeals on the site-specific projects which will implement the selected alternative.

**Response:** The agencies involved in the preparation of this SEIS do not have the authority to include sufficiency language. Such an action is under congressional authority and, as such, is outside the scope of this SEIS. Appeals procedures are determined through a separate administrative process and are also outside the scope of this SEIS.

- **Comment:** An administrative solution is highly vulnerable to appeals and other litigation because no strategy will satisfy everyone. We need to enact comprehensive forest legislation.

**Response:** Enactment of new legislation is fundamentally inconsistent with the purpose and need of the proposed action, which calls for adoption, within existing legal and regulatory requirements, of a revised management strategy for the federal late-successional and old-growth forests within the range of the northern spotted owl.

- **Comment:** A number of individuals suggested ways to reorganize the Forest Service and Bureau of Land Management to better facilitate implementation of the selected alternative, or to otherwise improve the agencies.

**Response:** Reorganization of federal agencies and their work forces is beyond the scope of the proposed action analyzed in this SEIS. However, the new emphasis on interagency coordination and cooperation with state and local governments, private landowners, tribes, and citizens; the new standards and guidelines; and the new management objectives all will lead to major changes in how the agencies "do business".

- **Comment:** Develop an alternative that considers purchasing productive lowland and low-gradient habitats in floodplains and estuaries which have been lost to agriculture, flood control, transportation, navigation, and land development projects. Restore these areas to forest land to supplement the shrinking timber base.

**Response:** Purchase of specific parcels of private land is outside the scope of this programmatic SEIS. However, land exchanges involving Late-Successional Reserves may be considered during site-specific planning when they will provide benefits equal to or better than current conditions (see Appendix B7 in this Final SEIS).

- **Comment:** Option 9 in the FEMAT Report recommends that Forest Service and BLM administrative units be realigned along watershed boundaries. This recommendation should be adopted in the Final SEIS.

**Response:** Realignment of Forest Service and BLM administrative unit boundaries is outside the scope of the proposed action analyzed in this SEIS. However, the Forests and BLM Districts do have limited authority to adjust administrative boundaries within their own units. Such adjustments may be considered by the Forests and Districts during more site-specific analyses which will occur during implementation of the selected alternative.

- **Comment:** The SEIS should address the downsizing issue now occurring within the Pacific Northwest and Pacific Southwest Regions of the Forest Service. If Alternative 9 is selected, the Forest Service will need qualified, trained personnel to implement the many facets of this program, and many of these personnel are currently threatened with layoffs.



**Response:** While it is true that the Forest Service is currently decreasing its work force, downsizing is related to budgets which are allocated by Congress. Congressional appropriations are outside the scope of the proposed action of this programmatic SEIS.

- **Comment:** The Clinton administration should introduce legislation for an interim management plan. The measure would allow scientific review of the current federal management plan to identify acreage that can be harvested. An interim solution is necessary to generate timber sales in the short term, and maintain some level of economic activity in the region.

**Response:** One of the core purposes of the proposed action is to adopt, within existing legal and regulatory requirements, a revised management strategy for the federal late-successional and old-growth forests within the range of the northern spotted owl. Thus, modification of existing laws is fundamentally inconsistent with the purpose and need of the proposed action.

- **Comment:** Current forest and resource management planning techniques are often inconclusive, costly, and lengthy. The SEIS should direct federal agencies to reexamine planning technologies and procedures.

**Response:** The alternatives analyzed in this SEIS propose a broader planning approach, involving provincial and regional perspectives to address the regional nature of many issues within the planning area. The planning process itself is prescribed by laws and regulations. Analysis of current planning technologies and procedures is outside the scope of the proposed action analyzed in this SEIS.

## THE FEMAT REPORT AND THE SEIS

### Relationship Between the FEMAT Report and SEIS

- **Comment:** Where differences occur between the FEMAT Report and the SEIS, explain which is correct.

**Response:** While the SEIS Team intended that the Draft SEIS rely heavily on the analysis presented in the FEMAT Report, in some cases a choice was made between dual statements. In these cases, the statement in the SEIS reflects a standard or estimate that most closely reflects the general strategy and the ability to implement the option (alternative) proposed by the Assessment Team. Where such inconsistencies occur, the statement in the Final SEIS (as selected or modified in the Record of Decision) is the governing statement. The Final SEIS is intended to be a stand-alone document to the extent that it is possible for a supplemental NEPA document.

- **Comment:** Pages IV-20 through IV-27 of the FEMAT Report describe other, previous plans, and their rationale in order to support the thinking going into the Late-Successional and other Reserves. Some of the standards listed on these pages conflict, others are not included in all alternatives, and others appear differently in the Options. Clarify whether these standards and guidelines apply to the alternatives.

**Response:** The standards and guidelines displayed on the referenced pages are for information and example only and do not apply to the alternatives unless specifically included in the description of the alternatives.

- **Comment:** Clarify the distinction between the FEMAT Report's options and the Draft SEIS's alternatives.

**Response:** The SEIS Team intended that there be no significant difference between the options in the FEMAT Report and the alternatives in the Draft SEIS. "Alternatives" is the label more suited to the environmental impact statement format, thus the label was changed. Alternatives in this Final SEIS may

be slightly different from the options in the FEMAT Report. These changes incorporate additional standards and guidelines which were developed in response to additional analysis which took place since the Draft SEIS, provide analysis and comments from the public, and clarify management direction.

- **Comment:** The FEMAT Report raises the question of trust (FEMAT Report, p. II-14), but the SEIS does not deal with this issue. This issue is central to the application of management direction to achieve federal forest management objectives.

**Response:** A review process is a component of each of the SEIS alternatives. The Regional Ecosystem Office has been established to oversee the implementation of the selected alternative and ensure that agencies' actions are consistent with the direction of the selected alternative.

## The FEMAT Report

- **Comment:** Page III-28 of the FEMAT Report suggests that "... all or portions of the receipts from Adaptive Management Areas ..." should be used for activities within these areas. This is not legal and would be subject to court challenge.

**Response:** This recommendation was not carried forward from the FEMAT Report to the SEIS. Such an approach to funding would require a congressional appropriation and is outside the scope of the proposed action analyzed in this SEIS.

- **Comment:** There is a need to revisit the Assessment Team's process—not necessarily do it over, but calibrate it, append it, and provide assurance that every reasonable attempt has been made to find a solution that achieves the desired outcomes with the least cost to society.

**Response:** Additional analysis was completed between the Draft and Final SEIS, and this information has been incorporated into Chapter 3&4 and Appendices B11 and J of the Final SEIS. Furthermore, the SEIS and the process through which it was derived, were reconsidered through the public comment process, during which numerous aspects of the alternatives were adjusted. Forest management is an ongoing, evolving process, and there will be ample opportunity to revise forest management approaches and techniques through the adaptive management process.

## Draft SEIS

- **Comment:** The Draft SEIS calls for Managed Late-Successional Areas, but their use in Alternative 9 is not clear.

**Response:** Originally, Managed Late-Successional Areas were not included in Alternative 9. Some Managed Late-Successional Areas have been added in the Eastern Washington Cascades and the California Cascades Provinces, however, to address concerns expressed by the U.S. Fish and Wildlife Service as part of the Endangered Species Act consultation process for northern spotted owl habitat in those areas.

- **Comment:** The SEIS states that some old-growth stands would be harvested under the preferred alternative, and that these areas are not likely to exhibit the ecological and human values that they currently provide. The reasons for this should be clarified.

**Response:** This discussion has been expanded in the Final SEIS. See Chapter 3&4.

- **Comment:** More time should be taken to analyze the effects of the alternatives on ecosystems. The time demands of the schedule were unrealistic.

**Response:** The FEMAT Report and SEIS are based on analysis which has been ongoing for 3 years. The timelines established for analysis were considered to be sufficient given the extensive previous analysis. Because of the large number of public comments received during the public comment period, a 3-month extension was granted to analyze comments and incorporate changes resulting from those comments into the Final SEIS.

- **Comment:** The Draft SEIS discusses a sixth alternative that appears to be quite different from the others (Draft SEIS, p. 2-43). Explain what happened to this alternative.

**Response:** The sixth additional alternative developed by the Assessment Team consisted of a long timber harvest rotation (300 to 350 years) with no Late-Successional Reserves. This long-rotation alternative would have placed all federal forests outside of designated wilderness under active management, and would have been based on the "constant change" theory of forest ecology. The steady state theory, and its component of large reserves, was considered by the Assessment Team to represent a less risky approach for management of federal forests given the current proportion of late-successional forest ecosystems in the region. As a result, the sixth alternative was not included among the 10 alternatives selected for further analysis. The 10 alternatives that were given further detailed analysis were considered by the Assessment Team to have the highest probability of meeting all the objectives given to the team at the April 1993 Forest Conference. Long-rotation alternatives and the "constant change" theory of forest ecology are further addressed in the Silviculture section of this appendix, and will continue to be evaluated over time by the Forest Service and BLM, especially as the proportion of late-successional and old-growth forest in the planning area landscape increases.

- **Comment:** The FEMAT Report calls for involvement of the states, tribes, and other organizations in the local planning processes which will implement the selected alternative. Many of these organizations do not have the funding or staffing to provide such support. The SEIS should include provisions for federal funding to enable representation from these outside organizations.

**Response:** The alternatives analyzed in the SEIS do not provide for funding individuals from outside organizations to participate in local planning efforts. Federal appropriations are congressionally allocated and thus are outside the scope of the proposed action and the agencies' authority. In the case of Alternative 9, innovative approaches to foster local involvement, cooperation, and consensus in managing the Adaptive Management Areas would be encouraged, however, as would creative funding approaches to accomplish these strategies.

## Peer Review

- **Comment:** The FEMAT Report and SEIS did not receive peer review based on scientific analysis. There is scientific dispute about some of the assumptions made by the Assessment Team.

**Response:** NEPA does not require peer review. Nonetheless, the FEMAT Report did receive "blind" peer-review by qualified individuals from 16 universities and organizations. Additionally, the opportunity to comment on the scientific and technical adequacy of the FEMAT Report and Draft SEIS was provided during the 90-day public comment period. Aspects of the SEIS that are in scientific dispute are identified and discussed in this SEIS.

## ENVIRONMENTAL ANALYSIS

- **Comment:** The Adverse and Long-Term Consequences, and Short-Term Uses and Long-Term Productivity sections in the Draft SEIS need to be strengthened using information available in the appendices.

**Response:** These sections have been updated and expanded in this Final SEIS. See Chapter 3&4.

- **Comment:** The proposed use of watershed analysis to determine actual levels of water quality and fish habitat protection effectively precludes full disclosure of environmental impacts as required under NEPA.

**Response:** The Final SEIS includes a complete description of the environmental impacts, at an appropriate level for a programmatic SEIS, which is sufficient for the decision makers to make an informed decision. In this analysis, prescribed Riparian Reserves are provided and analyzed. Watershed analysis will provide additional, site-specific information for local NEPA planning efforts. To the extent that the environmental analysis of a site-specific proposal relies on watershed analysis, this information will be available for public review during the NEPA process associated with the analysis of site-specific project proposals.

- **Comment:** In the FEMAT Report, Option 7, Option 1, and Option 1 with Recreation Emphasis are analyzed. Explain Option 1 with Recreation Emphasis and clarify the reason for not addressing recreation emphasis in all options.

**Response:** Options 1 and 7 represent the ends of the spectrum of land allocations for a variety of recreational uses. The acreage contribution and the economic value of any of the remaining alternatives can be extrapolated by their proximity to either end of the spectrum.

Option 1 with Recreation Emphasis was developed as part of the analysis. It represents management under Option 1, combined with additional road closures, to meet a need for semiprimitive nonmotorized recreation (see Swanson and Loomis unpub.). The recreation emphasis could be added by the decision makers to any of the alternatives to generate similar results.

- **Comment:** Analysis of past timber harvest activities should be emphasized, and emphasis on potential timber harvest volume should be reduced.

**Response:** This SEIS displays effects of past timber activities, in large measure through the analysis of the current amounts and distribution of particular kinds of stands and habitat. More detailed analysis of the lasting effects of past timber harvest activities and patterns will occur as part of the watershed analysis process. Disturbance and land use history are some of many variables which will be considered on a watershed-by-watershed basis to provide information on what processes are active within a watershed and how those processes are distributed over time and space. Emphasis on potential timber harvest volume is necessary because a sustained level of timber harvest and maintenance of rural communities are part of the purpose and need for this SEIS.

- **Comment:** The Draft SEIS states that "the uses of resources under the standards and guidelines of the preferred alternative and current plans will result in no long-term loss in productivity of forest soils and other components necessary for a healthy forest environment" (Draft SEIS, p. 3&4-139). This statement is incorrect because under any of the alternatives in the report, increased pressure to harvest timber on state and private lands will result in increased impacts to ecosystems. Without a change in local and state environmental laws, impacts to forest and aquatic ecosystems will continue as a result of this increased pressure to harvest on state or private lands.

**Response:** The process of evaluating cumulative effects included consideration of the incremental impact of actions on lands owned and/or managed by other nonfederal agencies, states, American Indian tribes, corporations, and individuals. Road construction and use, and timber harvest are the principal activities on nonfederal forest lands which make an incremental contribution to the cumulative impacts disclosed in the SEIS. Modeling indicates that, although reductions in federal harvests tend to spur some supply responses on the part of private landowners in the region (timber harvest), the level of the supply response is short lived and is limited by the age distribution of the timber on private lands. Moreover, changes to local and state environmental laws are outside the scope of the proposed action and beyond the authority of either joint lead agency.

- **Comment:** The SEIS ignores global environmental consequences, such as climate change and increased timber harvest in other parts of the world, that would result from decreased timber harvest in the United States.

**Response:** A section on the Effects of Alternatives on Global Change has been added to the Final SEIS.

- **Comment:** The analysis of the alternatives should include a fragmentation index to allow the decision makers to determine the impacts of edge effects.

**Response:** Analysis of fragmentation is best done at the landscape and watershed level, and it is therefore not prudent or practicable to use such an index for this programmatic SEIS. A primary purpose of the Late-Successional Reserves is to minimize and reverse the effects of fragmentation. Also, connectivity was a primary factor in the development and assessment of Late-Successional Reserves, Adaptive Management Areas, and Riparian Reserves.

## PUBLIC INVOLVEMENT

### General Comments

- **Comment:** Everyone should have the opportunity to participate in the process for making decisions about the management of our public lands.

**Response:** The 90-day public comment period and public hearings provided the public with the opportunity to participate in the SEIS process. Substantive comments were analyzed in detail. This SEIS reflects changes in response to concerns. The implementation of the selected alternative through future planning efforts undertaken at more site-specific levels will provide additional opportunities for public involvement.

- **Comment:** Explain how the public has been informed on land management practices from the adoption of NEPA to the present. Address how and to what extent the public has been informed of, and involved in, decisions regarding timber harvest practices in the Pacific Northwest.

**Response:** The scoping that led up to this effort is described in Chapter 1 of this SEIS. More detailed information can be found in Forest and District Plans, Resource Management Plans, and Annual Monitoring Reports. A historical analysis of public involvement and scoping for timber harvest in the Pacific Northwest since the adoption of NEPA is beyond the scope of this SEIS.

- **Comment:** The process did not consider extensive public involvement that took place during the development of Forest and District Plans, as required by NFMA and FLPMA.

**Response:** The Social Assessment of the FEMAT Report included a sampling of public comment on District and Forest Plans completed over the past decade to identify key concerns and issues. Also, the

alternatives in the SEIS are based on and supplement the NEPA documentation prepared for Forest and District Plans, and thus embody the extensive scoping involved in and reflected by those plans. Additional scoping is not required (see the Memo from CEQ in Appendix C for more information).

- **Comment:** Copies of the Draft SEIS and FEMAT Report were not mailed out in a timely manner, and this functionally limited the comment period to less than 90 days.

**Response:** Copies of these documents were distributed as expeditiously as was practicable throughout the public comment period. The 90-day comment period, as required by the CEQ regulations (40 CFR 1506.10(a)(1)), is designed partially to assure time for document distribution. Moreover, copies of the Draft SEIS and FEMAT Report were available in public reading rooms during the entire comment period.

- **Comment:** The public was not provided with a reasonable opportunity to review the Draft SEIS. Also, copies of the Draft SEIS and FEMAT Report were not sent out to those who had previously requested copies of significant Forest and District Plan amendments and significant regional guides.

**Response:** The comment period was July 30 to October 28, 1993, in accordance with the 90-day comment period required by NFMA (36 CFR 219.6) and FLPMA (43 CFR 1610.2(e)). A letter with a response form for requesting copies of the Draft SEIS and FEMAT Report was sent out to an interagency mailing list. This mailing list included names from the mailing lists for the Final Environmental Impact Statement for the Northern Spotted Owl (USDA FS 1992), the Draft Spotted Owl Recovery Plan (USDI 1992), and BLM's Draft Resource Management Plans for Oregon and northern California (USDI BLM 1992a-f). Also, a Notice of Intent describing the proposed action, and a Notice of Availability notifying interested individuals that the Draft SEIS was available for review, were published in the Federal Register, and notice was published in numerous papers of general circulation in Washington, Oregon, and California.

Copies were also available from Forest Service and BLM offices in the planning area, in the Public Reading Room in the BLM State Office in Portland, Oregon, and in many schools, universities, and libraries throughout Washington, Oregon, and northern California and other areas of the United States. For more detail, see the distribution list in the Draft SEIS.

- **Comment:** The Draft Spotted Owl Recovery Plan did not receive adequate public review and should be opened for public comment to provide for the incorporation of new research findings.

**Response:** Development of the spotted owl recovery plan was subject to public review and participation as required by the Endangered Species Act (see 16 USC § 1533(f)(4)). In addition, the Draft Spotted Owl Recovery Plan was subject to review during a 90-day public comment period, and during a series of public meetings. Additionally, the 90-day comment period for the Draft SEIS provided an opportunity for individuals to comment on those elements of the Final Draft Spotted Owl Recovery Plan that were incorporated into the SEIS.

- **Comment:** Forest Service and BLM offices throughout the planning area were instructed to avoid any direct facilitation of public participation opportunities at the local level, such as public meetings, information exchange, and record review. As a result, members of the public were unable to receive basic information needed to assess the impacts of this proposed federal action at the forest level.

**Response:** Forest Service and BLM offices were not instructed to avoid public participation related to this SEIS. The approach taken to provide meaningful public involvement for this effort varied among administrative units. Information and copies of the Draft SEIS and the FEMAT Report were made available at Forest Service and BLM field offices in the planning area, and maps of the preferred alternative were available at field offices in Oregon and Washington. Many of the field offices

conducted public meetings. Public outreach was also promoted through publication of notice in local papers throughout the planning area and information letters (with forms to request copies of the SEIS) which were sent out to a large interagency mailing list.

## FEMAT Public Involvement

- **Comment:** The 60 days allowed to produce the FEMAT Report did not provide for adequate public involvement. Members of the public were denied opportunity to participate in the Assessment Team's effort and have been denied access to the administrative records of the Assessment Team.

**Response:** The FEMAT Report was an effort of scientists, designed to develop a technical assessment of options for management of federal late-successional and old-growth forests within the range of the northern spotted owl in order to meet the criteria laid out at the April 1993 Forest Conference. The public was provided an opportunity to comment on the FEMAT Report and Draft SEIS and to review the administrative records of the Assessment Team during the 90-day public comment period. Opportunities to comment were also provided during the President's Forest Conference and the extensive scoping efforts that led up to the SEIS effort (see Chapter 1).

- **Comment:** The public could not comment fully and properly on the FEMAT Report's options without seeing the documents supporting the FEMAT Report's analysis, which were not provided to the public. All written materials and any taped discussions which were made during the meetings of the Assessment Team, or that were provided to the Assessment Team by invited guests, should be made available to the public. If these materials are not made available, this should be justified to the public.

**Response:** The administrative record of the Assessment Team's effort has been available for public review at the BLM Oregon State Office, in Portland, Oregon. All those who inquired about the administrative record were notified that they could review it at this location. The administrative record will continue to be available for review for 30 days following the Notice of Availability of this Final SEIS.

## SEIS Public Involvement

- **Comment:** Scoping should be required for a Supplemental EIS, especially one that affects Forest and District Plans in a multistate area, impacts several million people, affects the tax base of every community, and modifies critical habitat designated under the Endangered Species Act.

**Response:** The scoping section in Chapter 1 details the scoping efforts that led to the development of this SEIS. This effort is guided by NEPA regulations (40 CFR 1500-1508). As per 40 CFR 1502.9(c)(4), scoping is not required for a Supplemental EIS. See also the June 21, 1993, letter from the Council on Environmental Quality in Appendix C of this SEIS. Critical habitat, as defined by the U.S. Fish and Wildlife Service under the Endangered Species Act, is not modified by the proposed action analyzed in this SEIS.

- **Comment:** Clarify when comments to the Draft SEIS had to be received. Some people understood that the comments had to be received before the end of September 1993, in order to be considered.

**Response:** The Notice of Availability for the Draft SEIS, which was published in the Federal Register and in newspapers, identified the close of the comment period. All comments from the public or from agencies that were postmarked by October 28, 1993, have been fully considered in the preparation of this Final SEIS. Additionally, the SEIS Interdisciplinary Team also reviewed those letters which were received after the close of the comment period.

- **Comment:** The Draft SEIS and Alternative 9 were developed without consulting local forest managers and others who have knowledge of local forest systems.

**Response:** See Chapter 1 of this SEIS for a description of the scoping efforts that led to the development of this SEIS. Most of the base data for all of the options considered by the Assessment Team were provided by the local Forest Service and Bureau of Land Management offices. Local forest managers were also provided with the opportunity to comment on the Draft SEIS (and Alternative 9) during the 90-day public comment. There will be further opportunities for local input as site-specific analyses are conducted for local projects and the adaptive management process is implemented.

- **Comment:** Alternative 9 was developed without the participation of labor groups or the timber industry.

**Response:** Labor groups and the timber industry had an opportunity to provide input during the 90-day Draft SEIS public comment period.

- **Comment:** The agencies will not be able to meaningfully consider public input gathered during the comment period because there is inadequate time provided between the end of the comment period and the publishing date of the Final SEIS.

**Response:** The completion date for the Final SEIS was extended 3 months to allow additional time to analyze public comments.

## Post-ROD Public Involvement

- **Comment:** Regional management committees and regional reforestation teams should be formed that would direct forest management activities in a specific area, and provide for public involvement.

**Response:** The Regional Interagency Executive Committee (RIEC) will oversee implementation of the selected alternative, as described in Chapter 2, Implementation.

- **Comment:** The FEMAT Report implied that public involvement begins with the implementation phase. Explain how diverse social values will be considered in the decision-making process. Clarify how the Forest Service and Bureau of Land Management will conduct public involvement under the selected alternative.

**Response:** The public is, and will continue to be, involved in all phases of decision making, as they were in the comment period used to revise the Draft SEIS. Overall, ecosystem management is intended to involve federal land managers, state agencies, county and city officials, private landowners, and the public in an open, collaborative, decision-making process. Diverse social values are considered through a variety of channels, including participation in the NEPA scoping process, public involvement during environmental analysis, and submission of comments to the decision maker.

## MANAGEMENT DIRECTION

### General

- **Comment:** The Assessment Team was instructed to develop alternatives that address “maintenance and/or restoration of spawning and rearing habitat on Forest Service, Bureau of Land Management, National Park Service, and other federal lands to support recovery and maintenance of viable



populations of . . . fish species . . .” (FEMAT Report, p. II-5). The Draft SEIS only presents management direction for lands managed by the Forest Service and BLM.

**Response:** Because current management plans for National Parks and National Wildlife Refuges generally do maintain such habitat, and there is no indication that this management will change, there is no need to reiterate this management direction in the SEIS. As indicated in The Planning Area section of Chapter 2 of this Final SEIS, management direction for federal lands other than those managed by the Forest Service and BLM will generally maintain existing habitat.

- **Comment:** Page 2-11 of the Draft SEIS states that standards and guidelines from current plans and draft plan preferred alternatives will apply when they provide “greater benefits to late-successional and old-growth species” than other provisions of the alternatives. Clarify the management direction in Chapter 2 and define “greater benefits”.

**Response:** This has been clarified in the Final SEIS to state that in all allocations, unless specifically excepted by standards and guidelines presented in this SEIS, standards and guidelines within current plans and draft plan preferred alternatives apply where they *are more restrictive or provide greater benefits* to late-successional forest related species. For example, thinning in a Late-Successional Reserve would be permitted only if it was consistent with the standards and guidelines of the selected alternative in this SEIS and consistent with the standards and guidelines of the underlying current or draft plan preferred alternative. When a site-specific issue arises, the determination of greater benefits will be made by the decision maker at the level most appropriate to the issue. More specific definition of “greater benefits” is not possible at this stage of planning, and will be determined at the site-specific level.

- **Comment:** The California-Oregon state line intersects small slivers of certain administrative units, such as the Klamath and Siskiyou National Forests. For administrative efficiency, it should be reasonable to apply province or state-specific standards and guidelines to these entire administrative units rather than to administer these few acres differently.

**Response:** Management along administrative unit boundaries instead of along the California-Oregon state line is acceptable as long as it is consistent, stated as the intent of the unit, involves only a slight fraction of that unit, and does not violate a clear assumption or conclusion of the selected alternative.

- **Comment:** Explain how the preferred alternative relates to the Deferred Old-Growth Emphasis Areas in the BLM Draft Resource Management Plans.

**Response:** Deferred and Non-Deferred Old-Growth Emphasis Area prescriptions are not part of the preferred alternative. However, the Connectivity/Diversity Block allocation and prescription will be applied to those lands in the South Willamette/North Umpqua Area of Concern in the Eugene District of the BLM which were designated as Deferred Old-Growth Emphasis Areas and Non-Deferred Old-Growth Emphasis Areas in the Revised Preferred Alternative to the Draft Resource Management Plans. Connectivity/Diversity Block standards require 150-year area control rotations. Overall, 25 to 30 percent of these blocks will be maintained in late-successional condition and, when areas are harvested, 12 to 18 green trees per acre will be retained.

## National Forest Management Act (NFMA)

- **Comment:** Certain NFMA constraints need to be revised. In particular, the provision that calls for the National Forest to be the planning unit. These changes should not await a more comprehensive review and revision of the planning statute.

**Response:** One of the core purposes of the proposed action is to adopt, within existing legal and regulatory requirements, a revised management strategy for the federal late-successional and old-growth forests within the range of the northern spotted owl. Thus, changes to the NFMA Regulations (36 CFR Part 219) are fundamentally inconsistent with the purpose and need of the proposed action.

- **Comment:** The Draft SEIS violates the National Forest Management Act because the amendments to existing Forest Plans are "significant" amendments and the procedures of NFMA and the NFMA regulations, including seeking public input and participation, have not been completed.

**Response:** Adoption of the selected alternative, regardless of which of the SEIS alternatives is adopted, would result in significant changes to the existing Region 6 Forest Plans. The forest planning regulations pertaining to significant Forest Plan amendments address individual Forest Plan significant amendments (36 CFR 219.10(f) and 219.12). The purpose and need for this SEIS and decision, as defined in the May 7, 1993, mission statement, are much broader and are based on a different management approach (ecosystem management) than a traditional Forest Plan EIS. Because of this broader focus, the forest planning regulations do not precisely fit the type of Forest Plan amendments that will occur with adoption of the selected alternative.

As with many forest planning concepts developed in the late 1970's and early 1980's, the individual Forest Plan significant amendment regulatory process must be applied to the extent reasonable, given the current broader focus on ecosystem management and interagency cooperation as reflected in this SEIS and decision. Nonetheless, public involvement and disclosure requirements of both NFMA and NEPA have been met for the significant amendments to the existing Forest Plans.

The Final SEIS addresses each of the planning actions of 36 CFR 219.12. The requirements for a significant amendment to a Forest Plan have been met because the process used in the development of the FEMAT Report and the SEIS incorporates all the elements of the general planning process, including identification of the purpose and need and planning criteria, data inventory and collection, analysis of the management situation, formulation of alternatives, estimation of effects and evaluation of the alternatives, comparison of the alternatives, identification of the preferred alternative, and development of monitoring requirements. In addition, the Final SEIS is based, in part, on public comment generated during and after the April 2, 1993, Forest Conference, and on the more than 100,000 comments received during the public comment period for the Draft SEIS. Thus, public involvement and disclosure requirements of both NFMA and NEPA have been met for the significant amendments to the existing Forest Plans.

The figures for suitable timber acres and allowable sale quantities in the individual existing Forest Plans will be adjusted when Forest Plans are revised. In the meantime, the land allocations and standards and guidelines from this decision, as amended into the individual Forest Plans, control timber management. The Probable Sale Quantity concept (Chapter 3&4, Timber Harvest) is a current prediction of likely timber sale volume for the area covered by this SEIS. By the time Forest Plan revisions occur, the forests and BLM districts will have experience with the application of the SEIS land allocations and standards and guidelines, and will be able to make specific adjustments to suitable timber acres and allowable sale quantities.

- **Comment:** The viability rule requires the Forest Service to manage habitat "to maintain viable populations of existing native and desired non-native vertebrate species" (36 CFR 219.19). This rule neither requires nor authorizes the Forest Service to manage the National Forests for the viability of nonvertebrate species. The alternatives considered, however, were designed to create habitat for hundreds or perhaps thousands of nonvertebrate species. Additionally, the Forest Service viability standard does not apply to the Bureau of Land Management, which has no authority to manage to maintain the viability of any species or to preserve late-successional and old-growth forest ecosystems.

**Response:** The Forest Service and Bureau of Land Management have broad discretionary authority to consider the conservation of any species in the management of the lands they administer. Statutes granting such authority include the Multiple-Use-Sustained Yield Act, Sikes Act, Forest and Rangeland Renewable Resources Planning Act, Endangered Species Act, Federal Land Policy and Management Act, and National Forest Management Act. The issue of viability is addressed in more detail in the Terrestrial Species section of this Appendix.

- **Comment:** The NFMA regulations require Forest Plans to set forth specific requirements for managing each management area. Alternative 9 fails to do so for Adaptive Management Areas and, thus, violates NFMA.

**Response:** Until the Adaptive Management Area plans are developed, the Adaptive Management Areas are governed by the standards and guidelines provided in the existing Forest and District Plans, and by other standards and guidelines provided under Alternative 9. These standards and guidelines are specific management requirements, and thus Alternative 9 is consistent with NFMA.

- **Comment:** Contrary to NFMA, the question of whether or not clearcutting is the "optimum" method for logging and forest regeneration is never addressed.

**Response:** The alternatives analyzed in this programmatic SEIS do not specify site-specific harvest methods. The harvest methods used will be based on local, site-specific analyses by interdisciplinary teams, who will determine how to meet the objectives for a given area. The question of whether clearcutting is an optimum method will be addressed at the site-specific project level.

## Multiple-Use Sustained-Yield Act

- **Comment:** The alternatives were designed to achieve "maintenance and/or creation of a connected or interactive old-growth forest ecosystem on the federal lands" within the range of the northern spotted owl (Draft SEIS, Appendix C, p. C-4). This violates the Multiple-Use Sustained-Yield Act (MUSYA) and the NFMA, both of which require the Forest Service to manage the National Forests under the principles of multiple use and sustained yield.

**Response:** The alternatives are consistent with MUSYA and NFMA because they provide for a sustained level of harvest and for multiple-use of forest lands.

## Federal Land Policy and Management Act (FLPMA)

- **Comment:** FLPMA requires that administrative withdrawals of the magnitude recommended by the SEIS be submitted for congressional review.

**Response:** The Federal Land Policy and Management Act of 1976 requires that, for a withdrawal of 5,000 acres or more, the Secretary must notify both Houses of Congress no later than the effective date of the proposal (FLPMA Sec. 204(2)(c)(1)). However, FLPMA defines "withdrawal" as "withholding of an area of federal land from settlement, sale, location, or entry, under some or all of the general land laws, for the purpose of limiting activities under those laws in order to maintain other public values in the area or reserving the area for a particular public purpose or program . . ." (Sec. 103(j)). The Late-Successional Reserves are not administrative withdrawals as defined by FLPMA, and thus are not governed by this requirement. The Administratively Withdrawn Areas included in the alternatives are those created through current Forest and District Plans, prior to this SEIS.

## Federal Advisory Committee Act (FACA)

- **Comment:** The Assessment Team violated the Federal Advisory Committee Act by not including an adequate representation of all nonfederal interest groups.

**Response:** The Assessment Team did not constitute a Federal Advisory Committee. This issue is currently being litigated in the U.S. District Court for the District of Columbia (*Northwest Forest Resources Council v. Espy*, Civ. 93-1621).

- **Comment:** Explain the recommendation in Appendix E of the Draft SEIS that an exemption be sought from the requirements of the Federal Advisory Committee Act.

**Response:** The Federal Advisory Committee Act has operated to significantly impair the opportunities for involvement of the public and state and tribal governments in federal land management planning. An exemption from the Federal Advisory Committee Act would significantly enhance the ability of land management agencies to consult with state and tribal governments, obtain input from the public, gather scientific analysis from non-federal scientists, and include non-federal employees or officials on agency teams. The objectives of the Federal Advisory Committee Act could be accomplished through less onerous provisions better targeted at the public participation needs and public disclosure requirements of land management planning.

## Organic Administration Act

- **Comment:** The SEIS is not consistent with the Organic Administration Act of 1897, which states that one of the purposes of the National Forests is "... to furnish a continuous supply of timber for the use and necessities of the citizens of the United States."

**Response:** Part of the purpose and need for this SEIS is to "... maintain a sustained yield of renewable resources, including timber..." This is consistent with the Organic Administration Act.

## Endangered Species Act

- **Comment:** The Draft SEIS does not contain a letter indicating that formal consultation under the Endangered Species Act has been initiated.

**Response:** Formal consultation with the U.S. Fish and Wildlife Service on the preferred alternative of the Final SEIS has been completed. The Biological Opinion is included as Appendix G of this Final SEIS.

- **Comment:** Requirements of the Endangered Species Act have not been adequately addressed.

**Response:** The Endangered Species Act has been adequately addressed for this programmatic SEIS. To a degree appropriate for this scale of analytical resolution, effects on all listed species in the planning area have been disclosed and considered. Consultation with the U.S. Fish and Wildlife Service also has been completed. See Consultation in Chapter 2, Threatened, Endangered and Proposed Species in Chapter 3&4, and the Biological Opinion in Appendix G.

- **Comment:** The Endangered Species Act requires consultation with the U.S. Fish and Wildlife Service on all agency actions, including both programmatic plans and individual site-specific actions such as timber sales. By following the procedures disclosed in the Draft SEIS, the Forest Service is in violation of Section 7 Consultation requirements. Consultation must occur for the individual projects.

**Response:** The Draft SEIS states on pages 2-4 and 3&4-50 that actions proposed to implement the selected alternative will undergo consultation, either formal or informal, as required for compliance with Section 7 of the Endangered Species Act.

- **Comment:** The effects of the Endangered Species Act on timber supply potentials have not been addressed.

**Response:** The alternatives were designed to meet many objectives, of which meeting the requirements of the Endangered Species Act is but one. It is not possible to single out the effects of ESA on timber supply potentials as they pertain to the alternatives in this SEIS.

## O&C Lands Act

- **Comment:** The SEIS fails to acknowledge the Oregon and California (O&C) Lands Act (43 USC Sec. 1181a) as a constraint on the management of O&C lands. Alternative 9 violates the dominant use of O&C lands, and fails to acknowledge that these lands are the subject of special legislation that dedicates them primarily to timber production rather than ecologic (including wildlife) uses. The Endangered Species Act does not require the enormous land set-asides for wildlife which are being proposed, and the magnitude of the exclusion of the timber use must be submitted for congressional review under Section 202(e) of FLPMA.

**Response:** The management of the O&C lands is governed by a variety of statutes, including the O&C Lands Act, FLPMA, the Endangered Species Act, and the Clean Water Act. The O&C Lands Act requires the Secretary of the Interior to manage O&C lands for permanent forest production; however, such management must also be in accord with sustained-yield principles. Further, that Act requires that management of O&C lands protect watersheds, regulate streamflow, provide for recreational facilities, and contribute to the economic stability of local communities and industries. The Act does not require the Secretary to harvest all old-growth timber or all commercial timber as rapidly as possible or according to any particular schedule. The Secretary has discretion to determine how to manage the forest on a sustained-yield basis that provides for permanency of timber production over a long-term period. The Secretary must necessarily make judgments, informed by as much information as possible, about what kind of management will lead to permanent forest production that satisfies the principle of sustained yield.

O&C lands must also be managed in accordance with other environmental laws such as the Endangered Species Act and the Clean Water Act. Some provisions of these laws take predominance over the O&C Lands Act. For instance, the Endangered Species Act (ESA) requires the Secretary to insure that management of O&C lands will not likely result in jeopardy to listed species or destruction or adverse modification of critical habitat. The ESA directs the Secretary and all federal agencies to utilize their authorities to carry out programs for the conservation and recovery of listed species. Although several owl recovery plans have been proposed, the Secretary has not yet adopted final recovery plans for either the northern spotted owl or the marbled murrelet. Alternative 9's Late-Successional and Riparian Reserve concepts are important building blocks in the development of recovery plans to achieve the conservation and recovery of those species.

One of the purposes of the Endangered Species Act is the preservation of ecosystems upon which endangered and threatened species depend. Certainly, a forward-looking land management policy would require that federal lands be managed in a way to minimize the need to list species under the ESA. Additional species listings could have the effect of further limiting the O&C Lands Act's goals of achieving permanent forest production which would contribute to the economic stability of local communities and industries. The O&C Lands Act ought not be interpreted in such a manner that limits

the Secretary's ability to take steps now that would avoid future listings, and additional disruptions, in the future.

Moreover, the concept of creating a set of reserves in which timber harvest is substantially circumscribed across a portion of the landscape, such as the proposed Late Successional Reserves, is consistent with the O&C Lands Act. The Secretary has discretion under the O&C Lands Act to determine the length of harvest rotations on O&C lands or whether any particular tract should be subject to harvest, as well as the intensity of harvest activities which should occur. From a practical point of view, there is little or no on-the-ground difference between a management strategy that provides for a deferred harvest for 80 years on Old-Growth Emphasis Areas as proposed in BLM's Draft Resource Management Plans, and one that sets aside reserves in order to restore and maintain a healthy old-growth forest ecosystem, over the time of the deferred harvest. Regardless of approach, FLPMA requires the Secretary to monitor and revise Resource Management Plans in light of changed circumstances or new information generated through the adaptive management process.

The lands included in the reserves under the preferred alternative greatly constrain, but do not exclude timber use. Silvicultural treatments, such as thinnings, consistent with the objectives for the reserves will be allowed. Since this use is not totally eliminated, this management decision will not be subject to the reporting requirement in Sec. 202(e) of FLPMA.

- **Comment:** The timber production requirements and the community stability requirements of the O&C Lands Act should be used as criteria for evaluating the 10 alternatives.

**Response:** The O&C Lands Act does not have specific timber production requirements. The Act does state that a 500 million board-foot minimum will be offered on an annual basis; this was to apply, however, only until the allowable cut has been determined. All the alternatives in this SEIS provide a reliable, sustained yield of timber, and therefore contribute to the community stability requirements of the O&C Lands Act. Timber volume and social analysis are addressed for the alternatives, and they provide adequate criteria with which to evaluate the alternatives for their anticipated effects on community stability.

- **Comment:** Alternative 9 would violate the BLM "O&C Forest Resources Policy".

**Response:** Since this decision will be made at the Secretarial level, the BLM policy statement would not be a constraint. To the extent that the decision would be inconsistent with that policy, the policy would be superseded by the Secretarial decision.

## Compliance with Other Laws

- **Comment:** The preferred alternative will violate the Americans with Disability Act. Those who are disabled will have a difficult time hunting if logging is virtually eliminated.

**Response:** Alternative 9 will not eliminate all existing roads and, through provision of a sustained annual harvest level, will provide hunting opportunities associated with roads and harvest units. The Americans with Disability Act will continue to be addressed and complied with in plans at province, Forest, and District levels, as appropriate, where decisions regarding recreational use are made.

- **Comment:** There is a need to review the current Freedom of Information Act restrictions on providing information to the public when the information is "predecisional." The public should be part of the decision-making process.

**Response:** Review of the direction in the Freedom of Information Act is outside the scope of the proposed action for this programmatic SEIS and outside the authority of the agencies. The public has been included in the decision-making process, as required by NEPA and other laws and regulations.

## RELATIONSHIP TO CURRENT PLANS AND DRAFT PLAN PREFERRED ALTERNATIVES

- **Comment:** The FEMAT Report built upon existing Forest and District Plans, and should have revisited those plans to determine if the assumptions therein were still valid.

**Response:** The selected alternative from this SEIS will amend the existing Forest and District Plans. Existing Forest and District Plan designations were considered in the structure of the alternatives and in the analysis of effects. Information in this SEIS is based on ongoing planning efforts.

- **Comment:** Draft Forest Plans in northern California are being revised to be consistent with the final recommendations of the SEIS. Interested California citizens are asked to comment on these Draft Forest Plans and EISs now, without the benefit of reviewing the Final SEIS, which will not be available for public review until after the comment period for the Draft Forest Plans has closed. This makes reasonable review of the Draft Forest Plans difficult. Also, discuss how the conclusion was reached that the preferred alternative is within the range of alternatives being considered in the Draft EISs for the Draft Forest Plans in California.

**Response:** Comments on the Draft Forest Plans for the four northern California National Forests are outside the scope of this SEIS.

This SEIS makes no assumption or statement about the range of alternatives in the Draft Forest Plans for the four National Forests in northern California. Those Draft Forest Plans were issued after the Draft SEIS. Questions about the range of alternatives in those Draft Forest Plans are outside the scope of this SEIS.

The conclusion that Alternative 9 is within the range of alternatives being considered in the Draft EISs for the northern California National Forests was made in the planning process for the proposed Land and Resource Management Plans for the four National Forests in the Klamath Province of California, and was published in the Addendum which was bound into the front of those Draft EISs. Accordingly, the preferred alternatives were updated to closely reflect the management direction offered by Alternative 9 and, as a result, Alternative 9 falls within the range of alternatives considered in those draft plans.

- **Comment:** Explain how Alternative 9 relates to the land allocations and standards and guidelines in the current plans and draft plan preferred alternatives.

**Response:** The current plans and draft plan preferred alternatives serve as a baseline for the SEIS alternatives. As described in Chapter 2 of this SEIS, land allocations and standards and guidelines of the selected alternative will amend direction in current plans by adding additional standards and guidelines for late-successional forest species. Standards and guidelines in current plans that are consistent with, or not specifically replaced by, the selected alternative remain in effect, as do any that are more restrictive or that provide greater benefits to late-successional species, unless specifically noted otherwise. The specific exceptions to this rule for Alternative 9 are described in The Alternatives section of Chapter 2 and include: (1) lands administratively withdrawn for American marten and other late-successional species (including, unless otherwise noted, northern spotted owl); (2) green tree retention standards; and, (3) changes made in Adaptive Management Area plans. The relationship of the SEIS to current plans and draft plan preferred alternatives has been clarified in the Final SEIS.

## RELATIONSHIP TO OTHER PLANS AND POLICIES

- **Comment:** The Assessment Team failed to coordinate its planning efforts with local counties. Under the FLPMA, NFMA, RPA, ESA, NEPA, and their implementing regulations, the federal agencies are to coordinate and, to the fullest extent practicable, be consistent with local plans and policies. Note also that the BLM planning regulations provide clear directives that the resource management plans are to be consistent with officially approved or adopted resource-related plans and the policies and programs contained therein (43 CFR 1610.3-2). Similar coordination provisions are found in the Forest Service planning regulations (36 CFR 219.7).

**Response:** The FEMAT Report is a technical assessment and comparison of options. The applicable requirements of the cited laws and regulations have been met. This SEIS serves as the document and effort responsible for the required coordination. The scope of this SEIS made coordination with local governments difficult. This coordination was partially accomplished through correspondence received during the public comment period. In addition to this SEIS, existing EISs, EISs for future completion of BLM Resource Management Plans and Forest Service Land and Resource Management Plans, and amendments to existing plans, have met and will continue to meet the requirements of these laws and regulations.

- **Comment:** The selected alternative should recommend and support the implementation of the recent Convention on International Trade in Endangered Species proposal.

**Response:** The Convention on International Trade in Endangered Species, which addresses trade of wild flora and fauna, does not affect implementation of the alternatives considered, and is outside the scope of the proposed action of this programmatic SEIS.

- **Comment:** The SEIS fails to disclose and discuss the requirements of state and federal environmental laws applicable to the logging options under consideration.

**Response:** The principal federal laws applicable to logging operations are discussed in this SEIS and in the Forest Service and BLM plans that are being supplemented. Among the many laws that guide logging plans and operations are NEPA, FLPMA, NFMA, the Endangered Species Act, the Clean Water Act, and the Clean Air Act. States, which typically do not have jurisdiction over federal activities, have forest practices acts and other environmental laws that apply to logging on state and private lands.

- **Comment:** Explain how this Final SEIS relates to the *Environmental Impact Statement for Managing Competing and Unwanted Vegetation* on the National Forests.

**Response:** As described in Chapter 2 of this SEIS, land designations and standards and guidelines of the selected alternative will amend current regional guides and plan direction by adding additional standards and guidelines for late-successional forest related species. Direction in the above EIS (USDA FS 1988a) and that for the Pacific Southwest Region (USDA FS 1988b) that is consistent with, or not specifically replaced by, the selected alternative remains in effect. Within the matrix there would likely be little effect on the direction in these EISs. Silvicultural treatments within Late-Successional or Riparian Reserves, however, must be consistent with the standards and guidelines for those designations.

## AGENCY AUTHORITY

- **Comment:** The Forest Service has no authority to establish a system of old-growth reserves.



**Response:** The Forest Service was one of several agencies involved in the development of the FEMAT Report and the SEIS. The Secretaries of Agriculture and Interior are the responsible officials for this SEIS, and have the authority to allocate lands to Late-Successional Reserves.

- **Comment:** The Secretaries of Agriculture and Interior do not have the authority to adopt a comprehensive salmonid management plan because they do not have jurisdiction over other federal agencies or nonfederal lands.

**Response:** The Secretaries can select an alternative from this SEIS to provide management direction for lands administrated by the Forest Service and BLM.

## Implementation

The following comments and responses address implementation of the alternative to be selected by the decision makers and documented in the Record of Decision for this Supplemental Environmental Impact Statement.

### ADAPTIVE MANAGEMENT PROCESS

- **Comment:** Clarify the relationship between the adaptive management process and the Adaptive Management Areas.

**Response:** The process of adaptive management applies to all land allocation categories under all alternatives. Under the concept of adaptive management, new information will be evaluated and a decision will be made whether to make adjustments to the selected alternative. Adaptive Management Areas are a land allocation category that occurs only under Alternative 9. The objective of each of these areas is to learn more about ecosystem management while meeting social and economic objectives. A complete description of the purpose and objectives of Adaptive Management Areas is found in Appendix B3 of this SEIS.

- **Comment:** The preferred alternative prescribes adaptive management that allows experimentation with public resources without clearly defined controls.

**Response:** When specific research projects are conducted, controls appropriate for each project will be used. On an overall basis, the Regional Ecosystem Office will provide review and guidance for implementation of the selected alternative. That office will be responsible for evaluating major modifications arising from the adaptive management process. It will report to the Regional Interagency Executive Committee and will be responsible for the development, evaluation, and resolution of consistency and implementation issues.

- **Comment:** The alternatives rely too heavily on adaptive management. The changes in the ecosystem may be too slow or subtle compared to the rapid rate at which the forests will be changed.

**Response:** Adaptive management will rely on monitoring and research, inventories, experience, and new knowledge and technology to determine when changes in goals and management are warranted. The alternatives represent more conservative management than in the past, and will respond in a timely manner to changing situations. A strategy so conservative that it would restrict or prohibit actions to allow for the possibility of unknown information not detectable by monitoring or other methods would not provide the flexibility for human use of the forests.

- **Comment:** Rigorous experimental design and well-conceived monitoring are essential features of a successful adaptive management process and should be developed prior to any implementation.

**Response:** Although research is an important part of the adaptive management process, not all components of adaptive management can be characterized as experiments or research. The knowledge and experience associated with the overall strategy and the specific standards and guidelines of the alternatives vary. Although there are acknowledged gaps in information, there is enough reliable information, field experience and existing research that monitoring, new research and overall implementation of the selected alternative may go forward simultaneously.

- **Comment:** Specify what information might cause a change in the management of Late-Successional Reserves.

**Response:** It is not possible to be specific about what information might cause a change in management. However, the alternatives are based on goals, knowledge, technology, and inventory. In the event of a revision of the goals, or emergence of significant new knowledge, inventory or technology that would alter assumptions or analysis, an evaluation would be made to determine if changes were warranted through the adaptive management process. Changes resulting from adaptive management may or may not require changes to Regional Guides or Forest and District Plans.

- **Comment:** A more rigorous operational model of adaptive management is needed to provide insight into critical process design issues such as what constitutes low versus high levels of performance for adaptive management, goal conflict, feedback conflict (both positive and negative from an action), policy change resistance, and an operational definition of organizational learning.

**Response:** The concept of adaptive management has been incorporated into all alternatives. The adaptive management discussion has been expanded in the Final SEIS. Additional development of the adaptive management process will continue during implementation of the selected alternative.

- **Comment:** Changes through the adaptive management process should be approved at the Forest or District level, with limited oversight or review at the province or regional level.

**Response:** The evaluation of major modifications arising from the adaptive management process is the responsibility of the Regional Ecosystem Office. This review process will prevent inconsistencies in implementation of the selected alternative among administrative units or provinces.

## ADAPTIVE MANAGEMENT AREAS

- **Comment:** The Draft SEIS discussion of Adaptive Management Areas states that "initiation of activities not be delayed by requirements for comprehensive plans" (p. B-60). Taking extra time to avoid making mistakes seems to be not only prudent but legally necessary. Major actions such as timber sales and road building without a plan would violate NEPA regulations.

**Response:** All actions within Adaptive Management Areas will meet existing legal requirements, including NEPA. In addition, the standards and guidelines for Congressional Reserved Areas or Late-Successional Reserves must be followed when these areas are located within Adaptive Management Areas (with some exceptions for the Finney and North Coast Adaptive Management Areas). These guidelines, as well as additional guidelines contained in Appendix B3, will apply to Adaptive Management Area activities.

- **Comment:** The SEIS mentions an “area management team” in the description of the Adaptive Management Areas. Identify the members of this team and how the public will be allowed to participate.

**Response:** The Adaptive Management Areas will provide opportunities for land managing and regulatory agencies, other government entities, nongovernmental organizations, local groups, landowners, communities, and citizens to work together to develop innovative management approaches. There is not a prescribed membership for the team or prescribed rules of participation. The various local approaches will be part of the information gained from Adaptive Management Areas, and may be applied elsewhere.

- **Comment:** It is unclear how conflicts in Adaptive Management Areas would be resolved if, for example, local communities decide to manage these areas in a manner contrary to the selected alternative, or if they are unable to come to a consensus on how to manage them.

**Response:** The land management agencies have the responsibility and authority for managing the Adaptive Management Areas. Although management of these areas can not be delegated to local communities, these areas are designed to provide opportunities for land management and regulatory agencies, other government entities, nongovernmental organizations, local groups, landowners, communities, and citizens to work together to develop innovative management approaches. In some instances learning to work together may be as important as learning about natural resource management. The management of the Adaptive Management Areas will be subject to review and guidance by the Regional Ecosystem Office. Planning and review processes will also involve interagency coordination that will include both the management and regulatory agencies. This process will prevent management actions that would be contrary to the Adaptive Management Area objectives, the area’s emphasis as defined in the SEIS, or objectives of the selected alternative.

- **Comment:** Explain how local involvement in managing Adaptive Management Areas will be encouraged without precluding involvement from all interested groups.

**Response:** The Adaptive Management Areas are intended to provide opportunities for a broad range of agencies, groups, and individual citizens, local groups, and communities to work together to develop innovative management approaches. How these groups work together will vary with local situations and will change as processes are improved through adaptive management.

- **Comment:** Adaptive Management Areas are not suited for areas where there is considerable public controversy or polarization.

**Response:** The Adaptive Management Areas are intended to provide a vehicle for enabling agencies, organizations and the public to learn to work together to achieve objectives. For example, in an area of southwestern Oregon that has been characterized by high controversy and polarization, local citizens, industry and government agencies have progressed toward cooperation and partnerships. The Adaptive Management Areas may provide additional learning experiences.

- **Comment:** The responsibility for Adaptive Management Areas should be given to objective and innovative groups. A team of university foresters from diverse institutions, not local Forest Service supervisors or BLM District managers, would more likely concentrate on long-range management goals and not immediate income interests.

**Response:** The responsibility and authority for management of the Adaptive Management Areas rests with the land management agencies. Each Adaptive Management Area will have an interdisciplinary

technical advisory panel, which will include specialists from outside government agencies, that will provide advice on research, development, and demonstration programs. Initial direction and continuing review will be provided by the Regional Ecosystem Office.

- **Comment:** Include those standards and guidelines that enumerate the requirements or authority of the interdisciplinary technical advisory panels for the Adaptive Management Areas.

**Response:** There will be no specific standards and guidelines for such panels. Concerns about the operation of these advisory panels is not an environmental issue which must be analyzed in this SEIS. The requirements of such panels and technical reviews will be developed under the guidance and direction of the Regional Interagency Executive Committee after the Record of Decision for this SEIS has been signed.

- **Comment:** The technical advisory panel for the Adaptive Management Areas described in Appendix B should be replaced by a mechanism that links public and other government agencies to facilitate participation in development and research.

**Response:** In addition to the technical advisory panels designed specifically for the Adaptive Management Areas, cooperation, coordination and partnerships are encouraged in the implementation of the selected alternative. Linking public and other government agencies to facilitate participation in development and research would be permitted under all alternatives.

- **Comment:** There is no specific or detailed information showing how an Adaptive Management Area would actually be managed. Specific standards and guidelines for Adaptive Management Areas should be added to the SEIS.

**Response:** The specific emphasis of each Adaptive Management Area is described in Appendix B3 of this SEIS. However, the guiding principle is to allow flexibility in forest management approaches to encourage innovation in achieving the goals. Localized, distinct approaches to achieving the objectives of the selected alternative may be pursued. Specific and detailed information on the actual management will become available as the agencies complete the plans for the individual Adaptive Management Areas.

- **Comment:** Short-term projects in the Adaptive Management Areas must begin as soon as possible. Short-term projects should be flexible and adaptable to allow trial and error without incurring lasting long-term consequences.

**Response:** The projects in Adaptive Management Areas are not expected to be delayed by requirements for comprehensive plans or consensus documents beyond those required to meet legal requirements, such as NEPA. The process of adaptive management, which is used both within and outside Adaptive Management Areas, is designed to allow management flexibility to adapt to new information gathered through monitoring, research, and experience.

- **Comment:** Social and institutional experimentation are included as part of the reason for Adaptive Management Areas. The language in Appendix B of the Draft SEIS appears to anticipate new relationships between local communities and federal land managers as well as interagency plans which both expedite planning and set up new internal working mechanisms for the agencies. This entire discussion is vague and should be more specific.

**Response:** Adaptive Management Areas are designed to provide opportunities for local innovation by managers, government entities, groups and citizens. With respect to that design, it would be

inappropriate to prescribe a single method of accomplishing the new relationships or establishing the working mechanisms.

- **Comment:** The discussion of Adaptive Management Areas in Appendix B of the Draft SEIS states that new agency approaches to planning "should" receive initial direction and review from a regional interagency group. This should be clarified as a requirement, and further detail should be added about the review mechanism.

**Response:** The requirements and details of initial direction and review will be further developed, after the Record of Decision for this SEIS has been signed, under the guidance and direction of the Regional Ecosystem Office.

- **Comment:** Clarify the objectives, constraints, and procedures which will apply to the Adaptive Management Areas. It would be helpful to show a list outlining the relationship of project development to the Regional Ecosystem Office, public or other agency involvement, Adaptive Management Area planning, and watershed analysis.

**Response:** The discussion of Adaptive Management Area guidelines has been clarified in the Appendix B3 in the Final SEIS. These relationships will continue to be defined and clarified during the implementation of the selected alternative.

- **Comment:** There are no provisions in the regulations that would allow the Forest Service or BLM to require local processing of forest products harvested from Adaptive Management Areas.

**Response:** Local processing of forest products from Adaptive Management Areas was encouraged in the FEMAT Report. Implementation of this recommendation would require congressional action and is outside the scope of this SEIS.

- **Comment:** To facilitate local processing of wood products from Adaptive Management Areas, it will be necessary to provide timely delivery of specific log types to meet the needs of local entrepreneurial efforts.

**Response:** The types of forest products produced in the Adaptive Management Areas may vary with local conditions and will be considered in the Adaptive Management Area plans. Planning for the Adaptive Management Areas will consider both local and nonlocal interests. In some cases, innovative management approaches may be able to accommodate a local need for specialized products.

- **Comment:** The management emphasis of many of Adaptive Management Areas is inconsistent with the statement in the FEMAT Report on page II-47 that "probable sale calculations are based on the assumption that harvest levels would not be reduced significantly in these Adaptive Management Areas compared to the Matrix in which they exist."

**Response:** The harvest level in the Adaptive Management Areas was calculated based on the underlying land use allocation mix (i.e., matrix, Late-Successional Reserve, Riparian Reserve).

- **Comment:** The management emphasis of some Adaptive Management Areas will conflict with other resource objectives. In some instances, these conflicts would preclude timber harvest in the Adaptive Management Areas.

**Response:** The Adaptive Management Areas were collectively designed to provide a range of biological conditions and natural resource objectives. The Adaptive Management Area plans will need to consider

all the resource objectives that are pertinent in the context of existing laws, ownership patterns, and local social and cultural conditions. Exceptions to the standards and guidelines needed to meet the goals associated with the Adaptive Management Areas will be the responsibility of the Regional Ecosystem Office.

- **Comment:** Explain how watershed management will occur in the Adaptive Management Areas.

**Response:** The Aquatic Conservation Strategy objectives along with the guidelines for Key Watersheds, watershed analysis, and restoration apply within the Adaptive Management Areas.

- **Comment:** The planning process for Adaptive Management Areas should include early participation from the National Marine Fisheries Service and U.S. Fish and Wildlife Service.

**Response:** Innovative approaches to foster cooperation and coordination among federal agencies is encouraged in the management of Adaptive Management Areas.

- **Comment:** The question of whether local communities can support Adaptive Management Areas from a cultural or philosophical perspective should be addressed.

**Response:** This concern will be addressed in the course of managing the Adaptive Management Areas. These areas will provide an opportunity for local communities to learn about the political capacity, economic resources, and technical expertise needed to participate in management. The resolution of these concerns will require unique approaches for each community.

- **Comment:** Federal funding appropriations for training and education for Adaptive Management Areas should stipulate the involvement of local experiential knowledge.

**Response:** Federal appropriations are subject to Congressional authority and therefore are beyond the scope of this SEIS. However, innovative partnerships may be formed among agencies, educational institutions, and local citizens for the purposes of providing education and training in planning, managing, or implementing projects in Adaptive Management Areas.

- **Comment:** Restrict the trials and experiments associated with Adaptive Management Areas to stands other than old growth. There should be significantly fewer Adaptive Management Areas because of their experimental nature.

**Response:** The Adaptive Management Areas were designed to provide opportunities to innovate and experiment in management strategies, and to provide public participation in the context of a diversity of biological challenges, intermixed land ownerships, and natural resource objectives. Significantly reducing the number of Adaptive Management Areas or restricting management to younger stands would not provide the range of situations needed to derive experience and applicable lessons.

- **Comment:** The standards for managing the Adaptive Management Areas should not be lowered.

**Response:** The standards for managing the Adaptive Management Areas have not been lowered. All applicable laws and regulations apply and the overall objectives of the Adaptive Management Areas will be consistent with the objectives approved in the Record of Decision for this SEIS. Innovative approaches may be used to meet these objectives.

- **Comment:** Greater risk to the ecosystem should not be acceptable in the Adaptive Management Areas.

**Response:** The risk associated with the innovation, trials, and experiments in the Adaptive Management Areas was assessed in relationship to the overall objectives of Alternative 9. The underlying legal and regulatory constraints, along with the defined management emphasis of each Adaptive Management Area, create a situation in which the overall objectives of Alternative 9 would still be met.

- **Comment:** Clarify what activities are restricted in the Snoqualmie Pass Adaptive Management Area pending the completion of a comprehensive plan.

**Response:** Unlike other Adaptive Management Areas, project-level work will be restricted in the Snoqualmie Pass Adaptive Management Area prior to completion of an Adaptive Management Area plan. This has been clarified in Appendix B3 of this Final SEIS.

## REVIEW

- **Comment:** The oversight teams should include private citizens and organizations. There should be a mandate for open ( i.e., public) meetings.

**Response:** Review and guidance will be provided by the Regional Ecosystem Office, whose membership will not include private citizens. The Regional Ecosystem Office decisions, however, will be public information. The actions under all alternatives will meet the NEPA requirements that require agencies to involve the public in planning efforts.

- **Comment:** Set up independent review (outside the Forest Service and Bureau of Land Management) to evaluate, approve, and in emergencies, direct changes in forest practices to ensure sure that the conservation aspects of the selected alternative are implemented as intended.

**Response:** An Interagency Steering Committee has been established to oversee the prompt, coordinated and effective implementation of the selected alternative. This committee will be chaired by the Director of the White House Office on Environmental Policy or the Director's designee. In addition, a White House-appointed representative to the committee will serve as interagency coordinator to review and provide guidance on regional activities.

- **Comment:** Guidance regarding the review process should be provided.

**Response:** The Regional Ecosystem Office will provide review and guidance for management actions. That office will be responsible for evaluating major modifications arising from the adaptive management process. The Regional Ecosystem Office will report to the Regional Interagency Executive Committee and will be responsible for development, evaluation, and resolution of consistency and implementation issues. More specific guidance will be developed after the Record of Decision for this SEIS has been signed.

- **Comment:** Review committees with go/no-go authority need to be centralized at a single level.

**Response:** The review process will be the responsibility of the Regional Ecosystem Office and will be centralized at that level.

- **Comment:** Review of implementation of the selected alternative should be decentralized to the province level to facilitate timely reviews and interpretations that meet the needs of the local ecosystems.

**Response:** Providing review and guidance will be the responsibility of the Regional Ecosystem Office. This office may develop criteria that would exempt some activities from review, or define a different level or type of review as necessary. The details concerning these functions will be developed after the Record of Decision for this SEIS has been signed, and under the guidance and direction of the Regional Interagency Executive Committee.

- **Comment:** The standards and guidelines for silviculture in the Late-Successional Reserves are weakened by language in Appendix B of the Draft SEIS such as, "there will be exceptions to these guidelines.... " (page B-70); "... management that goes beyond these guidelines may be considered." (page B-72); "some salvage that does not meet the preceding guidelines will be allowed .... " (page B-73); and "some deviation from these general guidelines may be allowed to provide reasonable access to salvage sites and feasible logging operations" (p. B-74). Explain who has the authority to approve exceptions to the standards and guidelines.

**Response:** All silvicultural activities in Late-Successional Reserves are subject to review and guidance by the Regional Ecosystem Office to assure that exceptions or modifications to the standards and guidelines are appropriate and that the objectives are being met. The Regional Ecosystem Office may develop criteria that would exempt some activities from review. The Regional Ecosystem Office has the authority to make recommendations regarding exceptions to the standards and guidelines to the Regional Interagency Executive Committee, which has the ultimate responsibility for reviewing exceptions. Actions in the Late-Successional Reserves will be subject to NEPA regulations.

- **Comment:** Interdisciplinary Teams should provide oversight throughout the implementation and monitoring phases of a project, rather than being disbanded after a decision has been signed.

**Response:** Local review of projects will be in accordance with local agency plans and procedures which involve interdisciplinary teams. Review of projects on a regional basis will be provided by the Regional Ecosystem Office, which may develop criteria that would exempt some activities from review, or define a different level or type of review as necessary.

- **Comment:** The provision for an interagency oversight team has the potential to dramatically slow down desirable management activities. Any such team should develop general guidelines and provide input to individual National Forests and BLM Districts. The oversight team should not review or approve individual projects except as case examples.

**Response:** Providing review and guidance will be the responsibility of the Regional Ecosystem Office. This office may develop criteria that would exempt some activities from review, or define a different level or type of review as necessary. The details concerning these functions will be developed after the Record of Decision for this SEIS has been signed, and under the guidance and direction of the Regional Interagency Executive Committee.

- **Comment:** The SEIS ignores input from the local Forest Service and BLM administrative offices by calling for the development of complex teams, committees, and oversight procedures.

**Response:** The project-level implementation and decision making will be done by local units in the context of existing laws, regulations, and standards and guidelines. The interagency groups proposed in this SEIS will use local input and will avoid fragmentation and inconsistency in planning and decision making.

- **Comment:** Oversight should be established at no greater levels than individual physiographic provinces to keep the workload of the agencies at a manageable level to increase their ability to respond to local issues.



**Response:** Review at the regional level is the responsibility of the Regional Ecosystem Office. Regional-level review is necessary to resolve consistency issues throughout the planning area, and to eliminate duplicate review efforts. The Regional Ecosystem Office may define a different level or type of review as necessary to address local issues and workload requirements.

## STANDARDS AND GUIDELINES

- **Comment:** There should be no logging without clear guidelines.

**Response:** The standards and guidelines for each alternative set forth in this SEIS supplement extensive existing direction in Forest and District Plans, regulations, and policies. They provide sufficiently clear guidelines for logging. The Regional Ecosystem Office will further clarify concerns about unique local situations.

- **Comment:** Generic standards and guidelines are overly prescriptive for local conditions.

**Response:** The application of the adaptive management process will allow the flexibility needed to address local conditions. The Regional Ecosystem Office will be responsible for evaluating refinements or modifications arising from the adaptive management process, and resolving consistency and implementation issues. Changes in standards and guidelines resulting from the adaptive management process will be subject to the NEPA process.

- **Comment:** Standards and guidelines are scattered throughout the SEIS chapters, appendices and the FEMAT Report. They should be put in a single section.

**Response:** The standards and guidelines for the alternatives in this SEIS have been incorporated into Chapter 2 and are specifically addressed in Appendix B of this Final SEIS. In addition, a document will be published at the time of the Record of Decision that will include the standards and guidelines of the selected alternative.

- **Comment:** Possible mitigation measures should be part of the standards and guidelines.

**Response:** Mitigation measures are modifications of actions that help avoid, minimize, rectify, reduce or compensate impacts. Possible mitigation measures are not part of required standards and guidelines, and their use will depend on site-specific analysis. The description of environmental consequences in Chapter 3&4 assumed that the proposed actions under the various alternatives would take place only in accordance with the prescribed standards and guidelines, and without any of the suggested possible mitigation measures.

- **Comment:** A description of ecosystem management principles should be provided for the benefit of all forest landowners and the general public.

**Response:** Appendix B2 of this Final SEIS contains a discussion of the ecological principles for management of late-successional forests.

- **Comment:** The alternatives should provide criteria or statements of desired future condition with measurable goals. They should also allow for flexibility in achieving those objectives rather than mandating highly prescriptive and complex management direction.

**Response:** All alternatives have the same general goal: to maintain late-successional species and ecosystems on federal lands while providing for social and economic needs. Standards and guidelines

provide rules for management under the various alternatives. The rationale and objectives for management of Late-Successional Reserves and matrix lands, as well as the Aquatic Conservation Strategy objectives, are specifically addressed in Appendix B of this Final SEIS.

- **Comment:** There should be a stimulus to private landowners to comply with the Aquatic Conservation Strategy either through laws, economic inducement such as tax incentives, or professional assistance.

**Response:** Management direction for private landowners is beyond the scope of this SEIS.

- **Comment:** Explain what kind of site-specific flexibility is included in Alternative 9 to allow local analysis of needs.

**Response:** Review and guidance of situations that require site-specific flexibility will be the responsibility of the Regional Ecosystem Office. This office may develop criteria that would exempt some activities from review, or define a different level of review as necessary.

- **Comment:** Clarify whether existing uses such as fuel breaks, reservoirs, and existing roads and trails will be maintained in a municipal watershed that has been designated a Late-Successional Reserve under Alternative 9. Explain how potential conflicts between municipal watershed management needs and Late-Successional Reserve standards and guidelines would be resolved.

**Response:** Existing developments in Late-Successional Reserves can remain. In Late-Successional Reserves, a specific fire management plan will be prepared prior to any habitat manipulation activities. That plan, as an element of watershed analysis, province-level planning, or a Late-Successional Reserve plan, would specify how hazard reduction and other prescribed fire applications would meet the objectives of the Late-Successional Reserve. Existing management plans may provide much of the needed information. Until the fire management plan is approved, proposed activities will be subject to review by the Regional Ecosystem Office. The Regional Ecosystem Office may develop criteria that would exempt some activities from review, or define a different level or type of review as necessary. In these reserves, watershed-level analysis will provide guidance on how much coarse woody debris should be retained when applying prescribed fire.

- **Comment:** Address whether trail construction will be allowed in Late-Successional Reserves.

**Response:** New development proposals that address public needs or provide significant public benefits will be reviewed on a case-by-case basis and may be approved when adverse effects on Late-Successional Reserves can be minimized and mitigated.

- **Comment:** The standards and guidelines for Late-Successional Reserves allow for thinning of stands up to 80 years old for the purpose of creation or maintenance of late-successional forest conditions. This does not recognize that the landscape historically included some single-storied stands with open understories along with the multistoried old-growth stands.

**Response:** This standard and guideline is not meant to eliminate all single-storied stands. It recognizes that through past forest management, a significant amount of the landscape was converted to this forest type.

- **Comment:** The SEIS is not clear about whether thinning in the Late-Successional Reserves should be neutral or beneficial, or whether thinning should be beneficial to the creation and maintenance of late-successional forest conditions.

**Response:** The purpose of thinning is to benefit the creation and maintenance of late-successional forest conditions. This has been clarified in the Final SEIS.

- **Comment:** Describe the role of the National Park Service in the development of Alternative 9. It appears that the land allocations and standards and guidelines conflict with the management of Crater Lake National Park and Oregon Caves National Monument.

**Response:** The National Park Service, along with the Fish and Wildlife Service, National Marine Fisheries Service, Department of Commerce, and the Environmental Protection Agency, was a cooperating agency in the development of this SEIS. Lead agencies were the Forest Service and Bureau of Land Management. The management of the National Parks were considered in the design of the alternatives. The Oregon Caves National Monument is surrounded by land designated as Late-Successional Reserve. Adjacent to Crater Lake National Park's north boundary is a narrow strip of land designated as matrix which essentially follows and incorporates Highway 138 and 230. Adjacent to the west boundary are intermixed Administratively Withdrawn Areas and matrix, adjacent to the south boundary is a small amount of matrix, and adjacent to the east boundary are intermixed matrix, Late-Successional Reserve and private lands. The standards and guidelines of underlying Forest and District Plans will continue to apply where they provide greater benefits to species associated with late-successional forests. Current Forest Plan standards and guidelines that recognize the need for specific management direction for lands adjacent to National Parks will continue to apply. Participation by the National Park Service in the Regional Interagency Executive Committee will provide for necessary coordination of management of these lands during implementation of the selected alternative.

- **Comment:** Lands administered by the BLM should be managed under the same requirements as lands managed by the Forest Service. Modifications to account for the checkerboard ownership and heavy fragmentation should not lower the standard of protection for the ecosystem.

**Response:** The only variation in the proposed management of lands administered by the BLM in Oregon, when compared to those managed by the Forest Service, occurs under Alternatives 7 and 9. Under Alternative 7, management would consist of direction in current plans and draft plan preferred alternatives as defined in the SEIS. Under Alternative 9, management direction between agencies varies only in the matrix. Management of the BLM matrix is designed to fit the checkerboard and fragmented land pattern characteristic of these lands. Although the management strategies vary, the overall objectives are the same. The protection and management of the BLM matrix is at least comparable to that provided for the Forest Service matrix and is identical for all other land use allocation categories.

- **Comment:** The standards and guidelines will take precedence over current plans and draft plan preferred alternatives where they provide greater benefits to late-successional and old-growth related species. This hierarchy allows logging and the entering of lands administratively protected by Forest and District Plans.

**Response:** In addition to providing greater benefits to late-successional and old-growth related species, implementation of the standards and guidelines in Administratively Withdrawn Areas will need to be consistent with the intent of the withdrawal. This has been clarified in this Final SEIS.

- **Comment:** Simple, but specific standard and guidelines should be developed to protect unstable uplands in Key Watersheds.

**Response:** Unstable areas will be identified and analyzed through a combination of inventory and watershed analysis. The standards and guidelines for protecting unstable or potentially unstable areas are described in Appendix B6, Aquatic Conservation Strategy.

- **Comment:** Develop and implement standards and guidelines for the matrix that will result in increased connectivity and ecosystem health.

**Response:** The alternatives display a range of strategies that provide varying levels of protection for late-successional and old-growth forests, and this array is available for selection by the decision makers. The level of protection that is implemented will be established by the Record of Decision for this SEIS.

- **Comment:** The Grants Pass Line described in Chapter 2 of the Draft SEIS should apply to the BLM Medford District only.

**Response:** This has been clarified in the Final SEIS.

- **Comment:** Within the Coos Bay and Medford Districts of the BLM, the Connectivity/Diversity Blocks are not at a 3 to 5-mile spacing as described in Chapter 2 of the Draft SEIS.

**Response:** The 3 to 5-mile spacing of the Connectivity/Diversity Blocks in the Draft SEIS was meant to approximate how these areas occur on the landscape. The description of their spacing has been clarified in the Final SEIS.

## Implementation

- **Comment:** Identify when the proposals in the SEIS will be implemented.

**Response:** Implementation may begin after the Record of Decision for this SEIS is signed. A detailed schedule of implementation is not possible at this time and will vary throughout the planning area.

- **Comment:** Develop a guidance document for the Final SEIS that identifies implementation requirements and standards and guidelines in a complete yet concise manner.

**Response:** A document for this purpose will be published at approximately the same time as the Record of Decision for this SEIS.

- **Comment:** Existing administrative structure is not conducive to ecosystem management as pointed out in the Draft SEIS, Appendix E. Personnel are not trained in the disciplines and practices required of ecosystem management, and in many cases personnel may resist changes.

**Response:** A framework will be established for cooperative planning, improved decision making, and coordinated implementation of the forest ecosystem management of this SEIS. This has been initiated through a Memorandum of Understanding involving the White House Office on Environmental Policy; the Departments of the Interior, Agriculture and Commerce; and the Environmental Protection Agency (see Appendix E, Implementation Structure). In addition, the agencies may identify the need for a different mix of skills within their organizations to implement the selected alternative. This may require a combination of training and personnel actions.

- **Comment:** The implementation strategy and adaptive management process need to be more explicit and concrete. Discuss the future agency structure and identify which agencies and/or offices within those agencies will be responsible for the various processes. Address the staffing of the various committees and panels.

**Response:** The discussion of interagency coordination in the implementation section of Chapter 2 of this SEIS has been expanded to include a description of interagency groups and their responsibilities. However, details on staffing and operations will continue to be refined as the selected alternative is

implemented. Concerns about the operation of these committees and panels is not an environmental issue that must be analyzed in this SEIS.

- **Comment:** Discuss how and when province-level plans will replace Forest and District level plans. Clarify whether province plans will cover the multitude of issues covered by Forest and District plans (e.g., recreation, mining, and grazing) or whether forest plans will be discontinued.

**Response:** The transition to province plans will require changes in agency regulations. Current Forest and District Plans may be modified to accommodate province level analysis in the interim. Details of the transition will be completed after the Record of Decision for this SEIS has been signed

- **Comment:** The role of American Indian tribes on province planning teams should be given more emphasis. In some watersheds a tribe will be among the largest landowners.

**Response:** Composition of province teams and the roles of individual team members may vary depending on the local circumstances, including land ownership patterns and the resources involved.

- **Comment:** Clarify whether all the standards and guidelines for the Riparian Management Areas in the preferred alternatives of Draft Forest Plans in northern California will apply to the Riparian Reserves, or only to those that benefit late-successional forest associated species.

**Response:** The standards and guidelines for Riparian Reserves that are established in the Record of Decision for this SEIS will apply throughout the planning area. The standards and guidelines of current plans and draft plan preferred alternatives will apply where they are more beneficial to late-successional forest associated species

- **Comment:** The Federal Energy Regulatory Commission (FERC) should be involved in the process to ensure that implementation of the preferred alternative will comply with the Federal Power Act.

**Response:** FERC and other regulatory agencies will be involved as appropriate during the implementation of the selected alternative.

- **Comment:** The President should use his influence to direct federal agencies to implement the selected alternative as policy.

**Response:** An Interagency Steering Committee has been established to oversee the prompt, coordinated and effective implementation of the selected alternative. This committee will be chaired by the Director of the White House Office on Environmental Policy or the Director's designee. In addition, a White House appointed representative to the committee will serve as interagency coordinator to review and provide guidance of regional activities.

- **Comment:** Because of the uncertainty of the proposed practices, the SEIS should include an alternative that establishes a 2-year study period with interim guidelines. This would preserve all options while sufficient information is gathered for better decision making. The Forest Service and BLM planning processes provide for a regular 10-year review and amendment process which could incorporate this new information.

**Response:** The flexibility and safeguards created by the monitoring system and adaptive management process precludes the need for a 2-year or extended study period with interim guidelines. The implementation, effectiveness, and validity of the standards and guidelines will be monitored. The

adaptive management process of planning, monitoring, researching, evaluating and adjusting will help managers determine how well their actions meet the objectives, and what steps to take to modify activities to increase success.

- **Comment:** Clarify to what extent the preferred alternative is intended to adopt the recommendations set forth in the FEMAT Report's Chapter VIII, Implementation and Adaptive Management.

**Response:** The Final SEIS sets forth the implementation and adaptive management strategies for all the alternatives (see Chapter 2, Implementation and Appendix E, Implementation Structure).

- **Comment:** Additional information is needed about implementation of province planning, watershed analysis, site-specific projects, monitoring, and coordination with nonfederal landowners. The environmental benefits derived from this management direction depend on the successful implementation of these activities.

**Response:** Additional information concerning these topics has been added to this Final SEIS, however these processes and efforts will continue to be developed as the selected alternative is implemented.

- **Comment:** More specific information should be presented on implementation, including a summary of major steps or tasks, lead agency or group roles, budget, and timelines.

**Response:** More specific information on implementation has been added to the Final SEIS (see Chapter 2, Implementation, and Appendix E, Implementation Structure), and additional detail will be developed as the selected alternative is implemented.

- **Comment:** Alternative 9 will hinder cooperative efforts among existing groups, such as the bioregional groups in California.

**Response:** The cooperation and coordination that is encouraged under Alternative 9 can build on, or operate in addition to, existing relationships.

- **Comment:** Participation of the regulatory agencies, such as the Fish and Wildlife Service and the National Marine Fisheries Service, in Forest Service and BLM planning processes (described in Chapter 2 and Appendix E of the SEIS) may create a conflict of interest later when regulators must review the land and resource management plans.

**Response:** The participation of regulatory agencies is intended to provide consistency to the agencies' management plans with respect to the requirements of the Endangered Species Act, and to also help streamline the process. Cooperation and coordination among federal agencies is encouraged. This is not intended to substitute for, or alter, the authority and responsibility of the individual agencies.

- **Comment:** The interagency cooperation and coordination structure involving various teams, committees, and offices has the potential to create bottlenecks, gridlock, and other problems during implementation.

**Response:** Greater coordination and cooperation among various groups and agencies will eliminate many of the procedural and implementation problems and inefficiencies of the past. Through the process of adaptive management described in this SEIS, as problems of implementation are identified (e.g., possible distortions of the decision-making process) adjustments will be made to correct them.

- **Comment:** The SEIS should propose substantive measures to ensure that past problems with forest management that were caused by the ineffective institutional structure and budget process will not reoccur.

**Response:** The basis of problems and challenges with forest management are complex and are not attributable solely to one or two causes. The system of interagency review and adaptive management should improve the ability to identify and respond to problems as the selected alternative is implemented.

- **Comment:** The alternatives call for lengthy analysis which will effectively halt activities. In particular, watershed analysis as described in the Draft SEIS will require a great amount of time and resources.

**Response:** Much of the analyses, including watershed analysis, will use existing information and analyses within the agencies as a foundation. Additional information and analysis that is required will create a high quality product and may avoid project delays that have occurred in the past.

- **Comment:** Clarify whether projects such as trail construction, which have completed environmental assessments, will be delayed by the implementation of the preferred alternative.

**Response:** All activities will need to comply with the standards and guidelines and land allocations of the selected alternative. Projects will need to be evaluated to determine compliance with the selected alternative. While this may result in modifications or cancellations of some projects, those that are already in compliance can proceed expeditiously.

- **Comment:** Explain how the National Parks would be involved in the implementation of the selected alternative.

**Response:** When the alternatives were developed, it was assumed that the National Park system would continue to be managed according to current direction. During implementation of the selected alternative, management of the National Parks is not expected to change. The National Park Service will participate in the Regional Interagency Executive Committee which will be involved in implementing the selected alternative.

- **Comment:** Administrative boundaries within watersheds should be dissolved.

**Response:** Changing certain administrative boundaries would require congressional action and is beyond the scope of this SEIS. Analysis will be conducted on a watershed basis and planning will be done on a physiographic province or river basin basis; these efforts will cross administrative boundaries. This province approach will require an interagency effort and will involve coordination and cooperation with other nonfederal landowners such as tribes, states, industry and private citizens.

- **Comment:** If Geographic Information System (GIS) technology and data is perceived as being withheld or controlled by the Forest Service and BLM, the social objectives of the Adaptive Management Areas and overall strategy will not be served.

**Response:** Although the GIS hardware is controlled by the agencies, GIS data is generally available to the public.

- **Comment:** The unscheduled harvest in the Late-Successional Reserves should receive sufficient public disclosure to allow a full understanding of the scope and impacts.

**Response:** Any proposals for unscheduled harvest (thinning and salvage only) in the Late-Successional Reserves will be subject to public disclosure and participation under the National Environmental Policy Act.

- **Comment:** More consideration should be given to supporting the use of innovative land-based and aerial logging systems which only minimally impact the surface.

**Response:** The SEIS prescribes standards and guidelines to achieve objectives. The complex, site-specific implementation of the standards and guidelines will vary as a result of watershed analysis and project planning. While innovative logging systems may be used as a result of this analysis and planning to meet specific objectives and conditions, prescribing their use at the programmatic level of this SEIS would be inappropriate.

- **Comment:** We recognize that specific watershed restoration projects and budgets must be developed based on watershed analyses. However, the Final SEIS should provide the overall context for developing these projects and budgets.

**Response:** The overall context for watershed restoration projects is described in the Aquatic Conservation Strategy in Appendix B6 of this Final SEIS. The context for developing restoration projects includes the value and sensitivity of downstream uses, transportation needs, social expectations, "treatability" of the problems, costs, and other factors. The most important components of a restoration program are control and prevention of road-related runoff and sediment production, restoration of the condition of the riparian vegetation, and restoration of in-stream habitat complexity. The Regional Ecosystem Office will provide guidance and direction for watershed restoration projects.

- **Comment:** To implement and oversee the alternative selected from this SEIS, establish a regional organization to serve under an appointee of the U.S. Supreme Court. There would be an executive group under the authority of this person similar to the Regional Interagency Executive Committee. The group would include representatives of state governments and it would have all the powers of the current federal and state agencies plus the authority to overrule any agency powers.

**Response:** The responsibility for managing the public lands discussed in this SEIS rests with the Department of the Interior through the BLM, and with the Department of Agriculture through the Forest Service. To substitute or alter the responsibilities and authority of the Departments of Interior and Agriculture would require congressional action, which is beyond the scope of this SEIS.

- **Comment:** Require local processing of all resources removed from the forest.

**Response:** To implement this recommendation would require congressional action and is outside the scope of this SEIS.

- **Comment:** The Final SEIS should provide a more specific framework for incorporation of nonfederal land-management activities during implementation of the selected alternative. There should be an approach or strategy for promoting and coordinating drainage-wide conservation and restoration programs with the participation of nonfederal landowners.

**Response:** While cooperation and coordination among landowners is encouraged, the management of nonfederal lands is beyond the scope of this SEIS. The impacts described in Chapter 3&4 are based on the assumption that private forest lands will be managed intensively on a short-rotation, even-age basis, and to meet applicable state and federal law.



- **Comment:** Agencies should exchange or purchase those lands that create an intermingled or checkerboard ownership pattern. These lands complicate management of the resources and greatly increase problems in achieving objectives.

**Response:** The development of the alternatives and their assessment of impacts assumed that the present land ownership pattern would remain basically unchanged. Some land tenure adjustments are permitted for various objectives, through purchase or exchange, under current plans and draft plan preferred alternatives. Substantial land exchange or purchase programs are outside the scope of this SEIS.

- **Comment:** Clarify the effect on the success of implementing the selected alternative in cases where private landowners decide not to cooperate in developing an overall plan in watersheds or Adaptive Management Areas.

**Response:** The success of implementing the selected alternative does not depend on cooperation of private landowners.

- **Comment:** Landowners should be compensated if the actions proposed in the SEIS result in a reduction in the value of private land or affect the profit potential of existing businesses.

**Response:** Although private land values could be affected, positively or negatively, by actions on federal lands, compensation of landowners would require congressional authority and is outside the scope of this SEIS.

- **Comment:** The local authorities should only advise. The National Forests and BLM Districts should be managed with the nation in mind.

**Response:** The selected alternative will be implemented in accordance with the National Environmental Policy Act, which requires public involvement. In addition, coordination, cooperation and involvement of various local groups, citizens, and government agencies is encouraged under all alternatives. The land management agencies have the ultimate responsibility for management of the public forests.

- **Comment:** The Draft SEIS encourages local partnerships but does not give them authority to make decisions. Therefore, they will not be true partnerships.

**Response:** Although local partnerships are encouraged, the responsibility and authority for managing the public lands lie with the land management agencies.

- **Comment:** The proposed partnerships are experimental in nature and should be limited to noncontroversial areas in the matrix.

**Response:** The proposed cooperation, coordination and partnerships will operate in the context of existing laws and regulations, and standards and guidelines as selected in the Record of Decision for this SEIS. The ultimate responsibility and authority for managing the public lands will remain with the land management agencies. The institutional and social lessons learned from these relationships will be applied through the adaptive management process to facilitate and improve the management of public lands. The learning process will be most valuable if the relationships occur in a variety of situations, circumstances and conditions.

- **Comment:** Explore ways to help timber-dependent communities adjust to the changes that are taking place. Consider involving local people who have a unique understanding of the nontimber resources,

such as salal, mushrooms, flowers, berries, wildlife, and fish in their area. These resources might be usable or harvestable in a comparatively harmless yet profitable way.

**Response:** Cooperation, coordination and partnerships with citizens, groups, and government entities are encouraged under all alternatives. In addition, under Alternative 9, the Adaptive Management Areas have specific social objectives. These areas will provide opportunities for land management and regulatory agencies, other government entities, nongovernmental organizations, local groups, landowners, communities, and citizens to work together to develop innovative management approaches.

- **Comment:** Foster collaboration between local communities and researchers to identify opportunities for change. This approach would bring local experience together with more technical knowledge resulting in a very productive mix.

**Response:** Cooperation, coordination, and partnerships are encouraged under all alternatives. In addition, in the Adaptive Management Areas under Alternative 9, innovation in community involvement is encouraged, including approaches to implementation of initial management strategies and perhaps over the longer term, development of new forest policies. Each Adaptive Management Area will have an interdisciplinary technical advisory panel that will include specialists from outside government agencies to provide advice on research, development, and demonstration programs.

## MONITORING AND RESEARCH

- **Comment:** The SEIS should include an expanded discussion of monitoring to address monitoring strategy, protocols, and minimum biological, chemical and physical measurements that will be addressed in all aspects of implementation.

**Response:** The monitoring discussion in the SEIS has been expanded to include such a strategy (see Chapter 2, Implementation and Appendix I, Monitoring and Evaluation Plan). Specification of monitoring details such as protocols would not be appropriate at the programmatic level of this SEIS.

- **Comment:** Monitoring must be coordinated throughout the region to be effective.

**Response:** Monitoring will be conducted at multiple levels and scales such as project, land allocation category, watershed, administrative unit, physiographic province or river basin, state, and planning area or regional scale. Monitoring will be coordinated among appropriate agencies and organizations to enhance the efficiency and usefulness of the data and results across a variety of administrative units and provinces.

- **Comment:** There should be citizen monitors that are independent of the federal agencies.

**Response:** Monitoring among agencies will be coordinated by the Regional Ecosystem Office. This interagency office will report to the Regional Interagency Executive Committee. The coordination and review of monitoring on a regional basis will increase consistency and accountability. The land management agencies have the ultimate responsibility for monitoring, which cannot be delegated to private citizens. Cooperative monitoring involving federal agencies and citizens may be part of an Adaptive Management Area plan. Citizen groups may conduct monitoring on their own if they choose. Federal agency monitoring plans, data and results will be available to the public.

- **Comment:** Any thinning or salvage in forests for riparian recovery must be scientifically monitored by objective parties.

**Response:** The implementation, effectiveness, and validity of the standards and guidelines will be monitored. Some of the effectiveness and validation monitoring will be accomplished by formal research. Through the adaptive management process of planning, monitoring, researching, evaluating and adjusting, managers will determine how well their actions meet the objectives and what steps to take to modify activities to increase success. While the involvement and cooperation of the public, state and federal agencies, and groups is encouraged under the alternatives, the ultimate responsibility for management, including monitoring, rests with the land management agencies.

- **Comment:** Explain how the monitoring program will work.

**Response:** The implementation, effectiveness and validity of the standards and guidelines will be monitored. The level and intensity of monitoring will vary depending on the sensitivity of the resource or area, and the scope of the proposed management activity. Existing monitoring programs will be used where appropriate. Specific monitoring protocols and guidelines will be used to revise existing monitoring plans. Some of the effectiveness and validation monitoring will be accomplished with formal research.

- **Comment:** A monitoring appendix should be added to discuss the minimum physical, chemical, and biological monitoring that will be used in all aspects of implementation, especially water quality.

**Response:** Appendix I, Monitoring and Evaluation Plan, has been added to the Final SEIS. In addition, the monitoring discussion has been expanded in Chapter 2. Additional detail will continue to be developed as the selected alternative is implemented.

- **Comment:** Explain how monitoring results will be used to ensure that ecosystem goals and objectives are met. For example, if monitoring shows that sedimentation of spawning gravel is occurring where there are 300-foot wide riparian reserves, a decision to modify other planned riparian reserves or to initiate restoration could be warranted.

**Response:** The adaptive management process of planning, monitoring, researching, evaluating and adjusting will help managers determine how well their actions meet the objectives and what steps to take to modify activities to increase success. Monitoring will be subject to guidance and review by the Regional Ecosystem Office. The implementation, effectiveness, and validity of the standards and guidelines will be monitored. Some of the effectiveness and validation monitoring will be accomplished with research.

- **Comment:** The SEIS should discuss monitoring related to watershed restoration, including monitoring of habitat, physical parameters, water chemistry, biological communities, and road removal. The discussion should also include how experience could improve restoration effectiveness.

**Response:** The monitoring discussion has been expanded in the Final SEIS. Specific monitoring protocols and guidelines will be developed for site-specific restoration projects at the time of their development based on information from watershed analysis. Through the adaptive management process of planning, monitoring, researching, evaluating and adjusting, managers will determine how well their actions meet the objectives and what steps to take to modify activities to increase success.

- **Comment:** Monitoring has been inadequately funded and executed in the past. Resource extraction should be conditional on full implementation of programs such as monitoring. The agencies need to make a stronger commitment to monitoring.

**Response:** The commitment to monitoring will build on existing programs. The Pacific Northwest Regions's Forest Monitoring & Evaluation Guide (USDA FS 1993), states: "All programs and projects should contain appropriate levels of monitoring funds in their costs—or they should not be undertaken." Similar commitments to monitoring were made in the BLM Western Oregon Draft Resource Management Plans and Environmental Impact Statements. For example, the Roseburg District Draft RMP/EIS states: "Timber sale volumes and associated programs will be reduced if annual funding is not sufficient to support the relevant actions assumed in the plan, including mitigation and monitoring. The extent of the reduction will be based on the principle of program balance as envisioned in the plan."

- **Comment:** The inventory upon which monitoring is based should not only be coordinated among federal agencies, but should also include state, private and tribal data bases.

**Response:** Cooperative efforts to create a common data base will be undertaken where possible, and with the coordination of the Regional Ecosystem Office. To require private, state, and tribal organizations to adhere or contribute data to a common data base is beyond the scope of this SEIS.

- **Comment:** Include a general prioritization of research activities and a description of research questions that will be addressed during implementation of the selected alternative. A priority should be given to landscape or watershed-level research.

**Response:** A Research and Monitoring Committee will be established as one of the interagency groups under the Memorandum of Understanding for Forest Ecosystem Management (see Appendix E, Implementation Structure). This committee will be composed of research scientists and managers from a variety of disciplines who will develop a research plan after the Record of Decision for this SEIS has been signed.

- **Comment:** Discuss research projects that are underway, such as the Demonstration of Ecosystem Management Options (DEMO), and whether these will be able to proceed if they require timber harvest that does not meet the standards and guidelines of the selected alternative.

**Response:** The Research and Monitoring Committee will review and evaluate ongoing research and may make recommendations to the Regional Interagency Executive Committee about accommodating research that does not meet the standards and guidelines.

- **Comment:** Additional scientific research on forest management is needed, but not to the extent suggested in the SEIS. An enormous amount of existing research can be used for the purposes described in the SEIS.

**Response:** Part of any research proposal will be a literature search to determine the existing research and knowledge on the subject in question. In addition, coordination by the Research and Monitoring Committee is designed to avoid unnecessary duplication of research projects.

- **Comment:** The Adaptive Management Areas should be located to accommodate research projects.

**Response:** The location of research projects is not limited by the location or boundaries of Adaptive Management Areas. Research may be located in any of the land allocations, pending review by the Regional Interagency Executive Committee which will receive advice and recommendations from the Research and Monitoring Committee.

## Terrestrial Species

The following comments and responses address terrestrial wildlife threatened and endangered species, nonwildlife species, and viability assessments.

### THE NORTHERN SPOTTED OWL

- **Comment:** Appendix B of the Draft SEIS indicates that some or all of the standards and guidelines in the Final Draft Recovery Plan for the Northern Spotted Owl apply to Alternatives 2 through 10. Clarify which standards and guidelines apply to each alternative.

**Response:** The texts of Chapter 2 and Appendix B5 of the Final SEIS have been rewritten to clarify these standards and guidelines.

- **Comment:** Explain the relationship between the preferred alternative and the guidance and recommendations in the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.).

**Response:** The Final Draft Recovery Plan has not received final approval. However, the preferred alternative would provide the federal lands' contribution to spotted owl recovery and also includes as standards and guidelines elements of the Final Draft Spotted Owl Recovery Plan.

- **Comment:** Clarify whether management plans are required for the Designated Conservation Areas (DCAs) identified in the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.).

**Response:** Management plans for DCAs are not required because the Final Draft Recovery Plan has not been signed and implemented. Late-Successional Reserves delineated in the SEIS will become the focal points for spotted owl recovery planning. This issue has been clarified in the Final SEIS. Management plans are required for large Late-Successional Reserves or groups of small Late-Successional Reserves before habitat manipulation can occur.

- **Comment:** The Draft SEIS should use the demographic data collected on the northern spotted owl during the last 2 years.

**Response:** Updated demographic data have been considered in the preparation of the Final SEIS; the conclusions and interpretations of those data are presented in Chapter 3&4 and in Appendix J. Future demographic research work will be considered through the adaptive management process.

- **Comment:** Based on band recovery data from northern California, there is a false assumption that the maximum dispersal distance of northern spotted owls is 12 miles.

**Response:** Spotted owl research has documented dispersal over distances greater than 12 miles. However, the dispersal distance for spotted owls was not the sole consideration taken into account in spacing reserves in the development of the alternatives for this SEIS, largely because the alternatives focused on broader ecosystem issues and were not limited to spotted owl management.

- **Comment:** The number of spotted owl pairs in California is much higher than historic data indicates.

**Response:** As a result of surveys conducted for northern spotted owls on private lands in California, many new activity centers have been located. These have been added to the State of California's data base. It should be noted that the northern spotted owl was listed as threatened primarily due to declining habitat conditions. Therefore, habitat protection is the focus of recovery planning for the species.

- **Comment:** The alternatives considered do not utilize new findings on northern spotted owls and their habitat, but rather rely on outdated management theories.

**Response:** Development of the alternatives relied heavily on findings in the Draft and Final Draft Recovery Plans for the Northern Spotted Owl (USDI 1992, USDI unpub.) which represented the best science on this subject at that time. New information in the scientific literature and recent owl demography data have been analyzed and included in Chapter 3&4 and in Appendix J, Technical Information (uncirculated).

- **Comment:** The alternatives establish vast reserves which are not necessary to protect wildlife species. For example, recent data from the McKenzie Resource Area of the Eugene BLM District indicates that northern spotted owls reproduce well in young, unmanaged stands.

**Response:** Late-Successional Reserves are not designed to provide only for northern spotted owls, but also for the numerous species of birds, mammals, fish, fungi, mosses, vascular plants, lichens, arthropods, mollusks, etc., that are associated with late-successional forests. While there is data suggesting that northern spotted owls in some locations may be able to reproduce in some types of younger, managed forests, these forests are not known to support the variety of other species that occur in late-successional forests.

- **Comment:** The SEIS alternatives do not take into account the variable response of the northern spotted owl to the environment they inhabit, i.e., to the different climate, prey, and forest management practices throughout the owl's range.

**Response:** Differences in spotted owl ecology and habitat requirements among the physiographic provinces were accounted for in the various standards and guidelines for several of the alternatives. For example, in some of the alternatives, management direction for drier habitat types includes fuels management and timber-stocking controls, where appropriate, to reduce wildfire hazard and improve forest health in Late-Successional Reserves.

- **Comment:** Alternative 9 should protect the Cottage Grove to Drain (Oregon) habitat link, which is a wide area linking the Coast and the Cascade Ranges, because this land is critical for providing habitat connectivity. This area was recognized in the ISC Report (Thomas et al. 1990). Several recommended changes include: (1) protecting all Late-Successional Reserves identified in the linking area and 100-acre core areas around all spotted owl nest sites within the matrix, (2) limiting regeneration harvest to the earlier seral stages while protecting the mature and old-growth seral stages, and (3) designating this area as an Adaptive Management Area with emphasis on protecting remnant old-growth and late-successional stands.

**Response:** Additional analysis of habitat and management considerations concluded that measures in Alternative 9 as originally proposed may not have adequately accounted for spotted owl dispersal conditions in this area. As a result, additional matrix standards and guidelines have been added to Alternative 9 to maintain and improve the connectivity value of the South Willamette/North Umpqua area in the Eugene BLM District. Specifically, the alternative now calls for the Connectivity/Diversity Block allocation and prescriptions to be applied to those lands which were designated as Deferred Old-Growth Emphasis Areas and Non-Deferred Old-Growth Emphasis Areas in the Revised Preferred Alternative to the BLM Draft Resource Management Plans. Connectivity/Diversity Block standards require 150-year area-control rotations. Overall, 25 to 30 percent of these blocks would be maintained in late-successional condition; and, when areas are harvested, 12 to 18 green trees per acre would be retained. For additional detail, refer to Chapter 2 under the Alternative 9 description of standards and guidelines.

- **Comment:** Clarify what the management would be for spotted owl activity centers in the matrix and Adaptive Management Areas under Alternative 9.

**Response:** Alternative 9 was modified in the Final SEIS to retain 100 acres of the best owl habitat around each known spotted owl activity center in the matrix and in Adaptive Management Areas (see the description of Alternative 9 in Chapter 2, and Appendix B11, Standards and Guidelines Resulting from Additional Species Analysis and Changes to Alternative 9). "Activity center" is defined as an area of concentrated activity of either a pair or a territorial single spotted owl. Federal agencies may not undertake actions that are likely to jeopardize the species, and consultation with the U.S. Fish and Wildlife Service will occur as required under Section 7 of the Endangered Species Act.

- **Comment:** The preferred alternative should provide for an increase, not a decrease, in spotted owl and marbled murrelet habitat in the reserve network.

**Response:** All 10 SEIS alternatives are expected to provide an increase in habitat for these threatened species over the long term. Currently, most of the Late-Successional Reserves include some acreage that has been harvested. These stands will eventually develop into late-successional habitat and result in an increase in spotted owl and marbled murrelet habitat over time. Similarly, the Riparian Reserves are expected to improve in condition, resulting in increased habitat for these species. In addition, existing spotted owl habitat will remain within Congressionally Reserved Areas.

- **Comment:** Discuss whether thinning under Alternative 9 is allowed in Late-Successional Reserve stands less than 80-years old if they currently meet the definition of northern spotted owl or marbled murrelet habitat.

**Response:** The standards and guidelines for Alternative 9 allow limited entry into stands less than 80-years old in the area west of the Cascades. Thinnings or other silvicultural treatments inside Late Successional Reserves must be beneficial to the creation of late-successional forest conditions, and are subject to review by the Regional Ecosystem Office.

- **Comment:** Explain why far fewer northern spotted owls are protected in the Washington Eastern Cascades Province under Alternative 9 than under the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.).

**Response:** Based on the consultation process on the SEIS with the U.S. Fish and Wildlife Service, it was determined that additional protection would better serve conservation of the spotted owl under Alternative 9 in this area and in the California Cascades Physiographic Province. Alternative 9 has been modified in the Final SEIS to include: Residual Habitat Areas around spotted owl activity centers in the matrix and in Adaptive Management Areas; and Reserved and Managed Pair Areas (to be considered as Managed Late-Successional Areas) in the Washington Eastern and the California Cascade Provinces. These modifications were added to Alternative 9 to address this issue and to further support the spotted owl population.

- **Comment:** The SEIS should compare and contrast the Final Draft Spotted Owl Recovery Plan with the alternatives presented in the SEIS.

**Response:** This comparison was made in the Biological Assessment that was prepared for the Draft SEIS (see Appendix G, Biological Opinion), which will be available for review by the decision makers. It is the intent of the joint lead agencies that management under the selected alternative will provide the federal contribution to spotted owl recovery.

- **Comment:** In Alternative 9, some recommendations for management activities in Late-Successional Reserves that are intended to improve ecosystem viability can be expected to reduce owl viability.
- **Response:** The provisions for thinning and salvage in the reserves were adapted from the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub.) and are considered compatible with the habitat requirements of the northern spotted owl.
- **Comment:** Reliance on Riparian Reserves as spotted owl habitat is highly questionable. Because these narrow strips of forest are essentially all edge habitat, they must be considered poor quality for owls.

**Response:** There will be areas where Riparian Reserves will be adjacent to other reserved lands and may be part of a spotted owls' home range, although these areas are not expected to contribute significantly to the maintenance of spotted owl populations. Under all alternatives, a major role for Riparian Reserves would be to help provide dispersal habitat for spotted owl populations.

- **Comment:** The use of prescribed fire and fuel breaks in Late-Successional Reserves to reduce wildfire potential poses significant risks to spotted owls, other species and their habitat.

**Response:** While the described risk clearly exists to a certain extent, the SEIS determined that the risk to these mature forests would be greater if steps were not taken to reduce wildfire hazards. Removal of fuels under controlled circumstances provides more assurance of maintaining these reserves. Prescribed fire and fuel breaks may be employed following development of fire plans by local units and review by the Regional Ecosystem Office.

- **Comment:** Managing some nonfederal land for old-growth characteristics is essential for viable populations of spotted owls. The SEIS should address this and propose regulations.

**Response:** The scope of this SEIS includes late-successional and old-growth forest management activities on Federal lands within the range of the northern spotted owl. Establishing management direction for nonfederal lands is beyond the authority of either joint lead agency. Nevertheless, the SEIS discusses, at a broad scale of resolution appropriate for a programmatic NEPA document, effects of expected management activities on nonfederal lands as they relate to the proposed action. The U.S. Fish and Wildlife Service has issued a Notice of Intent to prepare an environmental impact statement concerning direction for the removal or revision of the incidental take prohibitions currently in place for the northern spotted owl on nonfederal lands, which, because of the scope of its proposed action, will focus more specifically on effects of nonfederal land management (see the description of the proposal to issue a special 4(d) rule, under Cumulative Effects from Nonfederal Actions, in Chapter 3&4).

- **Comment:** The ratings for northern spotted owls show no likelihood for extirpation (Outcome D) and only a negligible chance that the species would occur only in refugia (Outcome C). Thus, the ratings suggest there may be considerable latitude to consider new options that have more management flexibility, without posing a significant marginal change in the ratings.

**Response:** While the northern spotted owl ratings may indicate room for flexibility, the overall conditions of late-successional and old-growth forest ecosystems and related species were also considered in the assessment of alternatives, and these needs also have been taken into account in the proposed action.

- **Comment:** Suitable owl habitat is too narrowly defined by the prevailing scientific theory and opinion that has been used to formulate conservation and recovery plans for the northern spotted owl.



**Response:** The definition and delineation of spotted owl habitat is largely based on the professional judgement of expert owl biologists and utilizes the best science available on this topic.

- **Comment:** SEIS maps and narrative describing the range of the northern spotted owl should be modified to reflect the known occurrence of owls east of the range in northeastern California (specifically the Widow Peak area in the Big Valley Mountains of northwestern Lassen County).

**Response:** The boundary line for the range of the northern spotted owl was developed in cooperation with a State of California biologist knowledgeable of the owls in the Widow Peak area. However, because these owls are far removed from any other known spotted owls, it was not considered prudent to extend the range line across large areas of unsuitable habitat to include them. These birds will continue to receive protection under the Endangered Species Act.

- **Comment:** The Cispus and Snoqualmie Pass Adaptive Management Areas are critical to the north-south movement of northern spotted owls on the west side of the Cascade Range. Each area should emphasize the maintenance of these valuable connectors rather than rely on innovative timber harvest experimentation.

**Response:** The Cispus Adaptive Management Area is located adjacent to three large Late-Successional Reserves which should help mitigate any risk to the owl population in this province. The Snoqualmie Pass Adaptive Management Area has specific guidance that acknowledges its role in maintaining north-south connections.

## MARBLED MURRELET

- **Comment:** The species assessment rating system did not adequately evaluate the short-term prospects for the marbled murrelet. The prescription for management of habitat around occupied sites outside reserves is inadequate to protect such sites in the short term, and thus population declines will continue for an extended time until habitat recovers within the reserves. There is considerable doubt whether the marbled murrelet can withstand substantial population losses in the short term. The alternatives should increase the amount of habitat provided around occupied sites outside reserves.

**Response:** The 0.5-mile protection area around marbled murrelet sites in the matrix is considered appropriate at this time. No scientific literature has documented marbled murrelet abandonment of nest sites protected with a 0.5-mile protection area. The recovery plan being developed by the U.S. Fish and Wildlife Service will further address recovery needs for the marbled murrelet. Whenever this plan is adopted, the Forest Service and BLM will reexamine the selected alternative to determine whether any changes are necessary in order to accomplish the objectives of the newly adopted murrelet recovery plan.

- **Comment:** Since most of the present habitat and populations of marbled murrelets are found on the Siuslaw National Forest, this habitat should be managed according to that Forest's guidelines and recommendations.

**Response:** Under each of the alternatives analyzed in the SEIS, most of the marbled murrelet habitat in the Siuslaw National Forest will be managed as Late-Successional Reserve. In addition, the allocations called for under the alternatives for this Forest are just one part of a much larger strategy that exceeds the Forest's boundaries.

- **Comment:** Clarify why the SEIS calls for a much higher amount of marbled murrelet nesting habitat in the Siuslaw National Forest than provided for under the 1990 Forest Plan.

**Response:** New information concerning the marbled murrelet has come into existence since 1990, including the listing of the marbled murrelet as a threatened species. This information is reflected in measures designed to protect the marbled murrelet that have been incorporated into the alternatives.

- **Comment:** Seasonal restrictions to minimize disturbance to the marbled murrelet leave little time to perform timber harvest operations during dry periods, which is the best time to protect other resources potentially affected by timber harvest operations.

**Response:** Protection of nesting marbled murrelets from the disturbance of timber harvest operations will reduce management flexibility in these situations. Nevertheless, such restrictions serve a useful function in protecting the marbled murrelet.

- **Comment:** Clarify the definition and intent of recruitment habitat for marbled murrelets, which was defined as stands capable of becoming habitat in 25 years.

**Response:** The intent of identifying recruitment habitat for marbled murrelets is to direct appropriate management toward stands which may not at this time be suitable marbled murrelet habitat, but which are in the condition to become suitable habitat as quickly as possible. To provide a rough guide, stands with an average age of 75 years should be considered as recruitment habitat. However, identification of recruitment habitat will rely on the expertise of local biologists and silviculturists, who may consider younger stands for delineation.

- **Comment:** According to the Draft SEIS, there are 2.6 million acres of suitable marbled murrelet habitat in Washington, Oregon and California. If you assume the occurrence of one nest tree per acre, we could expect a larger marbled murrelet population than the 20,000 pairs of marbled murrelets estimated to occur in this region.

**Response:** The assumption of one nest tree per acre is not supported by survey data for this species. Also, much of the 2.6 million acres of habitat reported in the SEIS occurs as fragmented parcels as a result of timber harvest and natural disturbances. Current knowledge of predation on marbled murrelet nests and young by ravens, crows, and jays indicates that fragmented stands provide greater opportunity for predation. Therefore, much of the habitat documented as "suitable" marbled murrelet habitat may provide adequate structural components, but occurs in such fragmented condition that marbled murrelets cannot effectively nest and rear young in these stands due to predation loss. The indications that this species, like other seabirds, may select nest groves which can accommodate "colony" nesting behavior would also classify many acres of fragmented old growth as unsuitable.

- **Comment:** The Final SEIS should include realistic timelines for conducting marbled murrelet surveys to assure protection of this species. Two-year surveys are inadequate because of the difficulty in locating this species.

**Response:** The protocol for marbled murrelet surveys that is followed by federal agencies (as adopted from the Pacific Seabird Group, Marbled Murrelet Technical Committee) generally prescribes a survey period of two consecutive years. This is to allow enough time to determine with some degree of confidence whether murrelets may nest in a particular forest stand. The U.S. Fish and Wildlife Service will advise other federal agencies as to the adequacy of this protocol. Changes in the protocol may occur as a result of additional research and development of a recovery plan for the marbled murrelet.

- **Comment:** Disclose how protection of undiscovered marbled murrelet nests might affect matrix management in the coastal ranges.

**Response:** Marbled murrelet occupied sites found in the future would be protected according to standards and guidelines described in Chapter 2 in the section Elements from the FEMAT Report Incorporated into the Alternatives. When the recovery plan for the marbled murrelet is completed, agencies will evaluate the plan and amend or revise management direction as appropriate.

- **Comment:** The SEIS purports to protect the marbled murrelet from extinction, but fails to take into account management of the nonfederal portions of the ecosystem.

**Response:** The SEIS focuses on the adequacy of the alternatives to provide marbled murrelet habitat on Forest Service and Bureau of Land Management lands. Nevertheless, it does discuss, at a broad level of resolution appropriate for a programmatic NEPA document, effects of nonfederal activities on the marbled murrelet. The SEIS does not make statements as to the avoidance of extinction or the recovery of the species, especially since recovery of this species is expected to be strongly influenced by conditions outside of the planning area. The recovery plan currently being developed by the U.S. Fish and Wildlife Service will address recovery needs for the marbled murrelet on federal and nonfederal lands.

- **Comment:** Determination of marbled murrelet occupied sites is an imprecise science based on observation of indirect behavioral elements. Use of circumstantial observations to determine occupied sites results in excessive protection of marbled murrelet habitat under the alternatives and severely restricts the amount of timber available for harvest.

**Response:** The protocol developed by the Marbled Murrelet Technical Committee of the Pacific Seabird Group, and currently used by the federal agencies, is offered as having a reasonable assurance of protecting this threatened species while continuing research develops more efficient methods.

- **Comment:** Address the assumed size of forest stands needed by marbled murrelets to successfully reproduce.

**Response:** Research on marbled murrelets has not provided a definitive answer to this question. The land allocations and standards and guidelines for marbled murrelet habitat in the SEIS are considered appropriate at this time. This information and criteria will be reevaluated through research and monitoring, and the selected alternative will be adjusted as necessary through the adaptive management process.

- **Comment:** Since forest history information indicates that marbled murrelets have persisted in areas dominated by catastrophic burns (such as the Yaquina burn), it should not be necessary to provide extensive contiguous blocks of habitat for marbled murrelets under the alternatives in the SEIS.

**Response:** Historically, wildfires in the coastal Douglas-fir/hemlock forests would generally burn in a mosaic pattern, with unburned areas occurring on north-facing slopes and in riparian zones, and partially burned areas with some stand retention occurring in other moist areas. This burn pattern resulted in sufficient habitat to allow the marbled murrelet to persist until regrowth occurred. Due to past levels of timber harvest, much of the landscape that would have naturally been available as marbled murrelet habitat does not now contain any old-growth forest. This situation necessitates the protection of much of the existing marbled murrelet habitat.

- **Comment:** Identify the Marbled Murrelet Working Team's recommendations and explain how they were modified under Alternative 9.

**Response:** The Working Team's recommendations are presented in the FEMAT Report, Chapter IV in the section Recommendations of the Marbled Murrelet Working Team. Under Alternative 9, Late-Successional Reserves substituted for the specific owl additions (which provide marbled murrelet habitat as well) outlined in Johnson et al. (1991). Otherwise, Alternative 9 incorporates the intent of the Working Team's recommendations.

- **Comment:** Explain why Alternatives 7 and 8 do not include the Marbled Murrelet Working Team's recommendations. These should be included in all alternatives. Clarify which alternatives would protect a murrelet nesting pair in the matrix.

**Response:** The range of alternatives was developed to provide an array of choices which would be likely to meet current statutes. Alternatives 7 and 8 are part of this array, but, unlike the other alternatives, they do not specifically describe protection of marbled murrelets in the matrix to contribute to the array of choices. However, requirements under the Endangered Species Act would provide an equivalent level of protection for Alternatives 7 and 8.

- **Comment:** The SEIS states that marbled murrelet populations will not stabilize in the next 100 years regardless of which alternative is selected. This is incorrect because Alternative 1 will provide more habitat for the species now and in the next 100 years than in other alternatives. In addition, there will be less fragmentation under Alternative 1. Therefore, this statement should be deleted or modified to say that the likelihood of supporting marbled murrelets over the next 100 years will be greater under the alternatives that provide the most habitat for the species within 100 years.

**Response:** The SEIS does display a table that indicates a slightly greater likelihood of achieving sufficient habitat to allow murrelet populations to stabilize, well distributed across federal lands under Alternative 1 than under Alternative 9 (Table 3&4-42). The hypothesis that placing more acres of old-growth forest off-limits to any silvicultural treatments leads to more murrelet habitat in 100 years is not necessarily accurate, however, as there is a contrary hypothesis based upon restorative silviculture. The text of the Draft SEIS correctly displays the biologists' conclusions for the marbled murrelet. This comment refers to text intended to describe the complex issues unrelated to federal land management, which are expected to play a pivotal role in the recovery of marbled murrelets. The Final SEIS provides a fuller discussion of these cumulative effects in Chapter 3&4 in the Marbled Murrelet section.

- **Comment:** The alternatives should be modified to provide more reserves in low elevation coastal areas. Observations indicate that the marbled murrelet is more abundant near the coast. Federal lands in close proximity to the coast (e.g., Coos Bay BLM District) would provide important future habitat areas for marbled murrelets.

**Response:** Under the preferred alternative of this SEIS, most of the marbled murrelet habitat on federal land in Marbled Murrelet Zone 1 is in reserves. This zone generally consists of low elevation lands that are 10 to 40 miles inland from marine environments. However, the amount of federal land within close proximity to the coast is limited.

- **Comment:** The Draft SEIS states that a possible mitigation measure is to incorporate the marbled murrelet recovery plan recommendations into Forest Service and BLM planning documents. However, as a federally listed species, the marbled murrelet's recovery plan must be a part of the Forest and District Plans because it identifies critical habitat for marbled murrelets. Update the SEIS to reflect that the recovery plan recommendations will be required.

**Response:** The marbled murrelet recovery plan has not been completed. Future recovery plans for any listed species dependent on the forest habitat in the Pacific Northwest will be able to use the selected alternative of this SEIS as a base to build a strategy for recovery of those species. When a new recovery

plan is adopted, the Forest Service and BLM will reexamine the selected alternative to determine whether any changes are necessary to accomplish the objectives of the newly adopted recovery plan. While recovery plans are not legally binding to federal agencies, all federal agencies are charged with using their authorities to conserve listed species. See 16 USC 1536(a).

Designation of critical habitat is a separate process from the recovery planning effort. Once critical habitat is designated, federal agencies may not take actions that will result in the destruction or adverse modification of this habitat pursuant to Section 7 of the Endangered Species Act.

- **Comment:** To maintain viable populations of marbled murrelets, the SEIS should consider an alternative with larger, well-distributed blocks outside reserves, cooperative goals for marbled murrelet management on all lands, and direction that prohibits thinning in natural stands.

**Response:** Alternative 1 includes most of these components. Designing cooperative goals for marbled murrelet management on all lands is beyond the scope of the proposed action in this SEIS, which provides management direction for only lands managed by the Forest Service and Bureau of Land Management within the range of the northern spotted owl.

## BALD EAGLE

- **Comment:** There seems to be conflict between northern spotted owl and bald eagle habitat needs and allocations in the Winema National Forest. Spotted owl habitat is not bald eagle habitat and, therefore, should not be substituted for the latter. Bald eagle habitat identified in the Bald Eagle Recovery Plan should remain a specific land allocation.

**Response:** Management of habitat used by both bald eagles and northern spotted owls will require careful planning at the local level and may require review by the Regional Ecosystem Office to achieve the appropriate balance. Forest and District Plans will continue to identify the appropriate boundaries for bald eagle nesting and roosting areas, based on local information, and may identify these areas as specific land allocations. In addition, management consistent with approved recovery plans for listed species (e.g., bald eagle) takes precedence over Late-Successional Reserve standards and guidelines under all alternatives. Refer to Changes Between the Draft and Final SEIS in Chapter 2.

## OTHER THREATENED AND ENDANGERED SPECIES

- **Comment:** Impacts of roads and forest management on grizzly bears and gray wolves should be modeled using habitat simulations throughout a complete forest rotation and by a cumulative effects analysis.

**Response:** Recovery plans are currently being developed by the U.S. Fish and Wildlife Service under the Endangered Species Act. They will assess the habitat needs of these species, and provide direction to Forest Plans. The Biological Opinion of the U.S. Fish and Wildlife Service (Appendix G) states that Alternative 9 complements grizzly bear and gray wolf recovery efforts in the planning area.

- **Comment:** The SEIS should comply with the Endangered Species Act by specifying measures to prevent future listings of species, including identification and protection of sites used by potential threatened and endangered species, before conducting any habitat-disturbing activities.

**Response:** The Fish and Wildlife Service provided a list of petitioned, candidate and proposed species associated with forest habitat in the range of the northern spotted owl to the SEIS Interdisciplinary Team. Some candidate species would benefit from the standards and guidelines added to Alternative 9

between the Draft and Final SEIS (e.g., Larch Mountain salamander [*Plethodon larselli*]; montane peaclam [*Pisidium (C.) ultramontanum*]; and two plants, the wayside aster [*Aster vialis*] and Cold water Corydalis [*Corydalis aquae-gelidae*]). After approval of the Record of Decision, agency sensitive species policies will still provide direction to the management of sensitive-species on lands administered by the Forest Service and BLM.

- **Comment:** Explain whether the Endangered Species Act's Section 7 consultation requirements for federal actions that may affect or jeopardize a listed species will still be required after the Record of Decision for this SEIS is signed.

**Response:** All proposed actions that modify or may be inconsistent with the land allocations or standards and guidelines of the selected alternative will be subject to consultation as required under Section 7 of the Endangered Species Act, and are subject to review by the Regional Ecosystem Office. In addition, the Forest Service and Bureau of Land Management will continue to review all proposed actions to determine whether they will affect species listed or critical habitat designated under the Endangered Species Act. At this time, however, both agencies anticipate that any future action that is consistent with the preferred alternative, and that does not implicate incidental take concerns, will not be likely to adversely affect any listed species or critical habitat, thus obviating the need to initiate formal consultation on such actions.

## AMPHIBIANS

- **Comment:** Standards and guidelines for the Del Norte Salamander should be clarified regarding use of helicopters or high-lead cable systems to avoid compaction or other disturbance of talus. Address whether it is permissible to construct a road in the 100-foot buffer around talus habitat as long as a 40 percent canopy closure is maintained.

**Response:** Partial timber harvest may be possible within the buffer as long as 40 percent canopy closure can be maintained. In such cases, tree harvest must be conducted using helicopters or high lead cable systems to avoid compaction or other disturbance of talus. Road construction would not be automatically approved in the buffer simply because 40 percent of the canopy closure is maintained. Management activities must consider compaction effects within the buffer area.

- **Comment:** The Shasta salamander should not be rated at a 20 percent likelihood of risk of extirpation under Alternative 9, and a 50 percent likelihood under Alternative 7. The habitat needed by this species is limestone outcrops, which are not suitable for timber management.

**Response:** Amphibians were rated based on the land allocations and standards and guidelines identified for each alternative. For the Final SEIS, species (e.g., the Shasta salamander) which fell below a certain level of likelihood under Option 9 in the FEMAT Report or for other reasons described in Chapter 3&4, in the section Methods for Additional Species Analysis, were analyzed to: (1) explain in more detail the basis for the ratings provided in the FEMAT Report, (2) contribute to a cumulative effects analysis, and (3) develop additional possible standards and guidelines if needed to improve habitat conditions on federal lands. This analytical process and results of the process are described in the Final SEIS.

## FURBEARERS

- **Comment:** The habitat needs of fur-bearing species have only brief discussion, if any, under all of the alternatives.

**Response:** The needs of furbearers associated with late-successional forests, such as marten and fisher, are discussed and assessed with respect to each of the alternatives. Late-Successional Reserves would be the primary basis for management of these furbearers under the alternatives. Furbearers associated with other habitats would also receive some benefits from the alternatives. For example, furbearers associated with riparian habitat (such as the beaver) would benefit from Riparian Reserves. Furbearers that use early-successional forest habitat (such as the bobcat) are expected to have sufficient habitat in the matrix, in early-successional forest stands in Late-Successional Reserves, and on nonfederal lands.

- **Comment:** The likelihood of martens and fishers being well distributed throughout their range could be enhanced under the preferred alternative by improving connectivity between Late-Successional Reserves. This could be accomplished by increasing rotation lengths (180 to 200 years), increasing buffer widths around streams, and adopting the 50-11-40 rule.

**Response:** These measures are included in some alternatives and are available for selection by the decision makers. Green-tree and snag retention, as well as Riparian Reserves and Administratively Withdrawn Areas, are expected to contribute to connectivity between Late-Successional Reserves. In addition, some additional measures for matrix management have been developed and incorporated into Alternative 9 of this Final SEIS to further address this concern. Refer to Appendix B11 for a complete description of these standards and guidelines. There is little information on the effects of adopting or rejecting the 50-11-40 rule specific to the dispersal of martens and fishers.

- **Comment:** Clarify whether the Forest Service protection buffer requirement (Appendix B4) in California for the American marten is required under the SEIS.

**Response:** Protection buffers are no longer required for the American marten in Alternative 9. The standards and guidelines added to Alternative 9 as a result of additional species analysis, such as Riparian Reserve Scenario 1, are expected to benefit this species.

## EARLY-SUCCESSIONAL SPECIES

- **Comment:** The SEIS should not be considered an ecosystem management plan because it does not address the plant and animal species that use early-successional stages such as elk, deer, and some passerine birds.

**Response:** The alternatives presented in this SEIS are intended to guide the management of the mature and old-growth habitat components of lands administered by the Forest Service and BLM within the range of the northern spotted owl. Younger seral stages will continue to exist in the matrix as timber harvest and natural disturbance events occur. Also, despite the focus on providing mature and old-growth habitat in Late-Successional Reserves, natural disturbances will continue to create pockets of younger-forest seral stage habitat in these areas (which are important to species such as elk), and will contribute to the biological diversity within these reserves. Additional younger-forest seral stage habitat will be provided on nonfederal lands where timber harvest is expected to continue on shorter rotations than on federal lands.

- **Comment:** Since the SEIS relies on management of private lands to partially provide early-successional habitat, the SEIS should include stipulations for wildlife habitat coordination with private landowners so that impacts on landowners are taken into account.

**Response:** Prescribing management on private lands is outside the scope of the proposed action in this SEIS and the management authority of either joint lead agency. The discussion of wildlife in the SEIS includes general assessment of the expected effects of management of private lands under existing laws.

- **Comment:** The Final SEIS should include standards and guidelines to assure the creation of canopy gaps in Late-Successional Reserves to provide forage plants for deer, elk and other species in close proximity to hiding and thermal cover.

**Response:** Forage needs of these species will primarily be met by management activities in the matrix, Adaptive Management Areas (Alternative 9 only), and nonfederal lands. Additional forage will be provided in Late-Successional Reserves, Administratively Withdrawn Areas, Congressionally Reserved Areas, and Riparian Reserves as a result of natural disturbances such as fire, disease, blowdown, and silvicultural activities associated with the development of late-successional habitat characteristics in Late-Successional Reserves. The alternatives presented in this SEIS are intended to guide the management of the mature and old-growth habitat components of lands administered by the Forest Service and BLM within the range of the northern spotted owl.

## PLANTS

- **Comment:** Clarify which site localities of late-successional associated plants were analyzed in the SEIS. It is likely that some of these sites are not protected in reserves under some or all of the alternatives.

**Response:** This information is available in the administrative record for this SEIS. For site localities that are known, many received protection in reserves. There are probably sites that remain unknown due to the lack of complete botanical surveys for most species. Plant surveys will continue at different scales of analysis ranging from the provincial to project level, and new locations will be addressed in the adaptive management process.

- **Comment:** The Final SEIS should analyze the impact of land allocations on rare and sensitive plant species and their habitats. Areas of plant diversity and narrow endemism should be identified, and specific standards and guidelines should then be added to the SEIS to protect these habitats.

**Response:** Late-successional forest associated plant species were analyzed in the SEIS with respect to the impacts of the alternatives. Additional analysis was conducted between the Draft and Final SEIS to address late-successional forest associated plant species for reasons specified in Methods for Additional Species Analysis in Chapter 3&4. This analysis clarified species habitat status and presented additional standards and guidelines to benefit habitat conditions for these species. Identification and protection of areas of high plant diversity and narrow endemism are more specifically covered under current plans and draft plan preferred alternatives.

- **Comment:** The SEIS does not give enough emphasis to general vegetation and floristic surveys.

**Response:** The Final SEIS section in Chapter 3&4 on Current Forest Conditions Within the Range of the Northern Spotted Owl discusses the general forest vegetation conditions within the range of the northern spotted owl. Standards and guidelines for vascular plants, which include additional surveys to provide information on the distribution and life histories of many plant species were incorporated into Alternative 9.

- **Comment:** The Final SEIS should incorporate a more thorough model of the dynamics of botanical succession.

**Response:** Refer to the Final SEIS, Appendix B2, Ecological Principles for Management of Late-Successional Forests, for a discussion of the ecological processes central to the successional development and maintenance of late-successional and old-growth forest ecosystems.



- **Comment:** Clarify at what height canopy cover is measured (5 feet and higher, or 16 feet and higher).

**Response:** Canopy cover is measured above 6 feet.

## SENSITIVE SPECIES

- **Comment:** The use of existing policy mechanisms, such as sensitive species designation or development of habitat conservation guidelines for groups of species, should also be an integral part of any direction on habitat management designed to contribute to species viability.

**Response:** Agency sensitive species policies will still be in place after adoption of the selected alternative. These policies will continue to provide direction to the management of sensitive species on lands administered by the Forest Service and BLM.

## MITIGATION

- **Comment:** Mitigation measures listed in the SEIS for late-successional associated species should be incorporated into the standards and guidelines rather than remaining simply recommendations.

**Response:** The decision makers may adopt any of the mitigation measures set forth in the SEIS. Certain recommended measures have been added as standards and guidelines to Alternative 9 in the Final SEIS.

- **Comment:** Mitigation for bats fails to include provisions for large green trees and snags, and also fails to address summer habitats, foraging areas and temporary roosts.

**Response:** These habitat components will primarily be provided in the Late-Successional Reserves, Riparian Reserves, Administratively Withdrawn Areas, and Congressionally Reserved Areas on federal lands. Additional standards and guidelines (such as provision for green-tree and snag retention in the matrix, and protection of roost sites in caves, mines, wooden bridges and buildings) for bats have been incorporated into the Final SEIS. Refer to Appendix B11, Standards and Guidelines Resulting From Additional Species Analysis and Changes to Alternative 9.

- **Comment:** Mitigation measures for vascular plants and arthropods dealing with use or nonuse of prescribed fires are contradictory (i.e., some plants need fire to provide suitable habitat while arthropods are adversely affected by fire). Please clarify this in the Final SEIS.

**Response:** Standards and guidelines have been included in the Final SEIS to address this concern. Site treatment practices would be prescribed to minimize intensive burning, unless appropriate for certain specific habitats, communities or stand conditions. Site-specific analysis by interdisciplinary teams will be necessary during project-level planning to determine the species that are present and the appropriate prescriptions.

## VIABILITY

- **Comment:** Clarify why Alternative 9 was selected as the preferred alternative when the assessment ratings for late-successional associated, terrestrial species are superior under Alternative 1.

**Response:** Species that received lower likelihood ratings under Alternative 9 as compared to Alternative 1 are, for the most part, species that are restricted to local refugia or are affected to a significant degree by Riparian Reserve widths, the overall size of the reserve system, or by human activities off federal forest lands. These species were further analyzed between the Draft and Final SEIS,

and Alternative 9 was revised to include additional standards and guidelines for many of them. Refer to Chapter 2 and Appendix B11 for a list and description of these standards and guidelines.

- **Comment:** The SEIS should assess the cumulative impacts of implementing the alternatives on habitat sufficiency for late-successional associated species by analyzing actions on nonfederal lands. Exclusion of these impacts from the SEIS results in overly optimistic likelihood ratings.

**Response:** Chapter 3&4 (see Cumulative Effects/Role of Nonfederal Land sections) of this Final SEIS discusses effects on species habitat from expected management activity on nonfederal lands. In addition, the effects on spotted owls from management of nonfederal lands will be further addressed in another EIS to be prepared by the U.S. Fish and Wildlife Service concerning issuance of a proposed rule under section 4(d) of the Endangered Species Act.

- **Comment:** The objective of the selected alternative should be to provide at least a 95 percent likelihood that all late-successional associated species will remain viable for at least the next 200 years.

**Response:** If only species viability were considered it would be preferable to have species ratings with the lowest likelihood of species extirpation from federal land and the highest likelihood of habitat that is of sufficient quality, distribution, and abundance to allow the species population to stabilize, well distributed across federal lands. However, while providing habitat to support species viability is an important objective of land management planning decisions, it is not the only one. The SEIS provides a substantial amount of information about the effects of the alternatives on species viability, using a combination of approaches, so that a well-informed decision can be made and the decision makers can assure themselves that the selected alternative will not create a level of risk of extirpation to a species that is unacceptable under applicable laws and regulations.

- **Comment:** The likelihoods of habitat outcomes are never related to social and economic measures or outcomes. For public policy purposes, it is not enough to know the likelihood of habitat outcomes. There must be some sense of how these likelihood ratings affect costs to society.

**Response:** The social and economic impacts of the various alternatives are displayed in Chapter 3&4 of the Final SEIS.

- **Comment:** Clarify why subjective assessments were made concerning likelihoods of habitat outcomes for species, and explain why confidence intervals and statistical significance levels were not used when assessing species. At a minimum, the ranges of the FEMAT Report's species assessment ratings for individual species should be provided along with the ratings of individual panelists, because the degree of scientific uncertainty associated with the overall ratings should be displayed. The ratings should have been done by the same persons under the same conditions across all alternatives, and the names and qualifications of panelist members should be disclosed as required by NEPA. Further, it is inappropriate to use agency employees on the assessment panels because their votes could reflect agency bias.

**Response:** As explained in the FEMAT Report, the likelihood voting methodology was adopted by the Assessment Team partly to allow for quantification of scientific and personal uncertainty. The Assessment Team believed that honest expressions of how little or how much is known about species/alternative interactions could help decision makers better understand the issues and make more informed decisions. Moreover, with respect to almost every species, the amount of empirical data available is so scarce that quantitative statistical analyses would be so uncertain as to be imprudent and of relatively minimal value.

It is important to note that the Final SEIS used the results of the assessment panel process to identify those species with ratings that did not attain specified likelihoods of achieving various outcomes (or for other reasons specified in Chapter 3&4, Methods for Additional Species Analysis) and analyzes in greater detail the reasons for these ratings and possible mitigation measures to improve such ratings. This process and its results are explained in detail in this Final SEIS.

The ranges of ratings for individual species, along with the ratings of individual panelists, their names, and qualifications, are available from the administrative record. Ratings could not be done by the same persons because of differences in scientific knowledge, background, etc., concerning the various species groups evaluated. Panel members were selected based on their knowledge of species and species groups and availability, not on their agency affiliation.

- **Comment:** Some assessment panelists have raised concerns about how the assessment process was conducted. Some panelists were apparently not provided adequate background data (e.g., maps and standards and guidelines) to enable them to make proper ratings. Other panelists apparently did not trust past agency performance and considered this when making species assessments.

**Response:** The FEMAT Report (Appendix A to this SEIS) includes a detailed description of the assessment panel process. Although background information was generally made available to the assessment panels, there were a few instances when some information was unavailable due to the tight timeframes of the Assessment Team's schedule. However, these data were available to the Assessment Team members when they made the determination of likelihood of habitat outcomes for species. As explained in the FEMAT Report, results from the panels were advisory only; the Assessment Team made the final decisions. Expert judgements were used because of the general scarcity of empirical and other data on many late-successional species.

Another issue raised by some assessment panelists concerned lack of trust in the federal agencies' commitment and willingness to protect species and their habitat. This may have affected some of the assessment panel ratings. For example, assessment panel ratings for mollusks may have been higher if panel perceptions of past agency performance had been included in the assessments. The Assessment Team instructed panelists that this consideration was inconsistent with the effort to compare management alternatives. The team stated that the assessments for these species were quite conservative, and concluded that the alternatives, if implemented properly, generally would result in more favorable habitat outcomes than indicated by the assessment panel findings for mollusks.

The assessment panel process, including many of its strengths and weaknesses, is described in detail so that the panel results may be considered for what they are. Panel assessments by different panelists or utilizing a different process would yield different specific results, but the overall relative ratings for each option would likely remain constant and provide useful information about the relative risks to species under the various alternatives.

- **Comment:** The FEMAT Report's species assessment process was flawed because some of the panelists, by their own admission, were not qualified to assess population viability.

**Response:** The primary emphasis of the assessment panels was to assess habitat sufficiency for species populations to persist as well-distributed populations on federal lands within the range of the northern spotted owl. Formal population viability assessments were not conducted for any species. The primary information upon which the panelists relied was their knowledge of the habitat requirements of the species. Knowledge of demographic modeling was also considered.

- **Comment:** Adjustments to panelist ratings by the Assessment Team to correct any errors or apparent misunderstandings were inappropriate.

**Response:** The FEMAT Report stated that results from the assessment panels were advisory to the Assessment Team. The Assessment Team made the final judgements on the likelihood ratings. Adjustments were intended to correct for any errors or misinterpretations that arose in the deliberation process, and because the Assessment Team had the final responsibility, under the President's charter, for making these judgements. The fact that adjustments were made was disclosed.

- **Comment:** The FEMAT Report's species assessments should have been submitted to scientific organizations for peer review.

**Response:** The FEMAT Report was submitted for formal, blind peer review to the following scientific organizations/governmental agencies: Society of American Foresters, Ecological Society of America, Society for Conservation Biology, The Wildlife Society, American Geophysical Union, American Fisheries Society, North American Benthological Society, Society of Wetland Scientists, Environmental Protection Agency, U.S. Fish and Wildlife Service, Society for Conservation Biology, National Marine Fisheries Service, American Forestry Association, Rural Sociological Society, and American Sociological Association. A total of 12 organizations/agencies provided their critiques and these are available for review in the administrative record.

- **Comment:** The results of the April viability panels should be contrasted to the June panel results to provide additional clarification to the SEIS.

**Response:** The results of the April viability panels were qualitative rankings (i.e., ratings of high, medium, and low) and reflected the original options in the FEMAT Report that were subsequently revised. Major attributes of these options were changed between the April and June panels, and three new options were added. Thus, comparisons would not be meaningful.

- **Comment:** It is important to provide a control for the FEMAT Report's species assessment process. For example, ratings should have provided a frame of reference for determining the marginal gains in species ratings from some measure of existing conditions.

**Response:** Normally the No-Action Alternative is described within an Environmental Impact Statement, even where it is not implementable, to serve as a baseline for comparison of effects among the action alternatives. For this SEIS, the No-Action Alternative, if viewed without recent, legally required changes, might be assumed to be represented by effects displayed in Chapter 3&4 as 1980-1989 average or equivalent. However, the No-Action Alternative is not implementable and therefore does not constitute a reasonable alternative (see the Memo from CEQ in Appendix C). In addition, most comparisons of the No-Action Alternative to the action alternatives would have been difficult, not practical, or not meaningful. Accordingly, a full discussion of the No-Action Alternative was not made in the SEIS. However, to facilitate the decision makers' and public's understanding, the SEIS compared, to the extent feasible, the No-Action Alternative with Alternative 7 to which all other alternatives can be compared. This comparison process provided a suitable benchmark to compare the effects of the alternatives.

- **Comment:** The FEMAT Report's species assessment process is valid as a quick method of analysis to cover general late-successional associated species and species groups but is invalid as an assessment of local endemics. Only in-depth knowledge of site-specific protection standards determined by field surveys would enable panelists to rate these species adequately.

**Response:** This problem in the process has been recognized and addressed in the Final SEIS discussion on the effects on species. The Final SEIS reflects additional analysis in response to this concern. It also

must be remembered that the framework for the proposed action is a very broad scale of resolution and that additional analysis and measures will be undertaken and considered at more site-specific levels of planning.

- **Comment:** Clarify how the FEMAT Report's species assessments would change if: (1) implementation and effectiveness monitoring are not adequately funded in the future, and (2) Adaptive Management Areas do not produce the additional scientific knowledge necessary to enable managers to create late-successional forests with desirable forest structural conditions at a faster rate.

**Response:** Species assessments were based upon the alternatives as presented to the assessment panels. Significant changes to the alternatives or to assumptions made by the panels would likely change how the panels would have rated the alternatives. The risk associated with innovation, trials, or experiments in the Adaptive Management Areas was part of the alternative presented to the assessment panels, and did not figure prominently in the species assessment ratings. Adaptive Management Areas with harvesting were largely treated like the matrix by most panelists. The Endangered Species Act, NEPA, and the agency planning regulations have provisions for reassessing new information which may develop in the future, and adjustments may be made through the adaptive management process.

- **Comment:** The species assessment process conceals variations in habitat and forest conditions that occur throughout the three-state region and, thus, ratings tend to reflect the worst rather than the best situations.

**Response:** The alternatives were designed to account for regional differences in habitat and forest conditions by specifying some standards and guidelines applicable to those regions. The assessment panels considered these differences when determining the likelihood ratings. Some ratings may be conservative because of this factor.

- **Comment:** The use of guilds (or functional groups) in the species assessment process is misleading because it ignores risks of extirpation for individual species.

**Response:** Guilds were used to address lack of information on specific habitat associations of species due to factors such as inadequate surveys, incomplete knowledge of taxonomy, and the diversity of the taxonomic category. Moreover, it simply is not practicable to assess every species individually in an ecosystem at a regional level. The process did not ignore risks of extirpation for individual species, but rather assessed risks to the habitat needs of groups of species where there was a lack of information on individual species. In assessing risks to groups of species, risks and trends are assumed to be similar among individual species within the various groups.

- **Comment:** There is no rational biological reason or legal justification to maintain the viability of other species in the range of the northern spotted owl where the other species' ranges do not coincide with the range of the owl.

**Response:** The land management agencies have to reconcile the objectives of legal requirements with the reality of the natural world. Where the range of a species extends beyond the planning area, viability considerations should not ignore that fact, but rather be applied in a manner that is reasonable for the on-the-ground conditions.

- **Comment:** The SEIS conclusion that the matrix and nonfederal forest lands are likely to maintain early-successional associated species does not satisfy the Forest Service viability rule, which requires that adequate habitat be available on federal land to maintain the viability of all vertebrate species. Federal land managers cannot rely on private land to maintain habitat for early-successional species.

**Response:** Early-successional habitat provided in Late-Successional Reserves (because of preexisting, early-seral stages), Adaptive Management Areas (Alternative 9 only), and the matrix are expected to provide adequate habitat to support early successional-associated species within the federal planning area. As part of its cumulative effects analysis, the SEIS also notes that there is a significant amount of early-successional forest on nonfederal lands within the range of the northern spotted owl, and that such lands will provide additional habitat for species associated with such habitat. Cumulative effects considerations are required under NEPA. Further, the slow rate of change in habitat conditions on federal lands (from the current preponderance of early-successional habitat) over the short term will limit negative impacts to these species and any necessary adjustments can be made through the adaptive management process. It must be remembered that such adjustments to create early-successional forests can be accomplished relatively much more quickly than creation of old-growth or late-successional forest conditions.

- **Comment:** The species assessment ratings may be lower than estimated by the Assessment Team because the assessment rating process did not consider species interactions. For example, there is a clear ecological relationship among some fungi, flying squirrels and spotted owls. This relationship was not considered in the rating process.

**Response:** Species interactions are important and will certainly occur. This is one reason why actual population levels may differ from levels expected, based on the amount of habitat alone. At the scale of analysis used in the SEIS, it would be difficult to assess results of these interactions for individual species. However, since this SEIS focuses on maintenance of suitable habitat throughout the range of the northern spotted owl, it is assumed that the late-successional ecosystem, along with its attributes such as complex species interactions, will be maintained at that scale.

- **Comment:** It is important to identify species whose viability is in question, regardless of what is done on federal forest lands.

**Response:** The SEIS does identify such species. These species generally had relatively lower likelihood ratings across the alternatives because they are endemic or restricted to local refugia, or are primarily impacted by activities occurring outside the control of the BLM or Forest Service. These species have been further evaluated in the Final SEIS in response to this concern (see Chapter 3&4, Methods for Additional Species Analysis).

- **Comment:** The Final SEIS should prescribe scientifically reliable nest site buffers to ensure population viability of the northern goshawk and marbled murrelet.

**Response:** Nest site protection is provided for marbled murrelets under Alternative 9. Late-Successional Reserves are expected to benefit the northern goshawk by maintaining nesting habitat in the short term as well as providing additional habitat in the long term.

- **Comment:** In emphasizing Outcome A (i.e., habitat is of sufficient quality, distribution, and abundance to allow the species population to stabilize, well distributed across federal lands) as the standard to be achieved in the species assessment process, the SEIS implies a public policy emphasis of returning to historical species distribution. Not only is this not required by law or regulation, but it is technically and economically impossible in most cases.

**Response:** The SEIS does not state a public policy of returning species to their historic distributions. The SEIS does address the likelihood of species continuing to persist under various patterns of habitat distribution on federal lands. The FEMAT Report acknowledged the unlikelihood that all species can be

restored to their historical distributions. For example, the mammal assessment panelists recognized that populations of American martens may never again be distributed throughout their historic distribution regardless of federal land management direction.

- **Comment:** Address whether the species assessment for the alternatives was dependent on Late-Successional Reserves, as well as forested areas outside the reserves.

**Response:** Assessments were based on all land allocations and standards and guidelines presented to the panels. See the description of the FEMAT Report's species assessment process in Chapter 3&4 of the SEIS.

- **Comment:** Explain why the 100-year likelihood of attaining well-distributed habitat to support a stable population for the northern spotted owl and marbled murrelet was below 95 percent under Alternative 9.

**Response:** Evaluations of habitat sufficiency for maintaining stable populations were not precise analyses of likelihoods of habitat conditions, but rather informed professional judgements of knowledgeable experts. This must be kept in mind when assessing differences in the ratings. Ratings for the spotted owl and marbled murrelet were 83 percent and 80 percent likelihood, respectively, of achieving a stable, well-distributed population under Alternative 9 prior to its modification between the Draft and Final SEIS. Ratings for the spotted owl under all alternatives reflected some degree of uncertainty and disagreement among the experts over such factors as adequacy of dispersal habitat, concern over short-term loss of habitat during the recovery process within reserves, and current population dynamics. Ratings for marbled murrelets reflected the experts' concern for inland nesting habitat and possible adverse impacts in the marine environment during the next 50 to 100 years.

- **Comment:** The species assessment ratings for mollusks are too low. The alternatives should be modified to improve the possible habitat outcomes to ensure viability.

**Response:** Further analysis of mollusks was conducted between the Draft and Final SEIS to address this concern. Many of these mollusks are locally endemic and there is uncertainty about the effects of land use on these species. Standards and guidelines to increase the likelihood of persistence of these species on federal lands are presented in Chapter 2 and in Appendix B11 of this Final SEIS.

- **Comment:** Clarify whether Riparian Reserves will be effective in maintaining viable populations of all riparian species.

**Response:** The species assessment process was restricted to those species associated with late-successional forests, some of which also occur in riparian zones. Thus, not all riparian-associated species were individually analyzed in this SEIS. However, Riparian Reserves should contribute to maintaining and restoring the productivity and resiliency of riparian ecosystems and all associated species.

- **Comment:** Clarify how many species/ranges/groups were actually evaluated in the assessment process and the degree of emphasis given by the panels for the different species and groups.

**Response:** The number of evaluations conducted by the Assessment Team was as follows: amphibians - 18; mammals - 27; birds - 38; fish - 9; mollusks - 102; vascular plants - 124; lichens - 157; fungi - 527; bryophytes - 106; and arthropods - 15. The amount of information available to the assessment panels varied by species group, as acknowledged in the FEMAT Report. Information was especially sparse for fungi, lichens, bryophytes, mollusks, and arthropods. For most of the species, the information necessary to precisely quantify the response to changes in the quality and pattern of their environments simply does not exist.

- **Comment:** Clarify why the lynx and the Baird's shrew were not included in the species assessment.

**Response:** The reasons why these species were not rated have been added in the section Mammals Other Than Bats in Chapter 3&4 of the Final SEIS.

- **Comment:** The assessment panels should have evaluated the effects of Alternatives 2, 6, and 10 on terrestrial species to assure equal analysis of all alternatives.

**Response:** Seven options representing a full range of conditions within the guidelines of the mission statement were selected for analysis. The effects of Alternatives 2, 6, and 10 should be within the range of effects expected under the alternatives that were analyzed in detail.

- **Comment:** The species assessment ratings would have been higher if native, late-successional hardwood stands in southwestern Oregon and northern California were protected. The Final SEIS should address this issue.

**Response:** The system of Late-Successional and Riparian Reserves, as well as Administratively Withdrawn Areas, should encompass hardwood stands in the same general proportion as their occurrence over the landscape. Most species addressed in the SEIS are conifer-associated and their assessment ratings would reflect the status of late-successional conifer habitat under the alternatives.

- **Comment:** Clarify the effects of omitting the 50-11-40 rule in Alternative 9 on the species assessments of all late-successional associated species. A full-scale analysis of connectivity is needed for all species.

**Response:** The 50-11-40 rule was a management prescription designed to address dispersal of the spotted owl. In lieu of the 50-11-40 rule, the Draft SEIS concluded that Riparian Reserves, retention of green trees, and Administratively Withdrawn Areas would contribute to the dispersal of late-successional associated species in the matrix under Alternative 9. These factors were considered by the species assessment panelists in evaluating the effects of the alternatives on other late-successional associated species. In addition, connectivity was a key factor in determining likelihoods of habitat outcomes under each alternative for each species, as well as for the late-successional forest ecosystem generally. The additional species analysis described in Chapter 3&4 of the Final SEIS also identified standards and guidelines which further address the issues of connectivity.

- **Comment:** The species assessments should be accompanied by at least crude population estimates for analyzed species.

**Response:** Analysis emphasis was on habitat sufficiency on federal lands, not overall population viability. In most cases, information is simply not available to determine even crude population estimates.

- **Comment:** The Forest Service has no legal authority to maintain viability of nonvertebrate species.

**Response:** Many statutes authorize the Forest Service to consider the viability of all species in its land management decisions, including the Multiple-Use Sustained-Yield Act, National Forest Management Act, and Endangered Species Act. Consideration of species viability is part of being good stewards of the land.

- **Comment:** All SEIS alternatives unlawfully impose the Forest Service viability rule on the O&C lands.

**Response:** The direction given to the Assessment Team was to apply the "viability standard" in the design of all alternatives to achieve similar treatment across all federal lands. The Assessment Team concluded that, "As a practical matter, this instruction made little difference to the final results. In all of



the options developed by the Team, potential harvest levels were affected primarily by the need for protecting the northern spotted owl, the marbled murrelet, at-risk fish species, and late-successional forest considerations.” (FEMAT Report, p. II-5).

Sufficient legal authority exists to apply this standard to the O&C lands in the design of alternatives. Concern over the long-term health of the forests is a dominant principle of the management strategies under consideration. Providing for species viability is an important part of maintaining “permanent” forest production of the kind mandated by Congress in the O&C Act.

- **Comment:** Alternative 9 violates the National Forest Management Act’s legal requirements for maintaining species viability. More than 400 species, including salmon and several other vertebrates, would fall below the threshold of viability if Alternative 9 were adopted.

**Response:** There is no single assessment-panel numerical rating that represents the minimum legal threshold under the viability provision in NFMA regulations. The species conservation and stewardship responsibilities of the land management agencies cannot be simplified to a single number, and the Assessment Team explicitly did not make such a recommendation.

The assessment panel’s numerical ratings of likelihoods of habitat outcomes are useful information about the relative expected effects of the alternatives on old-growth and late-successional species. However, the numerical ratings should always be evaluated in the context of the procedures and assumptions used in the panel process.

Because of changes in the preferred alternative between the Draft and Final SEIS, the previous numerical ratings are not reflective of the current preferred alternative. Additional species analysis between the Draft and Final SEIS was conducted on many species and additional standards and guidelines were adopted in Alternative 9.

- **Comment:** The description of the methodology and information sources used in developing the species assessment ratings should be more specific.

**Response:** The description of the process used to determine species assessment ratings has been expanded in the FEMAT Report, Chapter IV, Terrestrial Forest Ecosystem Assessment. In addition, a section detailing the process for assessing habitat sufficiency has been expanded in Chapter 3&4 of this Final SEIS, and in Appendix J.

## OTHER TERRESTRIAL WILDLIFE COMMENTS

- **Comment:** Clarify what species would be protected by protection buffers and address their management.

**Response:** Refer to Appendix B4, Protection Buffers, in the Final SEIS for clarification of this issue.

- **Comment:** Clarify the rationale in Alternative 9 for eliminating administrative withdrawals for martens, pileated woodpeckers, and other late-successional species.

**Response:** The alternatives each provide for species habitat in somewhat different ways. Habitat for these species is provided for under Alternative 9 in the land allocations and standards and guidelines specified under that alternative.

- **Comment:** Clarify whether timber harvest associated with meadow restoration is allowed in Late-Successional Reserves.

**Response:** In some cases, certain management activities to maintain specific vegetative conditions may be appropriate to meet the objectives of Late-Successional Reserve plans, which include a history and inventory of overall vegetative conditions within the Late-Successional Reserve. Proposals for such activities are subject to review by the Regional Ecosystem Office prior to implementation.

- **Comment:** Watershed analysis should consider the habitat needs of terrestrial species.

**Response:** Although its primary focus will be watershed protection and conservation of aquatic and riparian species, watershed analysis also will consider the distribution and abundance of terrestrial species and populations throughout the watershed.

- **Comment:** The movement or dispersal of upland terrestrial species with limited dispersal capabilities (e.g., chipmunks, salamanders and mollusks) will be adversely affected by reliance on riparian areas and small green-tree retention patches as connectors between reserve areas. Provide large patches of green trees to maintain habitat for these species and to assist their dispersal.

**Response:** Limited information is available concerning the movement of terrestrial species (especially invertebrates) with limited dispersal capabilities in fragmented forest ecosystems. Research is underway to provide information on some of these species. The network of Riparian Reserves, green-tree patches, and Administratively Withdrawn Areas under Alternative 9 would contribute to the dispersal of these species and provide habitat for these species. Assessment ratings considered the uncertainty and risk associated with dispersal of these species. Additional standards and guidelines have been incorporated into Alternative 9 which would further alleviate these concerns. Refer to Alternative 9 standards and guidelines in Chapter 2 and Appendix B11 for additional information on these measures.

- **Comment:** The size and location of the BLM's Connectivity/Diversity Blocks are not adequate for maintaining old-growth habitat. For example, 33 percent of the blocks in the Medford District contain no late-successional habitat at all, and an additional 24 percent of the blocks contain significantly less old growth than the 25 to 30 percent level that the SEIS seeks to maintain.

**Response:** The objectives for establishing Connectivity/Diversity Blocks were related to enhancing richness and diversity throughout the landscape, and linking large areas of late-successional forest habitat with smaller islands of this habitat. Maintaining or creating appropriate habitat links between the large habitat blocks was often more important than protecting all existing old growth. Landscape factors such as the presence of other reserves, Areas of Critical Environmental Concern, and Wild and Scenic Rivers were considered in locating Connectivity/Diversity Blocks. Blocks with little existing late-successional forests will develop desired old-growth characteristics over time.

- **Comment:** The SEIS should address habitat management for wildlife species that use residual old-growth and late-successional forest components in the early and mid-seral stages. Provide more detailed standards and guidelines including: (1) the number, size and type of snags and green trees to be retained; (2) an analysis of the relationship between snag and green-tree densities and projected population densities of cavity-nesting species; and (3) an analysis of snag recruitment rates. Adopt snag guidelines consistent with Thomas et al. (1993), including no removal of snags greater than 20 inches diameter at breast height. Clarify the percentage of the cavity-dweller population that should be managed for in the matrix under the preferred alternative.

**Response:** The alternatives provide for snags, coarse woody debris and green trees in the matrix, and Riparian Reserves interspersed throughout the matrix which should provide some residual old-growth and late-successional forest components. In the Final SEIS, snag, coarse woody debris, and green-tree retention standards and guidelines have been revised in Alternative 9 to provide enhanced habitat

features for certain late-successional associated species in the matrix. Analysis of the relationship between snag and green tree densities and projected population densities of cavity-nesting species may be conducted in subsequent plans adopted after the Record of Decision has been signed. Some of these analyses, as well as analyses of snag recruitment rates, have already been completed for the current plans and draft plan preferred alternatives (e.g., USDI BLM 1992a-f). The goal for the matrix under the preferred alternative is to provide at least a 40 percent population level of cavity dweller species. The specifics of managing for old-growth and late-successional forest components within the matrix will be determined after project-level environmental analysis.

- **Comment:** Reliance on current plans and draft plan preferred alternatives to meet snag objectives in the matrix is inappropriate, due to current state safety standards which do not permit attainment of goals for snag retention.

**Response:** Retention of green trees in the amounts required under the various alternatives should provide adequate numbers of live, decadent trees as well as allowing for the recruitment of snags in the future. Analysis of snag recruitment rates in current plans and draft plan preferred alternatives supports this contention (USDI BLM 1992a-f). Retention of existing snags usually varies from site to site based on such factors as safety considerations, topography, slope, and number and condition of existing snags in stands prior to harvest.

- **Comment:** There needs to be a regional strategy for bats.

**Response:** The alternatives in the SEIS each constitute a regional strategy that specifically addresses bats associated with late-successional forests. The needs of these bats are considered at a programmatic level in the design of each alternative. In addition, some additional standards and guidelines designed, in part, to enhance and protect bat habitat, have been incorporated into Alternative 9 in the Final SEIS. Refer to the Final SEIS, Chapter 2, Alternative 9, Standards and Guidelines and Appendix B11 for a description of these measures.

- **Comment:** To assist the band-tailed pigeon, avoid Douglas-fir monocultures and interplant cascara, elderberry and holly to provide forage for spring migrants.

**Response:** Specific management actions for the band-tailed pigeon would be considered, if necessary, in the Forest and District plans.

- **Comment:** The band-tailed pigeon should have been considered a late-successional species, and the dusky-footed woodrat should not have been considered a late-successional species in California.

**Response:** The list of animals closely associated with late-successional forests and their components was developed based on existing assessments and publications, and the advice of experts who reviewed the lists to ensure they represented all federal lands within the range of the northern spotted owl. These experts made the decisions on which species were considered late-successional associated species. The two changes suggested here would not have measurably changed the allocations and standards and guidelines specified under the various alternatives.

- **Comment:** Clarify whether the alternatives meet the requirements of the Migratory Bird Treaty Act of 1918. The alternatives should assure that habitat is not degraded and that migratory species covered by the Act are protected.

**Response:** The Migratory Bird Treaty Act prohibits the taking of migratory birds except under permit. "Taking", for purposes of this Act, means to pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to take any such action (see 50 CFR 10.12). Not all migratory birds use late-successional forest

ecosystems. For those that do, the network of Late-Successional and Riparian Reserves, in addition to the standards and guidelines specified for the matrix lands, is consistent with the Migratory Bird Treaty Act.

- **Comment:** Wildlife species would benefit if thinnings were allowed in closed 110 to 130- year-old stands that are essentially pure Douglas-fir with little understory.

**Response:** Management of these stands will vary depending on the management objectives for the various land allocations under each alternative. The effects on wildlife from thinning these stands are likely to be both beneficial and adverse, depending on the species.

- **Comment:** Address the current condition of species habitat across the range of the northern spotted owl.

**Response:** The SEIS provides data on the general forest structural condition within the range of the northern spotted owl. These data, along with the amount and distribution of reserves and matrix, plus standards and guidelines for these land allocations, formed the background information from which the conclusions on habitat sufficiency for late-successional associated species were derived. Site-specific habitat condition data for many of the species considered in the SEIS were not available for assessment, as acknowledged in the FEMAT Report.

- **Comment:** The Final SEIS should include the list of late-successional associated arthropods that was developed for the Assessment Team but was not included in either the FEMAT Report or the Draft SEIS.

**Response:** These species were analyzed and rated in functional groups, not species-by-species, for reasons of practicability. The list to which the comment refers is available in the administrative record.

- **Comment:** The SEIS approach to assessing impacts of the alternatives on forest invertebrate species is oversimplified. There is enough knowledge on the natural history and species diversity of certain groups of forest invertebrates (e.g., carabid beetles and mollusks) to conduct "gap analysis" and geographically identify areas of high diversity and endemism. The SEIS could then tailor conservation programs for the protection of these areas.

**Response:** Ratings for arthropods and their allies expressed the likelihood that habitat to support functional groups would be maintained, rather than expressing the likelihood of providing habitat for individual species. This approach emphasizes ecosystem function, rather than a species-by-species analysis, and was necessary because many of the species have not yet been identified and described. These ratings are preliminary and subject to modification as new scientific information becomes available. Due to the general paucity of information on this group, gap analysis would not generally be useful.

- **Comment:** Reliance on protection of forest successional stages alone may not be the best conservation strategy to provide habitat sufficient to support stable, well-distributed populations of late-successional associated species within the range of the northern spotted owl. For example, successional categories of forest are poor surrogates for measurable stand structural factors that determine habitat quality for the northern spotted owl.

**Response:** While admittedly not in a precise fashion, a forest strategy based on successional stage does account for structural features important to wildlife species. For example, maintenance of the late-successional forest stage provides reasonable assurance that its associated attributes (i.e., multiple

canopy layers; presence of large, old trees, numerous snags, and down woody debris; and microclimatic conditions) would also be maintained as a component of overall forest diversity in the range of the northern spotted owl.

- **Comment:** There is no objective, quantified process available for determining the acreage of late-successional forests to be set aside for associated species, where to emphasize them, and in what arrangement to distribute them. The approach taken in the SEIS is simply that "more is better."

**Response:** There is no quantitative, mechanical process for determining the best amount, arrangement, and location of late-successional forests to meet the variety of objectives for the federal forests in the range of the northern spotted owl. Nevertheless, the SEIS considers not only the amount of habitat of species associated with late-successional and old-growth forests in its analysis, but also habitat location and distribution.

- **Comment:** The alternatives must protect the rights of American Indians to have wildlife protected to secure the exercise of hunting rights. For example, the FEMAT Report recommends closure of all federal lands to kill-trapping of martens under all alternatives until incidental take of fishers is determined to be insignificant. Clarify whether this restriction would apply to tribal off-reservation reserved treaty rights.

**Response:** None of the alternatives in the SEIS would restrict tribal off-reservation reserved treaty rights.

## Aquatic Wildlife and Habitat

The following comments and responses address the Aquatic Conservation Strategy, Riparian Reserves, Key Watersheds, aquatic species, watershed restoration, watershed analysis, effects analysis, and other issues.

### AQUATIC CONSERVATION STRATEGY

- **Comment:** The standards and guidelines for fish-bearing streams in the matrix do not ensure that the streams are adequately protected.

**Response:** All streams and wetlands, regardless of whether they are fish bearing, are included within the Riparian Reserve land allocation (Chapter 2). The Riparian Reserve land allocation applies regardless of the adjacent land allocation. The standards and guidelines for Riparian Reserves apply to all streams and wetlands on federal lands within the range of the northern spotted owl. The primary emphasis of Riparian Reserves is restoration of the ecological processes and stream habitats that support riparian-dependent organisms. The standards and guidelines prohibit activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives.

- **Comment:** Protection of riparian-dependent species should consider the effects of management activities in upland areas, such as changes to hydrology, sediment yields, and road construction.

**Response:** The Aquatic Conservation Strategy takes into account the potential effects of management activities in all areas within a watershed. The Riparian Reserves are designed to maintain ecological functions and to protect stream and riparian habitat and water quality for all streams and wetlands. Key Watersheds have additional requirements which must be met prior to implementing any management activities within their boundaries. In the short term, watershed analyses (which will include upland

areas) must be completed before initiating actions within a Key Watershed; actions other than timber harvest that are categorically excluded (40 CFR 1508.4) from environmental NEPA documentation are excepted. The Aquatic Conservation Strategy encourages conducting watershed analyses on all watersheds containing lands administered by the Forest Service and BLM within the range of the northern spotted owl.

- **Comment:** Although Riparian Reserves occupy a significant part of the landscape, they cannot meet Aquatic Conservation Strategy objectives because many of the riparian areas do not currently have late-successional forest characteristics.

**Response:** The intent of the Aquatic Conservation Strategy is to maintain and restore riparian and aquatic habitats and the watershed functions and processes within the natural disturbance regime. Specific information on the current degraded state of stream conditions on federal and nonfederal lands in Oregon and Washington are discussed in Chapter 3&4 of this SEIS. Assuming that stream conditions are related to the condition of riparian areas, information on stream conditions indicates the extent of degradation in riparian areas. As noted in the aquatic discussion in this SEIS, it is not possible, regardless of the management strategy selected, to provide for the complete recovery of aquatic systems on federal lands within the range of the northern spotted owl within the next 100 years, and full recovery may take as long as 200 years. Implicit in this analysis is the understanding that many riparian areas do not currently have late-successional forest characteristics.

- **Comment:** The Aquatic Conservation Strategy will not protect habitat for at-risk anadromous fish because it relies on a system of Key Watersheds. The Key Watershed network limits habitat for at-risk anadromous fish stocks to refugia, which limits interaction among local populations.

**Response:** The Aquatic Conservation Strategy is more than a system of Key Watersheds. In addition to the Key Watersheds, the strategy's key components include Riparian Reserves and their standards and guidelines, the watershed analysis process, and watershed restoration programs. These other components provide the mechanisms to protect and restore riparian and aquatic habitat in areas within and outside Key Watersheds by creating a connected network of aquatic and riparian habitats.

- **Comment:** Analyze the effects of the alternatives on fishery management plans.

**Response:** The Aquatic Conservation Strategy is designed to maintain and restore aquatic and riparian habitats on federal lands within the range of the northern spotted owl. As such, the alternatives presented in the SEIS should not conflict with fishery management plans.

- **Comment:** The 50-11-40 rule provided better protection for water quality than measures required under the Aquatic Conservation Strategy.

**Response:** The Riparian Reserves and the standards and guidelines regulating actions within Riparian Reserves generally provide better protection for water quality than the 50-11-40 rule. First, the standards and guidelines for Riparian Reserves restrict activities within riparian areas to those actions that contribute to meeting Aquatic Conservation Strategy objectives. Timber management is restricted to: (1) removal of down and/or damaged trees resulting from catastrophic events if salvage is necessary to meet Aquatic Conservation Strategy objectives, and (2) silvicultural practices that would achieve desired vegetation characteristics. The 50-11-40 rule applied to the entire landscape and thus did not specifically restrict timber harvest in riparian areas. Under Alternative 9, the network of Late-Successional Reserves and green-tree retention standards and guidelines, along with the contiguous design of Riparian Reserves, provide a more connected system of riparian habitat than under the 50-11-40 rule. In addition, the watershed restoration component of the Aquatic Conservation Strategy focuses on improving upland

and riparian conditions that contribute to restoring water quality. Thus, the Aquatic Conservation Strategy provides a more comprehensive approach to protecting water quality than does the 50-11-40 rule.

- **Comment:** The Aquatic Conservation Strategy uses circular logic by using Riparian Reserves and Key Watersheds as the basis for "ecosystem management."

**Response:** The Aquatic Conservation Strategy uses Riparian Reserves and Key Watersheds to protect high quality habitat now and in the future. These areas comprise the part of the strategy that focuses on important refugia. The Key Watersheds also serve as priority areas for restoration in the short term. Watershed-based planning at the province, river basin, and smaller watershed levels, using information derived from watershed analysis, provides the opportunity to implement ecosystem management in both the short term and long term.

- **Comment:** The Aquatic Conservation Strategy focuses on protecting and restoring aquatic habitat within the range of the northern spotted owl to restore at-risk anadromous fish. Yet, the SEIS does not determine that freshwater habitat limits the production of anadromous fish.

**Response:** All anadromous fish require freshwater habitat to complete their life cycles. Rather than focus on a limiting-factors analysis, the Aquatic Conservation Strategy in this SEIS emphasizes maintaining and restoring complex aquatic habitats for fish and other riparian-dependent species. A number of factors affect the survival and production of anadromous fish within the range of the northern spotted owl. Whether freshwater habitat is the limiting factor for the production of anadromous fish is less important than ensuring that high quality habitat is available to the fish during the freshwater phase of their life histories.

- **Comment:** The SEIS includes detailed information about the amount of habitat available for the various terrestrial species within the range of the northern spotted owl but does not do the same for fish. Information on known distribution of fish within the range of the northern spotted owl should be included to show the relative contribution of streams on federal and nonfederal lands for the various fish species.

**Response:** The Aquatic Conservation Strategy is a regional approach to maintaining and restoring watersheds and their aquatic and riparian habitats. The strategy considers all existing and potential fish habitat and does not rely on known distributions of fish for the analysis. Fish distribution was used, however, to develop the Key Watershed network. Subsequent management actions could consider distribution of fish if deemed appropriate for the level of analysis. The watershed analysis process allows agencies to develop management objectives or restoration actions for specific streams; various reaches within a given stream; and fish groups, races, and species. The process also updates information on fish distribution.

- **Comment:** The Aquatic Conservation Strategy is based on natural disturbance processes, but none of its nine objectives include restoration to natural or near-natural levels.

**Response:** The discussion in Appendix B6, Aquatic Conservation Strategy, references the natural disturbance regime. This implies that ranges of natural variability, determined through watershed analysis, will be used to set habitat objectives. The range of natural variability of any parameter includes natural or near-natural levels. The term "natural level" implies static conditions and does not account for the natural disturbance regime operating within a river basin or smaller watershed.

- **Comment:** Alternative 9 should be revised to include standards and guidelines that preclude further degradation of aquatic and riparian habitat.

**Response:** The standards and guidelines for Riparian Reserves in Appendix B6 of this SEIS apply to all the alternatives except Alternative 7. The standards and guidelines are designed to prohibit activities that retard or prevent attainment of Aquatic Conservation Strategy objectives. The text of this SEIS includes a discussion on the context for consideration of future actions (see Appendix B6, Aquatic Conservation Strategy). Future management decisions affecting aquatic and riparian habitat must comply with the Aquatic Conservation Strategy. Under this strategy, management of aquatic and riparian-dependent resources under all the alternatives in this SEIS emphasizes the prevention of further degradation. Future actions that affect or potentially affect aquatic and riparian habitats will be those that maintain or restore the physical and biological processes operating within a watershed, and are based on the range of natural variability.

## RIPARIAN RESERVES

- **Comment:** The amount of Riparian Reserves varies by alternative. Clarify where the Riparian Reserves apply.

**Response:** Riparian Reserves overlay all land allocations for all alternatives except Alternative 7. The differences in acres displayed in Table 2-1 of this SEIS are due to differences in allocations by alternative, and due to the hierarchical relationship of the presentation of land allocations by alternative.

- **Comment:** The standards and guidelines for Alternative 9 in the Draft SEIS that protect intermittent streams and wetlands outside Tier 1 Key Watersheds are inadequate.

**Response:** The analysis in this SEIS displays the effects of the three Riparian Reserve Scenarios for protecting and restoring riparian and aquatic habitat. The three scenarios provide the decision makers with a range of alternatives for managing riparian areas within the range of the northern spotted owl. The results of the analysis of federal habitat assessments for fish shows that Riparian Reserve Scenario 1 affords more protection to riparian areas than Riparian Reserve Scenarios 2 and 3. The analysis further shows that Riparian Reserve Scenario 2, and the applicable standards and guidelines for protecting intermittent streams and wetlands, is adequate to protect the ecological integrity of intermittent streams. The difference is a reduction in risks due to management-related disturbances because of the wider Riparian Reserves for intermittent streams in Tier 2 Key Watersheds and non-Key Watersheds. Riparian Reserve Scenarios 1 and 2 would reverse the trend of riparian and aquatic habitat degradation and begin recovery of these habitats. Alternative 9 of this Final SEIS includes Riparian Reserve Scenario 1 to decrease the risks to riparian and aquatic dependent species. Watershed analysis will provide information to be used by decision makers to adjust Riparian Reserve boundaries to meet site-specific conditions. Should the decision makers determine that a level of protection higher than that provided by Alternative 9 is necessary, selection of a more restrictive alternative is an option available to them.

- **Comment:** The Riparian Reserve system will change the microclimate in the riparian area to that of the adjacent cutover stand due to edge effect.

**Response:** The Riparian Reserve widths are designed to minimize edge effect on interior riparian microclimate. Information from upland forest areas was used to generate the curves of the relationship of microclimate and distance from edge of clearcuts shown in Figure 3&4-3 of this SEIS. The Assessment Team applied the same principles to riparian areas.

- **Comment:** The description of Riparian Reserves in the Draft SEIS is not the same as that described in the FEMAT Report.



**Response:** The standards and guidelines in Appendix B6, Aquatic Conservation Strategy, of this Final SEIS are the same as those for Riparian Reserves in the FEMAT Report.

- **Comment:** The standards and guidelines for Riparian Reserves should specifically include the objectives and components of the Aquatic Conservation Strategy and should include the minimum required widths of Riparian Reserves.

**Response:** The standards and guidelines in Appendix B6, Aquatic Conservation Strategy, provide the Riparian Reserve definitions, including the prescribed widths. The Aquatic Conservation Strategy objectives do not meet the definition of standards and guidelines and thus, are not included. The objectives do, however, provide overall guidance on interpretation and application of the standards and guidelines.

- **Comment:** The Draft SEIS definition of a site-potential tree does not describe whether the height of a site-potential tree will be determined at the province, river basin, or watershed levels.

**Response:** The area to be considered for determining a site-potential tree is not defined due to the programmatic nature (i.e., broad scope) of this SEIS. The area of consideration for determining a site-potential tree varies by level of planning and analysis. Analysis at the province level will be much less specific than analysis at a smaller watershed level. The recommended site-potential tree will be initially based on Forest and District Plans. These site-potential tree definitions will apply to Riparian Reserves until site-specific factors to adjust Riparian Reserve boundaries are considered during watershed analysis. Site potential can be refined during watershed analysis to incorporate site-specific conditions. For example, site potential will vary from the headwaters down to larger rivers, and from the floodplains to the upslope upland areas. There can also be homogeneous Riparian Reserves along certain streams.

- **Comment:** The Riparian Reserve standards and guidelines are inadequate to prevent further degradation to fish habitat because they are too vague to ensure accountable implementation.

**Response:** A watershed analysis must precede the implementation of any proposed actions directly affecting Riparian Reserves. Information needed to develop site-specific habitat objectives, and monitoring plans tailored to those objectives, will be developed during watershed analysis. Decision makers for the respective agencies will use the results of watershed analysis to define habitat objectives and monitoring specific to the habitat objectives.

## KEY WATERSHEDS

- **Comment:** The Key Watershed network was based on the needs of at-risk anadromous fish stocks and did not consider other riparian-dependent vertebrates such as Olympic salamander and tailed frogs. The Assessment Team evaluated the effects of the alternatives on fish but did not assess other aquatic and riparian-dependent species. Thus, the selected alternative should establish a system of Key Watersheds for riparian-dependent species other than the at-risk anadromous fish stocks.

**Response:** The focus of the Key Watershed network is to serve as refugia for at-risk anadromous fish stocks. The Key Watershed network is designed primarily to meet the habitat needs of large, highly mobile species such as anadromous fish. The Riparian Reserve network will directly serve the habitat needs of less mobile species with smaller ranges such as tailed frogs. The effects to other aquatic and riparian-dependent species are displayed in Chapter 3&4. Other aquatic and riparian-dependent species could include subsets of mammals, amphibians, mollusks, plants, lichens, and bryophytes. The combination of the Key Watershed network, Riparian Reserves, existing high quality riparian and

stream habitat, and improved riparian and stream conditions expected in the future will benefit other riparian-dependent vertebrates.

## AQUATIC SPECIES

- **Comment:** The Aquatic Conservation Strategy adequately addresses concerns for salmonids but does not adequately protect other riparian-dependent species such as sculpin and amphibians.

**Response:** One function of Riparian Reserves is to protect habitat used by riparian-dependent species, including salmonids. Riparian Reserves are designed to be large enough to protect the ecological values required by riparian-dependent plant and animal species. Objectives 1, 2, 8, and 9 of the Aquatic Conservation Strategy (Appendix B6, Aquatic Conservation Strategy) specifically address maintaining the diversity of habitat conditions necessary to support the diversity of plants, invertebrates, and vertebrates that depend on healthy riparian systems. The standards and guidelines for Riparian Reserves in Appendix B6 are designed to prohibit activities within the Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy objectives. Riparian-dependent species other than fish can be protected during project implementation by adjusting Riparian Reserve boundaries based on the results of watershed analysis.

- **Comment:** Some streams within the range of the northern spotted owl can be both intermittent and fish-bearing. These are two separate criteria under the Riparian Reserves. Prioritize the criteria to be applied when conditions overlap.

**Response:** To meet the objectives of the Aquatic Conservation Strategy, the more restrictive criterion would apply. Given this situation, the stream would be managed under the Riparian Reserve strategy for fish-bearing streams.

- **Comment:** The SEIS states that one reason for not considering all 21 races/species/groups of fish within the range of the northern spotted owl was lack of knowledge on life history and ecology of the fish. However, the SEIS does not outline plans to collect needed life history and ecology information.

**Response:** The missing life history and ecology information was not necessary to complete the analysis of expected effects on fish for this SEIS. Further, the Aquatic Conservation Strategy will protect fish habitat by protecting aquatic ecosystem and watershed functions and processes. The analysis in this SEIS on the effects of the alternatives on aquatic habitat and fish was based on the seven races/species/groups of fish that use a wide range of conditions from larger river systems to headwater streams. All require clean gravel and cool, oxygenated water to reproduce, and require diverse and complex habitats. This analysis implies that providing the array of natural functions and processes in riparian and aquatic systems to benefit the seven races/species/groups would also benefit fish species for which there is little life history information. The assessments for riparian-dependent amphibians parallels the results of the assessment outcomes developed for the seven races/species/groups of fish. This supports the assumption that the habitat conditions used by the seven races/species/groups would benefit other species. A monitoring program may be developed to provide information in cases where management decisions could affect fish species about which there is little information and there is a high level of uncertainty on effects of implementing the action. This scenario fits within the adaptive management process proposed in this SEIS. To determine the effects of actions, monitoring will take into account the life history and ecology of fish that may be affected. If that information is lacking, then collecting that information could be part of the monitoring program.

- **Comment:** The Assessment Team considered 21 races/species/groups of fish and evaluated only seven of those. Specifically, the Assessment Team did not consider pink, chum, and sockeye salmon in their

assessment of the likelihood of attaining a set of outcomes for habitat for fish on federal lands. The Draft SEIS does not describe the relationship of the seven species/races/groups of fish evaluated to the 257 anadromous fish stocks at risk occurring on federal land.

**Response:** The analysis did not consider individual stocks of fish. Rather, the analysis considered seven races/species/groups of fish for a number of reasons outlined in Chapter 3&4 of this SEIS. The habitat requirements of the seven races/species/groups of fish evaluated generally represented those required by the stocks at risk. Pink, chum, and sockeye salmon were not included in the assessment primarily because of their limited distribution on federal land within the range of the northern spotted owl

- **Comment:** The Aquatic Conservation Strategy identifies Key Watersheds as being areas containing important refuge habitat for the stocks at risk. The Key Watershed network will work well for coho and chinook salmon and steelhead but it is not adequate for pink and chum salmon.

**Response:** While the range of pink and chum salmon includes Oregon and Washington, most of these fish occur in Washington. Pink and chum salmon tend to spawn in tidally influenced portions of rivers or a short distance upstream. Some Key Watersheds encompass pink and chum salmon habitat. However, there is little federal land that overlaps tidally influenced portions of rivers and streams within the range of pink and chum salmon. Even though there are few Key Watersheds encompassing pink and chum salmon habitat, all existing and potential pink and chum salmon habitat on federal lands is encompassed by Riparian Reserves and will be adequately protected..

- **Comment:** The habitat assessments for fish under Alternative 7 reflect the different management scenarios for riparian areas in the existing Forest and District Plans. Describe some of the differences between the Forest and District Plan standards and guidelines for management within riparian areas.

**Response:** Management direction in existing Forest and District Plans will result in riparian area conditions that may be better or worse than at present, depending on the plan. Overall, the habitat assessments reflect the range of outcomes anticipated from the Forest and District Plans for habitat to support fish.

- **Comment:** Many of the rivers and streams on federal land within the range of the northern spotted owl do not have an adequate number of adult fish returning to fully occupy available habitat. The Aquatic Conservation Strategy is not comprehensive enough to affect recovery of at-risk anadromous fish stocks because it ignores the effect on fish numbers from ocean conditions, recreational and commercial harvest, habitat changes due to floodplain development, predation by sea mammals, and management-related actions such as timber harvest and dam building. The goal of restoring and maintaining fish populations within the range of the northern spotted owl will not be achieved unless accompanied by management plans that restrict harvest.

**Response:** Chapter 3&4 of this SEIS discusses the many factors influencing anadromous salmonid populations. The section titled The Purposes, in Chapter 1 of this SEIS, outlines the scope of the proposed action, which in turn determined the primary focus of consideration. Management of sea mammals, ocean conditions, recreational and commercial harvest, and other non-habitat related factors on federal lands within the range of the northern spotted owl that affect fish production, are beyond the scope of the proposed action of this SEIS and are outside the authority of either joint lead agency. The section titled Cumulative Effects/Role of Nonfederal Lands in Chapter 3&4 of this SEIS discusses this issue.

- **Comment:** The Tier 1 Key Watershed network under the Aquatic Conservation Strategy focuses on at-risk fish stocks and fails to consider riparian-dependent species other than fish.

**Response:** The regional Aquatic Conservation Strategy protects more than riparian areas in Key Watersheds. While the Tier 1 Key Watershed network focuses on at-risk anadromous fish stocks, the Riparian Reserves protect all riparian areas on federal lands within the range of the northern spotted owl. Improved habitat conditions for the at-risk anadromous fish stocks will also benefit other riparian-dependent species. The results of the analysis in this SEIS indicates that riparian and aquatic habitats will improve under all alternatives except Alternatives 7 and 8. The rate of improvement depends on the alternative and land allocations. Key Watersheds are expected to recover at a faster rate than aquatic and riparian areas in non-Key Watersheds.

- **Comment:** Additional watershed and riparian protection may be required if fish, in particular the at-risk salmonids within the range of the northern spotted owl, are listed under the Endangered Species Act.

**Response:** Additional management objectives to protect fish listed under the Endangered Species Act will be determined largely through Section 7 consultation. Watershed-based analysis at province, river basin, and subwatershed levels will provide opportunities to establish site-specific habitat objectives to protect watersheds and streams inhabited by the at-risk fish stocks outside Key Watersheds. If the results of watershed analysis show the need to increase protection of riparian and stream habitat for at-risk fish stocks in non-Key Watersheds, habitat objectives will be established by site-specific NEPA documents based on the results.

- **Comment:** The Final SEIS should address the uncertainties regarding salmonid population genetics in more detail.

**Response:** Greater detail on population genetics of salmonids is beyond the scope of this SEIS. The existing discussion and analysis of salmonid populations is appropriate for assessing the effects of the alternatives presented in this programmatic SEIS.

- **Comment:** The habitat assessment ratings for anadromous fish stocks at risk under Alternative 9 are too low to restore anadromous fish populations to historic levels. The alternatives do not guarantee continued existence of many of the anadromous fish stocks at risk. The results of the assessments reflect this uncertainty.

**Response:** All alternatives except 7 and 8 are projected to reverse the trend of degradation and begin recovery of aquatic ecosystems and habitat on federal lands within the range of the northern spotted owl. Chapter 3&4 of this SEIS shows that Alternative 9, which includes the standards and guidelines incorporated since the Draft SEIS, results in ratings equivalent to the ratings for Alternative 4. Even with changes in land management practices and implementation of comprehensive restoration, it is possible that none of the alternatives would completely recover all degraded aquatic ecosystems within the next 100 years.

- **Comment:** Alternatives 1 and 4 provide a higher likelihood of attaining sufficient aquatic habitat to support well-distributed, stable populations of riparian and aquatic-dependent species on federal lands throughout the range of the northern spotted owl than Alternative 9. The 65 percent assessment rating for anadromous fish under Alternative 9 is too low to reverse the decline in anadromous salmonids. The decision makers should either modify Alternative 9 to achieve a higher likelihood of attaining sufficient aquatic habitat to support well-distributed, stable populations of riparian and aquatic-dependent species on federal lands, or they should select Alternatives 1 or 4.

**Response:** The results of the analysis within the SEIS show that all alternatives except 7 and 8 would reverse the trend of aquatic and riparian habitat degradation and begin recovery of these habitats on

federal land. The ratings are expert opinions on the likelihood of certain outcomes. They are not precise analyses of likelihoods of habitat and response of the species population to the expected habitat conditions. The ratings are intended to aid the decision makers in determining trade-offs between costs and risks. Chapter 3&4 of this SEIS shows that Alternative 9, which includes the standards and guidelines incorporated since the Draft SEIS, has an 80 percent or higher likelihood of attaining sufficient aquatic habitat to support well-distributed, stable populations of fish on federal lands. Appendix B11 describes the process for conducting the additional species analyses and displays the proposed mitigation measures. The Secretaries of Agriculture and the Interior are the responsible officials for this SEIS. They will review the projected effects of the alternatives in this SEIS on aquatic habitat. They have the option of choosing or modifying any alternative. The Record of Decision will describe their rationale for adopting the selected alternative.

## WATERSHED RESTORATION

- **Comment:** The standards and guidelines for watershed and habitat restoration in the SEIS should be expanded to include the section titled Elements of a 10-year Forest Ecosystem Restoration Program from Appendix V-J of the FEMAT Report.

**Response:** Appendix V-J of the FEMAT Report outlines a timeframe and the processes for conducting a restoration program. Although the standards and guidelines in Appendix B6 do not include the Elements of a 10-year Forest Ecosystem Restoration Program, this SEIS includes watershed restoration as a key component of the Aquatic Conservation Strategy for all alternatives except Alternative 7. The analysis contained in this SEIS assumes implementation of a watershed restoration program. Application of watershed restoration will be similar to that described in Appendix V-J of the FEMAT Report. The major difference is that there will not be a new team formed to specifically address watershed restoration projects. Key Watersheds serve as focal points for watershed analyses and development of the initial watershed restoration efforts. Implementation of restoration projects is expected to occur following preparation of project-specific NEPA documents, and will depend on funding.

- **Comment:** Stream improvement practices are short-term, high-risk actions that may offer little chance for success. Provide evidence that instream habitat improvement projects will succeed at increasing the numbers of returning adult anadromous fish.

**Response:** Appendix B6, Aquatic Conservation Strategy, of this Final SEIS states that instream improvements are to occur only after physical and biological processes and deficiencies have been assessed. These improvements are not to be substituted for habitat protection or to justify risky land management activities and practices. This SEIS also notes that instream improvement is a short-term management strategy and can be an important component in an overall program to restore fish and riparian habitat, including the long-term restoration of watersheds.

Many studies have been designed to analyze the effects of instream improvement projects, that focus on changes to habitat complexity and species composition and density. The scientific literature contains few references to successful projects where success was based on adult fish produced. There is information available that describes projects that are successful in restoring aquatic habitat complexity. Projects that use instream improvement to maintain desired levels of channel habitat complexity as a short-term solution, in combination with watershed and riparian restoration, are recommended by the Aquatic Conservation Strategy (Appendix B6).

- **Comment:** Instream improvement projects should be limited to areas of high productivity, such as low gradient lands, lowlands, and floodplain streams and estuaries on federal lands.

**Response:** Analysis of baseline stream habitat conditions, relative to the typical range of natural variability for these conditions, will occur during watershed analysis. The results of watershed analysis will be used to develop watershed restoration and instream-habitat improvement projects. Project design will occur at the site-specific project level.

- **Comment:** The outcome for fish within the range of the northern spotted owl is biased towards Alternative 9 because of the overly optimistic reliance on watershed restoration which the other alternatives lack. In addition, watershed restoration is currently untested and therefore, the Assessment Team erred in including it in the Aquatic Conservation Strategy and their evaluations.

**Response:** Chapter 3&4 describe the factors that influenced the analysis. Watershed restoration was one of the factors considered, but it did not influence the results as much as other factors (such as Riparian Reserve scenario) included in a given alternative. The Assessment Team assumed that all alternatives except Alternative 7 contained equivalent watershed restoration programs; thus, watershed restoration was not a factor resulting in strong differences between these alternatives. Recovery of riparian habitat, in part, depends on full implementation of the Aquatic Conservation Strategy, which includes watershed restoration. Watershed restoration was considered but given less weight during the evaluation. Further, watershed restoration is considered a short-term solution. The Aquatic Conservation Strategy, or components of the strategy, is included in all alternatives except Alternative 7.

- **Comment:** Restoration is a key component of the Aquatic Conservation Strategy but the Draft SEIS does not describe the framework for proposed restoration. Specifically, the standards and guidelines for salvage in Appendix B should describe buffer widths, coarse woody debris requirements, and restoration objectives.

**Response:** The Aquatic Conservation Strategy includes objectives for aquatic and riparian habitat within the range of the northern spotted owl. The specific restoration projects and objectives and the Riparian Reserve boundaries will be identified through watershed analysis and implemented through subsequent project-level decisions.

- **Comment:** Watershed and riparian restoration programs must be implemented as long-term programs.

**Response:** The province-level planning and watershed analysis aspects of watershed-based planning provide mechanisms to define long-term restoration programs. The Aquatic Conservation Strategy (Appendix B6) describes both short-term and long-term aspects of watershed and riparian restoration.

## WATERSHED ANALYSIS

- **Comment:** Identify the criteria to determine when an aquatic ecosystem is recovered.

**Response:** The alternatives in this SEIS establish new analytical levels based on watersheds at the province, river basin, and watershed scales. It is not appropriate at a regional scale to develop quantitative criteria because of the heterogeneity of habitats and processes operating within the planning area. Analyses at the province, river basin, and watershed levels will provide information to define objectives and restoration criteria specific to those levels.

- **Comment:** The standards and guidelines pertaining to timber management in Riparian Reserves allow salvage after a determination that present and future needs for coarse woody debris have been met. The standards and guidelines should be changed to require exceeding this level to account for unexpected disturbance.

**Response:** Present and future coarse woody debris needs will be analyzed in watershed analysis. Watershed analysis results will define a range of coarse woody debris levels that reflect the range of natural variation, rather than a static target level. The range of natural variation accounts for unexpected disturbances.

- **Comment:** The Aquatic Conservation Strategy objectives are difficult to quantitatively define. Specifically, there are no quantitative water quality or fish habitat objectives.

**Response:** The programmatic scope of this SEIS is not an appropriate level to define quantitative water quality and fish habitat objectives for the entire range of the northern spotted owl. Water quality and fish habitat objectives will be determined at either the province or the river basin and watershed levels. Agencies will use the results of watershed analysis to develop management objectives and restoration actions for specific streams; various reaches within a given stream; and fish groups, races, and species.

## EFFECTS ANALYSIS

- **Comment:** There is scientific evidence showing that degradation of forest habitat can adversely affect salmonid production, yet there is no evidence to show that continued salmonid production relies on old-growth forests.

**Response:** This Final SEIS includes a thorough discussion of the factors that affect maintenance and creation of complex aquatic habitats and, thus, salmonid production. The quality and complexity of aquatic habitat is a function of the riparian area and watershed. The distribution and density of coarse woody debris affects aquatic habitat complexity. Typically, the size of woody material needed to diversify aquatic habitat comes from old-growth forests. The quantity, distribution, and size of the coarse woody debris required to create the aquatic habitat complexity will be evaluated through watershed analysis.

- **Comment:** The SEIS does not display the effects of achieving well-distributed aquatic habitat within the range of the northern spotted owl that would occur without a watershed restoration program.

**Response:** The analysis in this SEIS is based on the assumption that all alternatives except 7 include all the components of the Aquatic Conservation Strategy. This includes the watershed restoration program described in Appendix B6, Aquatic Conservation Strategy, of this SEIS. The outcomes for the assessment for aquatic species in Chapter 3&4 depict differences between Alternative 7, which does not contain a comprehensive watershed restoration program, and the rest of the alternatives that do contain a comprehensive watershed restoration program. Differences in outcomes, however, are not directly related to inclusion of a watershed restoration program because of variations in land allocations between alternatives.

- **Comment:** Some stream habitat has improved in recent years under a strategy of protecting and enhancing fisheries and harvesting timber. The SEIS offers no evidence to justify the management restrictions within Riparian Reserves and Key Watersheds, nor does it define the benefits to salmon and steelhead resulting from the proposed restrictions.

**Response:** Chapter 3&4 of this SEIS describes the current condition of the aquatic and riparian habitat, the relationship of the current condition to past land management actions on federal land, and the rationale for the Aquatic Conservation Strategy. Also included in Chapter 3&4, the analysis of the alternatives on aquatic habitat displays how varied management restrictions affect the assessment outcomes. The assessment outcomes indicate the effectiveness of the three Riparian Reserve scenarios, including Key Watersheds, in achieving well-distributed aquatic habitat within the range of the northern spotted owl.

- **Comment:** Many Riparian Reserves occur along streams not used by anadromous fish, yet much of the discussion and many of the benefits address anadromous fish.

**Response:** Chapter 3&4 of this SEIS describes the dependence of downstream areas inhabited by fish on upstream nonfish-bearing and intermittent streams. In addition, the Aquatic Conservation Strategy (Appendix B6) is intended to benefit species other than anadromous fish. Many other riparian-dependent organisms use these nonfish-bearing and intermittent streams and adjacent riparian areas and, therefore, also benefit from the Aquatic Conservation Strategy.

- **Comment:** The FEMAT Report, Table III-1, p. III-2, displays ratings for at-risk fish stocks for various options or plans. The ratings for at-risk fish stocks for the 1992 BLM Draft Plan Preferred Alternatives (USDI BLM 1992a-f) and the subsequent Revised Preferred Alternative are medium-low and medium-high, respectively. The information shows that, while the 1992 Draft Plan Preferred Alternatives have twice as much acreage in protected riparian classification as the Revised Preferred Alternative, they may have a lower rating. Explain these rating differences.

**Response:** One reason for the unclear relationship between the simple number of acres of protected riparian areas and the ratings is that some of the protected riparian acres could be nested (i.e., located wholly within other allocations). Chapter 2 in this SEIS describes the hierarchical relationship of land allocations by alternative. In general, the more land allocated to other reserves, the less acreage displayed in the tables for Riparian Reserves.

- **Comment:** The SEIS concludes that forest management practices are the primary cause for degraded riparian and aquatic habitat conditions. Identify the streams and areas that were studied so independent reviewers can determine whether these conclusions are accurate.

**Response:** The analyses of aquatic and riparian habitat conditions in this SEIS rely on peer-reviewed literature and agency reports. There is no one source of information; a compilation of information was used in the analyses. Chapter V of the FEMAT Report contains the list of references used to support the analyses.

- **Comment:** The SEIS lacks important information about the effects of the alternatives on salmon habitat. In particular, it does not display the fact that only 30 percent of the nonreserved land containing salmon habitat is included in Key Watersheds.

**Response:** Chapter 2 of this SEIS describes land allocations by alternative. Tables 3&4-10a and 10b have been added to display land allocations by alternative within Key Watersheds. In addition, all existing and potential salmon habitat lies within Riparian Reserves under all alternatives except Alternative 7.

- **Comment:** The SEIS underestimates the extent of degraded aquatic and riparian conditions within the range of the northern spotted owl.

**Response:** Chapter 3&4 of this SEIS acknowledges that streams within the range of the northern spotted owl have been negatively affected by management activities on federal lands. The information used to support the analysis was the best data available and the information sources are identified and referenced in the SEIS and the FEMAT Report. Since there are various ways to describe degraded conditions, as discussed in this SEIS, one source document was not used to develop the baseline information from which the effects were assessed. In addition, not all areas have been inventoried to cover all riparian and aquatic systems on federal lands within the range of the northern spotted owl. This information will be collected as needed to complete watershed analyses.



## OTHER ISSUES

- **Comment:** Address the issue of hatchery fish management.

**Response:** While management is one of many factors that affects populations of fish inhabiting streams that flow through federal lands within the range of the northern spotted owl, it is outside the scope of the proposed action in this SEIS as well as the authority of both joint lead agencies.

- **Comment:** Analyze the risk to aquatic ecosystems from earthquakes.

**Response:** This is issue beyond the scope of this SEIS.

- **Comment:** The Draft SEIS makes contradictory statements regarding the effects of management actions within the range of the northern spotted owl on migration routes for the federally listed Snake River fall chinook salmon.

**Response:** The text of the SEIS has been revised to correct this contradiction.

- **Comment:** Appendix B states that representatives of the BLM and the Forest Service reviewed and revised the standards and guidelines for Riparian Reserves with the participation of the Assessment Team's Aquatic/Watershed group. Describe the revisions made by representatives of the BLM and the Forest Service.

**Response:** Representatives of the BLM and the Forest Service suggested revisions to the standards and guidelines for Riparian Reserves to the Assessment Team's Aquatic/Watershed group to facilitate administration and implementation of the standards and guidelines. These suggested revisions did not change the intent of the standards and guidelines.

- **Comment:** The proposed management scenarios do not adequately protect water quality and fisheries within designated Wild and Scenic Rivers.

**Response:** The Aquatic Conservation Strategy will complement existing management direction for designated Wild and Scenic Rivers. The Aquatic Conservation Strategy is a regional strategy designed to protect and restore water quality and aquatic habitat used by fish within the range of the northern spotted owl. The Aquatic Conservation Strategy will provide measures to protect and restore conditions for riparian-dependent resources which apply to Wild and Scenic Rivers. There may be instances where specific Wild and Scenic River management plans will be more restrictive, and instances where they will be less restrictive than the Aquatic Conservation Strategy. Where the management direction overlaps, the more restrictive direction will be applied. The analysis in this SEIS shows that rivers and streams flowing into Wild and Scenic Rivers will be better protected than under current Forest and District Plans.

- **Comment:** The Draft SEIS does not disclose the effects of the alternatives on critical habitat for the federally listed shortnose and Lost River suckers. Specifically, there is no analysis of effects to changes to the flows in streams used by the fish; changes in stream habitat characteristics; and changes in sedimentation, sinuosity, etc.

**Response:** Due to the programmatic nature of this SEIS and broad level of resolution of its analysis, the Assessment Team analyzed races/species/groups of fish within the range of the northern spotted owl and did not conduct specific river basin analyses.

- **Comment:** Address the effect of the alternatives on tribal fisheries and consider the goals of the Northwest Power Planning Council's Fish and Wildlife Program, *U.S. v. Oregon Columbia River Fish Management Plan*, and the U.S./Canada Pacific Salmon Treaty. In particular, the emphasis on managing for species viability in the SEIS is inconsistent with treaty rights because it does not provide for a sustained harvest of fish.

**Response:** One overriding objective of the Aquatic Conservation Strategy is to restore and maintain the ecological health of watersheds and to maintain natural disturbance regimes. The strategy emphasizes maintaining and restoring riparian and aquatic habitats on which fish depend. With all other things being equal, the strategy should improve the health of aquatic ecosystems supporting applicable tribal fisheries. The assessments focused on maintaining sufficient aquatic habitat to support well-distributed populations of fish within the range of the northern spotted owl. This SEIS proposes a habitat-based conservation strategy for all components of the ecosystem. Ecosystem management of uplands should complement aquatic and riparian-dependent resources. In Chapter 3&4, the SEIS describes other nonhabitat-related factors that affect population variability and states that amount of habitat available does not equate to population numbers of fish or to potential harvestable surpluses.

- **Comment:** To restore fish habitat on nonfederal land, the government should purchase land, rent, or acquire easements.

**Response:** The purchase or rental of land and acquisition of easements is beyond the scope of the proposed action analyzed in this SEIS.

- **Comment:** Address the environmental effects to aquatic species, not just to fish.

**Response:** Chapter 3&4 discusses the effects to other riparian and aquatic-dependent species such as vascular plants, mollusks, and amphibians.

## Watershed, Water Quality and Soils

The following comments and responses address watershed analysis, water quality and other related topics, including soils.

### WATERSHED ANALYSIS

- **Comment:** Describe watershed analysis in sufficient detail to determine its effectiveness in avoiding or preventing future impacts to nontimber forest resources.

**Response:** Watershed analysis is an analytical process and not a decision-making process. It provides data, analysis and information for informed decision making and sets the context from which the decisions will be made. Thus, a determination of its effectiveness in avoiding or preventing impacts is not possible.

- **Comment:** The watershed analysis procedure is unproven, unduly complicated, and not organized to provide effective decision points and cost-effective action priorities. Watershed analyses should be done by trained agency biologists as well as outside consultants.

**Response:** Watershed analysis is not a decision process but an analytical process. Appendix B6, Aquatic Conservation Strategy, and Chapter 2 of this Final SEIS describe the application, context, intent and structure of the watershed analysis process. Watershed analysis will help resource managers determine how a proposed project fits with the processes and condition of a watershed. The information will be

used to better understand the relationship between the effects of the proposed project on the existing condition and the physical and biological processes operating within a given watershed. This information will provide the decision maker with a better understanding of the potential effects of a proposed project, potential restoration opportunities, and will help determine whether the project complies with the management guidance of the selected alternative from this SEIS.

Watershed analysis will consider a wide range of physical and biological processes and beneficial uses occurring within a watershed. These include, but are not limited to, restoration of riparian and aquatic habitat, terrestrial and aquatic species distribution and habitats, aquatic and terrestrial dispersal corridors, transportation planning, cumulative effects analyses, and monitoring programs.

Trained specialists experienced in the fields of hydrology, soil science, geomorphology, fisheries biology, wildlife biology, ecology, and other natural sciences (as needed) will conduct the watershed analyses in a cooperative interagency effort that will include public involvement.

Watershed analyses are subject to review by the Regional Ecosystem Office. In addition, trained and experienced specialists will help ensure consistent application of methods, analyses, and rationale for decisions.

- **Comment:** The Draft SEIS states that watershed analysis must be done before conducting management actions within Key Watersheds or within roadless areas outside of Key Watersheds. This implies that significant management activity that could result in degradation of watershed conditions will be permissible following watershed analysis.

**Response:** Proposed activities that would degrade watershed conditions would be contrary to the Aquatic Conservation Strategy objectives and thus, would not be consistent with this SEIS. The intent of watershed analysis is to develop and document a scientifically-based understanding of the physical and biological processes and interactions operating within a watershed. Part of the analysis will include refining desired landscape characteristics at the watershed level. Landscape characteristics can be determined by Forest and District Plans, and province or river basin analyses necessary to meet Aquatic Conservation Strategy objectives. It is in this context that federal land managers will determine appropriate management actions to achieve the objectives resulting from watershed analysis. Watershed analysis will also provide appropriate monitoring schemes to determine if objectives are being met. The monitoring implemented following watershed analysis can include monitoring objectives developed at province, river basin, and watershed levels.

- **Comment:** The selected alternative should include a provision for maintaining a closed canopy in a large percentage of each watershed to protect watershed hydrology and complexity of stream habitat.

**Response:** Watershed analysis focuses on the processes and functions within a watershed and will consider the effects of vegetation on hydrology and habitat complexity in a stream.

- **Comment:** Watershed analysis should be compatible with Washington State's Timber, Fish and Wildlife watershed analysis process.

**Response:** The watershed analysis process adopted by this SEIS is similar to Washington State's Timber, Fish and Wildlife watershed analysis process. The SEIS encourages interagency and interdisciplinary efforts, including participation by affected and interested parties, as part of the watershed analysis process. Specific procedures will be developed and refined through time as part of the iterative, long-term implementation of watershed analysis, and this analysis is expected to draw on the experience of existing processes.

- **Comment:** The term “watershed” as used in the SEIS is misleading because it subdivides interconnected watersheds as though each part of the unified drainage could be managed separately. For example, the boundaries of many Key Watersheds do not follow ridge lines that delineate the watersheds.

**Response:** Watershed-based planning at the province, river basin, and watershed levels is discussed in the SEIS. The Key Watershed network does not include all drainage basins within a given river basin nor does it include “true ridgetop-to-ridgetop” watersheds. Rather, the network includes those portions of selected watersheds necessary to meet Aquatic Conservation Strategy objectives. For Key Watersheds that are not complete watersheds (e.g., ridgetop to ridgetop), watershed analyses must consider the processes and functions of the natural watersheds where the Key Watersheds occur.

- **Comment:** The SEIS does not describe how watershed analysis will consider nonfederal land. Watershed analysis should include nonfederal and federal lands in watersheds with mixed ownership within the range of the northern spotted owl.

**Response:** Watershed analysis is based on watershed boundaries not administrative boundaries, and is designed to look at the processes and functions taking place within a watershed. The analysis will consider processes and functions occurring within the entire target watershed, regardless of ownership. In addition, cumulative effects analysis required by NEPA will consider actions on both federal and nonfederal lands within a watershed. Subsequent decisions only apply to actions on federal lands.

## WATER QUALITY

- **Comment:** The SEIS does not adequately consider effects of the alternatives on municipal watersheds, public water supplies and filtration.

**Response:** A discussion on the benefits of the Aquatic Conservation Strategy to municipal watersheds, public water supply, and filtration is included in the Water Quality section in Chapter 3&4.

- **Comment:** The Tier 2 Key Watersheds occur in the Cascade Range in Oregon but the at-risk anadromous salmonid stocks do not occur within this area.

**Response:** Tier 2 Key Watersheds are designed to be sources of high quality water, not necessarily habitat for the at-risk anadromous salmonid stocks. Some Tier 2 Key Watersheds occur upstream of areas inhabited by the at-risk anadromous fish stocks and, thus, influence downstream aquatic habitat conditions.

- **Comment:** The Aquatic Conservation Strategy does not adequately protect water quality or the requirements of the Coastal Zone Act Reauthorization Amendments.

**Response:** Full implementation of the selected alternative is expected to maintain and improve water quality and be consistent with the enforceable policies of federally approved state coastal management programs and coastal nonpoint pollution control programs. The basic components of the Aquatic Conservation Strategy (Riparian Reserves, Key Watersheds, watershed analysis, and watershed restoration) will protect water quality and aquatic habitat when implemented with the adaptive management process in subsequent physiographic province and watershed analyses, and in site-specific NEPA analyses. The Riparian Reserve system, in particular, establishes reserves along all streams, wetlands, ponds, lakes, and unstable areas. This system will contribute to the protection and maintenance of water quality and fish habitats.

- **Comment:** The discussion of water quality is inadequate under the requirements of NEPA. Disclose the cumulative effects of the alternatives on key water quality parameters such as sediment loading and temperature.

**Response:** The discussion of water quality cumulative effects is adequate to meet the NEPA requirements for this programmatic SEIS. Cumulative effects are discussed in Chapters 2 and 3&4 of this Final SEIS. Cumulative water quality effects will also be evaluated through watershed analysis, during watershed-based planning at the province and river basin levels, and in site-specific NEPA analysis.

- **Comment:** Clarify the relationship between Key Watersheds and impaired and “water quality limited” water bodies under the Clean Water Act.

**Response:** These designations have different purposes. Key Watersheds are watersheds that either contain high quality habitat and water quality, or are in poor condition and have a high potential to be restored. The selection of the watersheds may or may not have been based on the availability of significant water quality data or consideration of state Water Quality Standards. Under the Clean Water Act, water bodies designated as “water quality limited” are characterized as streams having water that does not meet applicable Water Quality Standards and is not expected to meet those standards even after implementation of technology-based effluent limitations such as secondary treatment at sewage treatment plants and precipitators at metal treatment facilities. Unlike Key Watersheds, “water quality limited” water bodies are often identified based on extensive data collected from water quality monitoring. The monitoring may include information on habitat condition and the status of beneficial uses. Beneficial uses include public water supply; recreation in and on the water; and protection and propagation of fish, shellfish, and wildlife. However, water bodies designated as impaired may or may not be based on extensive water quality monitoring data. Therefore, listings of impaired waters are typically more extensive than listings of water quality limited waters. Not all Key Watersheds are “water quality limited” or impaired, though there may be overlap.

- **Comment:** Address the process for complying with state water quality standards and the federal consistency provisions of the Clean Water Act.

**Response:** An expanded discussion on Clean Water Act compliance and federal consistency has been added to the Water Quality section in Chapter 3&4.

- **Comment:** Water quality will continue to decline if the Aquatic Conservation Strategy is not applied to nonfederal lands. The Aquatic Conservation Strategy should be applied across all ownerships to maintain fish viability.

**Response:** This SEIS does not include specific requirements for nonfederal lands. Cooperation with nonfederal landowners, and consideration of water quality conditions and trends on nonfederal lands, will be recommended during province planning and watershed analysis. Road construction and harvest on nonfederal lands in multiple ownership watersheds could reduce the ability of the federal manager to harvest without reducing water quality. Cooperation with nonfederal landowners has the potential to benefit water quality on both federal and nonfederal lands and could reduce the potential need for developing total maximum daily loads under the Clean Water Act. Total maximum daily loads (TMDL) are the allowable pollutant loadings allocated to various pollution sources as necessary to achieve water quality standards in a given water body. A TMDL for sediment, for example, would allocate allowable sediment loadings for roads, timber harvest activities, grazing, and background erosion levels within the watershed for a water body listed as “water quality limited” under the Clean Water Act.

- **Comment:** The section on current water quality conditions includes data from the state water quality and nonpoint source assessments under Sections 305(b) and 319 of the Clean Water Act. Much of this data came from subjective surveys which are not scientific and, therefore, should not be used.

**Response:** Data from state water quality and nonpoint source assessments include both quantitative monitoring data and subjective professional opinion. Professional opinion is appropriate for use as an indicator of water quality issues. Management decisions will be based on watershed analysis and site-specific NEPA analysis.

- **Comment:** The SEIS should include a well-coordinated, watershed-based program to manage and restore habitat and develop water quality monitoring on both federal and nonfederal lands. Management, restoration, and monitoring are often not coordinated in watersheds, which results in wasted resources, conflicting goals, and increased damage to natural resources.

**Response:** It is outside the scope of this SEIS to establish direction for nonfederal lands. Cooperation among all landowners is strongly encouraged and will be sought during province planning and watershed analysis. Many federal and state agencies are structuring their programs based on watershed priorities.

- **Comment:** Discuss the potential effects to groundwater supplies, especially in the Klamath Basin.

**Response:** The extent of groundwater supply effects is a site-specific issue and will be evaluated at the watershed or project level. The effects to groundwater of timber harvest and road construction are generally limited to shallow groundwater due to changes in evapotranspiration. Surface water supplies are at a much greater risk than groundwater supplies.

- **Comment:** Discuss the states' obligation under the Clean Water Act to make a determination regarding compliance with state water quality standards, including how this compliance will be achieved.

**Response:** Chapter 3&4 of this Final SEIS includes additional information, in the Water Quality section, on compliance with state water quality standards and discusses the connection between water quality goals and the Aquatic Conservation Strategy (Appendix B6).

- **Comment:** Best management practices should be enforced for projects in riparian areas, and the SEIS should describe how best management practices will be used to control sediment production and its effect on riparian habitat.

**Response:** Best management practices (BMPs) are water quality protection measures developed by the Forest Service and BLM pursuant to the Clean Water Act. These practices are certified by the state agency with water pollution control authority and are approved by the Environmental Protection Agency. Existing Forest and District Plans require the use of best management practices. Therefore, current Forest Service and BLM operations include adhering to best management practices to meet state water quality requirements pursuant to the federal Clean Water Act. The standards and guidelines for all alternatives except Alternative 7 provide greater water quality protection than existing practices. Where current standards and guidelines in existing Forest and District Plans (including BMPs) provide greater protection than those of the selected alternative, the current standards and guidelines will continue to apply. In addition, reduced sediment production and attendant improvement in water quality should result from the Key Watershed network and the Late-Successional Reserve and Riparian Reserve systems established by this SEIS. A monitoring program and the adaptive management process will help ensure that water quality protection measures are meeting water quality and aquatic habitat objectives.

## OTHER

- **Comment:** The preferred alternative and proposed fire management scenario for northern California will lead to a more dense forest that will consume more water. This will decrease stream flow and negatively affect resources that depend on existing flows.

**Response:** Appendix B8, Fire Management Standards and Guidelines, has been added to the Final SEIS. The standards and guidelines in Appendix B8 are designed to result in forest structure characteristic of stands under natural fire regimes. This will restore the watersheds and the riparian and stream conditions representative of natural fire landscapes. The resulting hydrologic conditions will be more representative of historical conditions than those existing under intensive management.

- **Comment:** Fire management standards and guidelines should be linked to the outcomes of watershed analysis.

**Response:** Watershed analysis will consider the role of fire on the ecosystem processes operating within a watershed. The analysis will set the context from which fire management will occur. Thus, appropriate site-specific fire management standards and guidelines in Appendix B8, Fire Management Standards and Guidelines, will be refined based on information from the watershed analysis.

- **Comment:** The Aquatic Conservation Strategy will not be effective in watersheds where irrigation withdrawals occur and the Federal Government has limited authority to regulate the withdrawals.

**Response:** The standards and guidelines in Appendix B6 (Aquatic Conservation Strategy), specifically those concerning lands, require agencies to determine minimum flows necessary to meet the Aquatic Conservation Strategy objectives. The Aquatic Conservation Strategy objectives focus on maintenance and restoration of aquatic and riparian resources and the watersheds where they occur. Measures to meet the Aquatic Conservation Strategy objectives could include methods to reduce water loss due to leakage and evaporation. Regulation of water rights is beyond the scope of this SEIS.

- **Comment:** The SEIS should delineate river basins or portions of river basins within the range of the northern spotted owl that flow into the Columbia River for the river basin analysis.

**Response:** Chapter 2 of this SEIS includes a description of the analytical units for province/river basin analyses.

- **Comment:** The Aquatic Conservation Strategy objective of maintaining and restoring riparian, aquatic and wetland habitats is not necessary because only 1,900 of the 7,600 stream miles examined (FEMAT Report, Table V-D-2, p. V 121) have been listed as impaired by the 1988 Oregon Statewide Assessment of nonpoint sources of water pollution. The strategy will produce limited gains at a high cost to resource extraction.

**Response:** The numbers from this table are incorrectly interpreted. Actually, 1,900 of 2,100 stream miles (not 7,600 miles) assessed for federal land in the range of the northern spotted owl are listed as impaired.

- **Comment:** The Draft SEIS refers to earthflows but does not define them.

**Response:** The definition of earthflow that appeared in the FEMAT Report was included in the glossaries of both the Draft and Final SEIS.

- **Comment:** Discuss the effect of earthflows on aquatic and riparian habitat, as well as how earthflows affect land management.

**Response:** Appendix B6, Aquatic Conservation Strategy, discusses management considerations for earthflows. This SEIS classifies earthflows as unstable or potentially unstable areas. Specific management of earthflow areas will be established by Forest and District Plans and will be considered within the scope of watershed analysis and subsequent project-level planning efforts.

- **Comment:** The standards and guidelines for Riparian Reserves do not specifically address seeps and springs.

**Response:** Seeps and springs can be classified as streams, if they have sufficient flow in a channel, or they can be classified as seasonal or perennial wetlands under the criteria defined in the Corps of Engineers Wetlands Delineation Manual (Dept. of the Army 1987). The definition for the physical attributes of wetlands applies to seeps and springs, but the jurisdictional criteria such as minimum size do not apply. Standards and guidelines for wetlands, which are based on this manual, apply to seeps and springs regardless of size.

- **Comment:** Define intermittent and ephemeral streams in terms of extent of scour or duration of flow.

**Response:** The analysis was based on the definition of intermittent and ephemeral streams contained in the glossary. The extent of scour and duration of flow is not necessary to define intermittent and ephemeral streams.

- **Comment:** Clarify what activities are allowed within Key Watersheds.

**Response:** Chapter 2 of this SEIS describes the types of activities allowed prior to completing watershed analyses. All proposed management activities must comply with the standards and guidelines for Key Watersheds in Chapter 2 of this Final SEIS, or as amended in the Record of Decision.

- **Comment:** Discuss the importance of forest soils and long-term site productivity to the ecosystem.

**Response:** See the Air and Water Quality and Soil Productivity section in Chapter 3&4 of this Final SEIS.

- **Comment:** The restoration emphasis of the Aquatic Conservation Strategy focuses on recovering watersheds but there is no discussion of the criteria to determine what "recovered" means.

**Response:** Chapter 3&4 and Appendix B6, Aquatic Conservation Strategy, of this SEIS discuss watershed restoration and recovery as they relate to aquatic species and riparian habitat. Specific recovery criteria necessary to achieve desired landscape characteristics will be determined through watershed analysis and will be implemented through watershed-based planning at province, river basin, and watershed levels. This process will allow agencies to develop site-specific restoration plans.

- **Comment:** The discussion of the current condition of watersheds and the aquatic and riparian habitat emphasizes the degraded states of these areas. The Draft SEIS does not separate the causes of the degradation into categories such as logging conducted prior to 1980 or direction in current Forest and District Plans. There is no way to determine if logging under current Forest and District Plans has caused the degradation.



**Response:** Chapter 3&4 of this SEIS addresses current degraded riparian and aquatic conditions, and displays the outcomes of the alternatives. The analysis shows that Alternatives 1 through 6 and 8 through 10, all of which include the four major components of the Aquatic Conservation Strategy, yield higher outcomes in terms of improved habitat conditions than Alternative 7. Alternative 7 represents current plans and draft plan preferred alternatives, and does not include the four major components of the Aquatic Conservation Strategy.

- **Comment:** The standards and guidelines for Riparian Reserves should be adjusted to include wetlands and to specify that all wetland identification be consistent with the Corps of Engineers Wetlands Delineation Manual (Department of the Army 1987).

**Response:** The standards and guidelines have been revised to reflect wetland protection.

- **Comment:** The importance of, and effects to, the hyporheic zone should be addressed.

**Response:** Riparian Reserves, as defined in Chapter 2 and Appendix B6 of this SEIS, include the 100-year floodplain. Hyporheic zones typically occur within the 100-year floodplain, and therefore will be protected by the standards and guidelines for Riparian Reserves. The effects have been estimated in the assessments.

- **Comment:** The requirement for watershed analysis in Key Watersheds should not exempt timber harvest that is categorically excluded by the Forest Service Handbook. The handbook categorically excludes timber harvest that: (1) removes 250,000 board feet or less of merchantable wood products or salvage which removes 1,000,000 board feet or less of merchantable wood products; (2) requires 1 mile or less of low standard road construction; and (3) assures regeneration of harvested or salvaged areas, where required. Timber sales in Key Watersheds should be considered an "extraordinary circumstance."

**Response:** The standards and guidelines described in Chapter 2 and Appendix B6 of this SEIS require that watershed analysis be completed prior to all timber harvest, including that which is categorically excluded, in Key Watersheds.

- **Comment:** Clarify the types of activities allowed within Key Watersheds prior to completing watershed analysis. (This concern was expressed by those that thought more activities should be allowed and by those that thought all activities should be prohibited prior to completing the watershed analysis.)

**Response:** Only those actions that are categorically excluded under NEPA (40 CFR 1508.4) are allowed within Key Watersheds prior to completing a watershed analysis. Timber harvest and salvage, listed as categorically excluded activities in the Forest Service Manual [Chapter 30, 31.2(4)], do not fit within the types of activities allowed in Key Watersheds before completing a watershed analysis. Therefore, all timber harvest and salvage in Key Watersheds require watershed analysis before implementing the activity. Scoping may identify extraordinary circumstances for other actions that are normally categorically excluded. Actions involving extraordinary circumstances would require further analysis under the National Environmental Policy Act.

- **Comment:** Lethal doses of pesticides and herbicides for various forms of life can be much lower than they are for humans. Also, nonlethal doses can cause cancers, birth defects, and other adverse effects in lower life forms and microscopic plants and animals. Discuss the potential adverse effects of pesticides and herbicides on target and nontarget species and implications for protection of old-growth forests.

**Response:** The effects of herbicide use are outside the scope of this SEIS but are addressed in a number of Forest Service and BLM vegetation management plans. These plans were accompanied by EISs which addressed the effects of herbicide use on target and nontarget species. The effects of pesticide use are also analyzed in project-specific documents required under NEPA, in part because of the localized and unpredictable nature of pest problems. Under integrated pest management, alternatives to chemical use are considered prior to selecting a chemical alternative. When chemicals are selected their application is frequently limited and well monitored.

- **Comment:** Discuss wetland effects.

**Response:** Wetlands are one type of aquatic system. Chapter 3&4 and Appendix B6 of the SEIS provide an extensive discussion on aquatic and riparian systems and the different outcomes under the different alternatives.

## Other

The following comments and responses address concerns not readily incorporated into the other comment categories, including comments on the mission statement, cumulative effects, below-cost timber sales, nonfederal lands, biodiversity, data bases, agency cooperation, budgets and funding, editing, and other topics.

### MISSION STATEMENT

- **Comment:** The agencies artificially narrowed the objective to require the selection of an option developed by the Assessment Team. The agencies' definition of their objective must be reasonable, must not preordain the outcome, and must not artificially narrow the objectives or alternatives being considered. The unduly narrow statement of purpose and need is unreasonable, and violates NEPA.

**Response:** Defining the purpose and need of a proposed action is a matter particularly infused with agency discretion as the agency seeks to fulfill the various missions Congress has delegated to it. Here, that discretion was exercised after many years of grappling with issues concerning management of federal old-growth forests and numerous and varied opportunities for public input, including the April 1993 Forest Conference convened by the President. The purpose and need was driven primarily by the criteria the President articulated at the conference, which included crafting a strategy that would comply with all applicable laws and bring an end to the gridlock that has obstructed efforts at a lasting resolution of the salient issues. Such a purpose and need reflects sound public policy, lies within the discretion of the involved agencies, and clearly does not violate NEPA. The purpose and need criteria led to development of a wide array of reasonable alternatives, from which the decision makers will be able to choose.

- **Comment:** The original mission statement given to the Assessment Team and other working groups is flawed because it does not give people and communities equal consideration with plants and animals.

**Response:** The President's mission statement and the objectives and the purpose and need for this SEIS do give a high priority to social and economic considerations. In fact, they all manifest a clear intent to provide for the greatest possible human, social, and economic benefits consistent with meeting the agencies conservation duties. In so doing, a key goal is to ensure the long-term health of the late-successional and old-growth forest ecosystem so that benefits may continue to accrue to humans in all succeeding generations.

## CUMULATIVE EFFECTS

- **Comment:** The SEIS should develop a more specific framework for incorporating nonfederal land management actions during implementation of the selected alternative.

**Response:** This SEIS provides management direction for federal lands only. Cumulative effects related to nonfederal land management actions are considered in this programmatic SEIS—to the extent appropriate given the scale of analysis and available information—and will be further considered in the EIS for the proposal to issue a special 4(d) rule, watershed analyses, and site-specific environmental analyses which will occur before projects are approved. Management of nonfederal lands is outside the scope of this SEIS.

- **Comment:** The SEIS fails to discuss the cumulative effects on the national economy and the environment that would result from the increased use of oil (due to increased helicopter logging).

**Response:** The variation in oil consumption due to helicopter logging is not discernible across the alternatives.

- **Comment:** The SEIS fails to consider the cumulative effects of rapid population growth in areas such as the Siskiyou Range.

**Response:** The potential impacts of increasing human populations are primarily concentrated in the urban/wildland interface, where impacts of the alternatives in this SEIS would be minimal.

- **Comment:** The conclusions regarding cumulative effects are contradictory. The FEMAT Report says effects will be essentially the same for all options, but the Draft SEIS states that effects will change depending on outside management.

**Response:** The SEIS states that the cumulative environmental impacts from nonfederal lands would be similar across the 10 alternatives.

- **Comment:** The SEIS should describe the kind of cumulative effects analysis that was conducted. It should also address cumulative effects analysis that will be conducted for future NEPA analyses for projects, as well as future Forest and District Plans.

**Response:** This discussion has been clarified in the Cumulative Effects section, which has been expanded in the Final SEIS.

## “BELOW-COST” TIMBER SALES

- **Comment:** Timber sales cost the Federal Government more than they bring in (“below-cost sales”).

**Response:** While this is not the place to review the “below-cost” sale controversy, it does bear noting that timber sales that cost more than their benefits are not conducted where the main purpose is to provide wood or fiber to the market. The Forest Service and the Bureau of Land Management are responsible for the management of a wide variety of resources and uses, and are subject to numerous laws and regulations which are sometimes conflicting. These agencies use an ecosystem management approach that considers multiple resource values, tangible and intangible, on an equal basis. Timber sales represent only one of these resource values—one that has historically provided an economic benefit to the Pacific Northwest, and one that continues to have a place in the broad spectrum of management practices and tools available to the land management agencies to implement sound

ecosystem management. Timber sales can be an efficient and effective means of achieving not only silvicultural goals, but other, nontimber resource management goals; in these cases, timber sales may occur, even though the value of the timber does not exceed the cost of the entire ecosystem management project.

Land management agencies have traditionally been funded and evaluated based on their ability to economically sell timber on federal lands. Current planning approaches generate additional costs attributable to management of the intangible or difficult-to-quantify values that are equally important components of the ecosystem. Managing ecosystems strictly for a positive return would limit opportunities to maximize the intangible benefits of nonquantifiable resource values, resource protection, and provision of overall ecosystem management.

## NONFEDERAL LANDS

- **Comment:** The Forest Service and Bureau of Land Management should not have any jurisdiction over private lands, and any references to private forest lands should be removed from the SEIS.

**Response:** The SEIS alternatives do not apply to nonfederal lands. They apply only to lands administered by the Forest Service and Bureau of Land Management within the range of the northern spotted owl. In an EIS like this one, however, in which the proposed action will apply to federal lands integrally interspersed with nonfederal lands, the potential effects of ongoing and foreseeable activities on nonfederal lands are considered as part of the cumulative effects analysis.

- **Comment:** The SEIS calls for relief from spotted owl regulations on private lands. The alternatives must reduce the current burden of spotted owl regulations on private lands and guarantee access across public lands to private lands for the purpose of harvest.

**Response:** The alternatives do not apply to nonfederal lands. They apply only to lands administered by the Forest Service and Bureau of Land Management within the range of the northern spotted owl. Relief from spotted owl regulations on private lands is the subject of another EIS (the EIS for the proposal to issue a special 4(d) rule) and is outside the scope of the proposed action analyzed in this programmatic SEIS.

- **Comment:** The Riparian Reserve standards and guidelines should be applied not only to federal lands, but also to nonfederal lands.

**Response:** The SEIS provides management direction only for lands administered by the Forest Service and Bureau of Land Management within the range of the northern spotted owl. Prescription of management for nonfederal lands is outside the scope of the proposed action analyzed in this programmatic SEIS.

- **Comment:** The SEIS implies that the states and private landowners will play a role, but provides no discussion that focuses on their issues, the programs already in place that serve these potential cooperators, or the specific strategies that would be needed to produce desired outcomes.

**Response:** No specific role for states and private landowners is intended to be a part of any alternative in the SEIS.

- **Comment:** None of the alternatives consider habitat contributions of private or state lands for threatened species.

**Response:** The role of nonfederal lands is considered for each of the species evaluated in the environmental analysis for this SEIS. See Cumulative Effects/Nonfederal Lands under the environmental consequences section for each species or species group in Chapter 3&4. Pursuant to NEPA, cumulative effects were considered during the species assessment panel process and are reflected in this Final SEIS.

- **Comment:** The U.S. Fish and Wildlife Service's involvement with state and private landowners needs to be assessed and corrected to prohibit the taking of private property rights.

**Response:** Management of nonfederal lands is beyond the scope of the proposed action analyzed in this programmatic SEIS. The topic of U.S. Fish and Wildlife Service involvement with state and private lands will be addressed as part of the 4(d) EIS.

## CALIFORNIA

- **Comment:** The SEIS does not recognize the regional differences that exist between northern California and the Pacific Northwest. The data for these two regions were lumped together. The forest ecosystems of northern California are unique and warrant individual analysis.

**Response:** The alternatives in the SEIS were designed to address management of late-successional and old-growth forests on lands administered by the Forest Service and the Bureau of Land Management in the Pacific Northwest and northern California within the range of the northern spotted owl. Because this range includes northern California, this area was included in the planning area (see Chapter 2, The Planning Area). The differences between these areas were considered in the standards and guidelines and species assessments. Some changes were made in this Final SEIS to reflect those differences.

- **Comment:** California already has a strong, integrated system of forest practices regulations that needs to be recognized in any federal land management strategy. There is an apparent lack of partnership between the SEIS effort and ongoing efforts in California.

**Response:** The SEIS alternatives were designed to be consistent with existing laws and regulations. The discussion of consistency with state and local laws and regulations has been revised in the Final SEIS to address this concern.

- **Comment:** In the short term, National Forest Plans in the Klamath Physiographic Province should be completed. These plans include the latest science in ecosystem management and anadromous fisheries protection.

**Response:** It is expected that these plans will be completed in 1994, consistent with the alternative selected from this SEIS.

- **Comment:** California forest practices regulations have not protected water quality and, as a consequence, are not certified by the EPA as Best Management Practices (BMPs). Please review the history of the State of California's failure to provide the monitoring and data which are necessary to certify the regulations as BMPs. These uncertified regulations should be presumed to not protect the beneficial uses of water until they are certified by EPA.

**Response:** Review and certification of California's private land forest practices regulations are outside the scope of this SEIS. During implementation of the selected alternative, however, Riparian Reserve designation and standards and guidelines designed to protect water quality will be in effect for northern California on those lands managed by the Forest Service and BLM within the range of the northern spotted owl.

- **Comment:** Federal officials have implied that if the State of California institutes new regulations which are currently under consideration, it would impact federal land management. The SEIS Team should not assume the proposed regulations will substantially change management of private forests.

**Response:** The regulations under consideration in California were not considered in the environmental analysis or alternatives for this SEIS and are outside the scope of this programmatic SEIS.

## BIODIVERSITY

- **Comment:** Logging old-growth forests is not consistent with the commitment that the United States made to protect biodiversity under the global environmental agreement (Agenda 21) that was ratified subsequent to the UNCED process in Rio de Janeiro.

**Response:** The Convention on Biological Diversity (UNEP 1992) has not yet been ratified by the United States, and thus is not yet law. Nonetheless, Agenda 21, as implemented through the Convention, does not preclude sustainable use of resources. In fact, the objectives of the Convention include "... conservation of biological diversity ... [and] the sustainable use of its components ...." (Article 1, Objectives, UNEP 1992:26). Furthermore, Article 7, "Sustainable Use of Components of Biological Diversity", states that "Each Contracting Party shall, as far as possible and as appropriate .... Protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements ...." (UNEP 1992:30-31).

The SEIS alternatives propose sustainable use and protection of forest ecosystem resources. The maintenance and restoration of biological diversity was identified as an important objective of this SEIS in the mission statement (May 7, 1993), which was given to the Assessment Team by the Forest Conference Executive Committee (see Appendix C). Biodiversity is protected and enhanced by the alternatives in this SEIS, which protect both ecosystems and species within the planning area. Timber harvest as proposed in the SEIS is, therefore, consistent with the Convention on Biological Diversity.

## DATA BASES

- **Comment:** The vegetative data base that was used to evaluate the effects of the alternatives is inadequate.

**Response:** The sources of information are detailed on pages IV-38 and IV-39 in the FEMAT Report. The data used were the best available at that time that provided information of a consistent quality across all ownerships. Local areas will use their own data bases for the site-specific planning efforts that will take place during implementation of the selected alternative.

- **Comment:** The SEIS should state that the agencies do not have a statistically defensible inventory of the biological entities that exist in the forests in the planning area. Discuss this need and a plan to rectify it.

**Response:** The analysis of the alternatives used the best information available at the time. Such information is more than sufficient to enable the decision makers to make a reasoned choice among alternatives; indeed, in many respects, the data compilation and generation for this SEIS is unprecedented for a federal land management decision-making process. Note that as part of implementation of the selected alternative, inventory, research, and monitoring will occur as integral parts of the adaptive management process.

- **Comment:** The Landsat imagery used to determine spotted owl habitat lacks enough detail to determine all the important characteristics of old growth. Therefore, the analysis based on this satellite imagery is inadequate to determine the environmental effects of the proposed alternatives on classic old-growth forests.

**Response:** The relationship between old-growth forests and the existing vegetation inventory is discussed at the beginning of Chapter 3&4. The SEIS acknowledges that the correlation between “old growth” and “medium/large conifers” is not one-to-one in the Landsat imagery, yet the use of the imagery as an approximation provides a good picture of the effects of the alternatives on old growth and old-growth characteristics. The medium/large conifer category is a good measure of the stands contributing to meeting the purpose and need of this SEIS. The Landsat imagery provided an adequate level of detail for a programmatic assessment. Subsequent local planning and analysis efforts will assess effects using more detailed information.

## AGENCY COOPERATION

- **Comment:** The Agency Coordination Working Group Report (Draft SEIS, Appendix E) points out many of the reasons why coordination among agencies has not worked. The Final SEIS must clearly identify those parts of that report that are being adopted. Terms of reference for interagency coordination groups need to be precise and spelled out in formal documents that define objectives, procedures, authority to make decisions, and termination procedures. These terms should be approved by top-level administration officials, with knowledge and approval (if necessary) by legislative leaders. The alternatives do not include the institutional framework required for success in interagency coordination.

**Response:** Specific information on interagency coordination has been revised and clarified in the Implementation section in Chapter 2 of this Final SEIS. That section of Chapter 2 also establishes the institutional structure for interagency coordination. See also Appendix E, Implementation Structure, that includes that Memorandum of Understanding (MOU) for Forest Ecosystem Management. This MOU, signed by the Director of the White House Office on Environmental Policy, the Secretaries of Agriculture and the Interior, the EPA Administrator, and the Under Secretary of Commerce, specifies the portions of the Report that have been adopted and approved by the Administration.

- **Comment:** The SEIS does not mandate or call for cooperation between the two implementing agencies, the Forest Service and the BLM, and other resource and government agencies and public landowners to ensure continued survival of salmon stocks once they leave forested areas.

**Response:** The management of salmon stocks outside the planning area is beyond the scope of the proposed action analyzed in this programmatic SEIS.

## BUDGETS AND FUNDING

- **Comment:** Alternatives are based on the implementation of forest and watershed restoration projects, habitat restoration, monitoring, research, and other activities which may not receive funding.

**Response:** The plan designates land allocations and sets limits, through standards and guidelines, for the management activities that may occur. The success of this aspect of the Forest Plan is not dependent on the level of funding, and the standards and guidelines place specific restrictions on how and where projects can be conducted. The more general issue of funding is a Congressional responsibility and is, therefore, outside the scope of the proposed action analyzed in this SEIS. While this SEIS provides the basis for the decision makers to propose budgets and allocate funds, it cannot guarantee funding.

Each alternative in this SEIS includes monitoring mechanisms to enable corrective actions and other adjustments as appropriate. In addition, site-specific environmental analysis will disclose environmental risks that would occur if restoration activities or mitigation measures are not in place or funded, and project decisions can be made contingent upon those measures.

- **Comment:** The SEIS does not specify how the Forest Service and BLM will pay for the qualified personnel required to do monitoring.

**Response:** Funding for the agencies is allocated by Congress, and the amounts vary from year to year. Funding allocations cannot be predicted and, thus, it is not possible to specify how monitoring will be funded.

- **Comment:** It is less expensive and more effective to protect what is left of the forests than to manage for each species individually. The SEIS should present the full costs of studying, protecting, and monitoring each species in the Final SEIS.

**Response:** This SEIS is designed, in part, to address the problems which occur when habitat of species is managed separately from habitat of other species in the same area. One of the objectives of the alternatives is to maintain and restore biological diversity as it applies to late-successional and old-growth forest ecosystems. This involves providing management direction (in one planning effort) that covers hundreds of species over a large area. This approach is more cost-effective than providing individual planning efforts for each late-successional and old-growth related species. Cost projections for some monitoring activity proposed as standards and guidelines have been furnished, and are in the administrative record for this SEIS.

- **Comment:** The FEMAT Report did not address the agencies' budget structures. The selected alternative should implement two suggestions from the interagency working group: establish a coordinated, flexible budget process; and adjust agency processes.

**Response:** Changes to agencies' budget processes are outside the scope of the proposed action analyzed in this SEIS.

- **Comment:** The costs of adaptive management may exceed the value of the resources to be extracted.

**Response:** Adaptive management is a process to adjust management approaches and standards and guidelines as new information and methodologies become available. The selected alternative will provide short-term and long-term value to the public of a number of outputs and benefits, not all of which can be valued monetarily. Many of the values (goods and services) addressed by the SEIS cannot be extracted to yield monetary benefits. Examples of such values are recreation, scenic quality, and protection of plant and wildlife species. The cost of adaptive management is an issue which will be considered as appropriate in the development of plans for the Adaptive Management Areas, and in site-specific analyses associated with project implementation.

- **Comment:** To achieve a balance in implementation, funding needs to be provided for all resources, not primarily timber harvest.

**Response:** Funding is allocated by Congress and, thus, is outside the scope of proposed action analyzed in this programmatic SEIS and the authorities of the agencies involved.

- **Comment:** The outcomes predicted for aquatic habitat were predicated on full funding and implementation of the Aquatic Conservation Strategy. Explain whether the Aquatic Conservation Strategy will be implemented if it is not fully funded.



**Response:** If implementation of the Aquatic Conservation Strategy is not fully funded, then the recovery of habitat and species projected by the Assessment Team likely will be delayed, as will achievement of the objectives of the Aquatic Conservation Strategy.

## EDITING

- **Comment:** The Draft SEIS and FEMAT Report were difficult to read and understand, making it difficult for the public to analyze the documents. The Final SEIS should be more of a stand-alone document.

**Response:** The Final SEIS has been revised and expanded to improve clarity and readability, and is intended to be a stand-alone document to the extent possible for a supplemental NEPA document.

- **Comment:** The definition of wetlands used for implementation of the Clean Water Act is more standardized than the Executive Order 11990 definition. To use the 11990 definition creates an inconsistency between the FEMAT Report and the SEIS. The Clean Water Act definition of wetlands should be used.

**Response:** The text of the Final SEIS has been revised to address this concern.

- **Comment:** The context for Appendix B should be clarified. Each subsection should include an explanation of how each section relates to each alternative.

**Response:** Appendix B has been modified and expanded to address this concern.

- **Comment:** In Chapter 2, the pie charts that display percentage of landscape designated to various land allocations do not match the text.

**Response:** The pie charts have been corrected to match the text.

- **Comment:** The SEIS does not define "old-growth forests."

**Response:** The glossary in the Final SEIS includes the FEMAT Report's definition of old-growth forest.

## MISCELLANEOUS

- **Comment:** Address the potential liability that could arise from allowing fire hazard to increase through increased fuel loading in late-successional forests on public lands adjacent to private lands.

**Response:** Questions of tort responsibility are outside the scope of this Final SEIS. However, standards and guidelines have been developed to address the risk of stand-replacing fires in Late-Successional Reserves (see Appendices B2, B5, and B8). Coordination with other agencies and landowners is an important part of the fire management strategies and is particularly important in the matrix, which is the land allocation most likely to be adjacent to nonfederal lands. For the matrix lands in the urban/wildland interface, coordination with local governments, agencies, and landowners is called for during watershed analysis to identify additional factors which may affect fire hazard reduction goals.

- **Comment:** The selected alternative should ensure fair compensation to affected landowners and businesses if the policies reduce the value of private land or the profit potential of existing businesses.

**Response:** The SEIS analyzes alternatives that provide management direction for federal lands within the range of the northern spotted owl. No change to permissible actions on nonfederal lands will result;

therefore, the proposed action will have no direct effect that would reduce the value or profitability of uses on nonfederal lands.

- **Comment:** The FEMAT Report incorrectly states, “in contrast, lands administered by the U.S. Forest Service tend to be more contiguous [than those of BLM], with few inclusions of private land” (FEMAT Report, p. IV-5). Refer to the maps generated with the FEMAT Report, particularly the checkerboard ownership, for most of Snoqualmie Pass and other areas.

**Response:** Generally, given the context of the lands administered by the Forest Service within the planning area, the statement in the FEMAT Report is correct.

- **Comment:** Discuss the proposal to issue a special 4(d) rule, authorized by the Endangered Species Act, which would address land use restrictions on nonfederal lands.

**Response:** Additional information relevant to a proposal to issue a special 4(d) rule has become available since the Draft SEIS was issued, and this information has been considered in this Final SEIS (see Chapter 3&4, Cumulative Effects from Nonfederal Actions). The relationship of the proposal to issue a special 4(d) rule to this SEIS has been addressed in the cumulative effects section (Final SEIS, Chapter 3&4). The proposed revision and alternatives to the proposal will be analyzed in detail as part of another EIS.

- **Comment:** The SEIS Team should develop complete on-the-ground inventories of public and private lands and full economic evaluations for all public forest resources, including air, water, fish and wildlife, recreation, etc.

**Response:** A comprehensive biological and economic inventory of all public forest resources is beyond the scope of this programmatic Final SEIS, which considers the best information available concerning the relevant resources that will be most directly affected through implementation of the proposed action.

- **Comment:** A Holistic Resource Management (HRM) approach to planning and decision-making should have been used to develop the SEIS.

**Response:** The planning process used was adequate to define alternatives that meet the objectives and purpose and need for this SEIS. There will be opportunities to use a Holistic Resource Management approach during the site-specific project planning associated with the implementation of the selected alternative.

## Appendix F References

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 10  
1200 Sixth Avenue  
Seattle, Washington 98101

SEP 28 1993

REPLY TO

ATTN OF:

WD-126

Robert Jacobs  
Team Leader  
Interagency SEIS Team  
P.O. Box 3623  
Portland, Oregon 97208-3623

Dear Mr. Jacobs:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, we have reviewed the Draft 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 (draft SEIS). The proposed action is to adopt a coordinated management direction for the lands administered by the Forest Service and Bureau of Land Management in California, Oregon, and Washington within the range of the northern spotted owl and to protect and enhance late-successional and old-growth forest ecosystems.

The Environmental Protection Agency (EPA) has had considerable involvement in the Interagency SEIS Team's development of this draft SEIS, serving as a formal cooperating agency on the development of the document. EPA also participated in the preparation of the *Forest Ecosystem Management: An Ecological, Economic and Social Assessment* (FEMAT Report) prepared by the Forest Ecosystem Management Assessment Team (Assessment Team). This has afforded EPA with an appreciation of the difficulties in preparing such a complex EIS within a short time. The basis for EPA's high level of involvement is the opportunity to work together with federal land managers to develop an ecosystem management approach consistent with the statutes that EPA administers.

This EIS effort sets a new precedent for regional scale federal forest planning and analysis. The preferred alternative should provide significant water quality and habitat protection if implemented in conjunction with the necessary adjustments identified in subsequent physiographic province, watershed, and site-specific NEPA analyses. We fully support the basic components of the Aquatic Conservation Strategy, described in detail in the FEMAT Report and summarized in the draft SEIS, and believe it must be retained in the final SEIS and Record of Decision to ensure that projected water quality protection and species viability assumptions are realized. We believe that the proposed riparian reserve system, in particular, which establishes no cut areas along all streams, wetlands, ponds, lakes, and unstable areas will protect and maintain water quality and fish habitats. The Aquatic Conservation Strategy is fully consistent with EPA, Region 10's Riparian Area Management Policy.

Based on our review we have rated the draft SEIS EC-2 (Environmental Concerns - Insufficient Information). We strongly support basic features of Alternative 9, the preferred alternative. As with many programmatic EISs, our main concern is with implementation. The environmental benefits derived from this management plan depend on successful completion of future activities such as provincial planning, watershed analysis, site-specific projects, monitoring and coordination with nonfederal landowners. Therefore, additional information on the framework for implementation of these important future activities is needed for the final SEIS and Record of Decision.

While we would prefer that our implementation concerns be addressed in the final SEIS, we understand this may not be possible in the time available. Remaining concerns may be addressed during the implementation process. We anticipate that future subregional tiered analyses will help clarify many of the details, and we look forward to being a partner in these efforts.

The following is a summary of our recommendations for the final SEIS:

- The criteria or process for arriving at the criteria for adjusting riparian reserves upwards or downwards during watershed analysis needs to be clearly delineated to ensure reductions in riparian reserve width do not cause adverse cumulative aquatic or terrestrial effects.
- A monitoring appendix should be added to discuss the minimum physical, chemical, and biological monitoring that will be used in all aspects of implementation, especially for water quality.
- A more specific framework should be provided for incorporating nonfederal lands into implementation through province planning and disclosure of viability/cumulative effects and role of nonfederal lands.
- More specific information should be presented on plans for implementation, including a summary of major steps or tasks, lead agency or group roles, budget, and timelines.
- Disclosure of air quality effects from prescribed burning should be included.

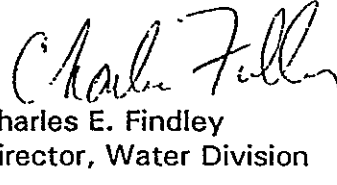
We also have requested additional information on wetlands, watershed restoration, riparian reserve standards and guidelines, adaptive management areas, mitigation, restoration, aquatic ecosystems, and drinking water sources.

The enclosure details our water and air quality comments and provides other specific comments with page number references. This review includes comments from EPA Headquarters and EPA Region 9. Also enclosed is a summary of the EPA rating system for draft EISs. Our rating and a summary of EPA's comments will be published in the *Federal Register*.

We are confident that these concerns can be resolved for the final SEIS since much of this information already exists. We expect to continue our involvement as a cooperating

agency to develop the final SEIS. Our intent through these comments is to help establish a strong basis for successful implementation of the progressive features of this management plan. If you have any questions about our comments please contact Kathy Veit, Chief, Program Coordination Branch at 206/553-1983 or me at 206/553-1793.

Sincerely,



Charles E. Findley  
Director, Water Division

Enclosures

cc: John Lowe, Regional Forester, Region 6  
Ronald Stewart, Regional Forester, Region 5  
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**U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) DETAILED COMMENTS  
ON THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (DRAFT SEIS)  
ON MANAGEMENT OF HABITAT FOR LATE-SUCCESSIONAL  
AND OLD-GROWTH FOREST RELATED SPECIES  
WITHIN THE RANGE OF THE NORTHERN SPOTTED OWL**

FEMAT Report means the *Forest Ecosystem Management: An Ecological, Economic and Social Assessment* prepared by the Forest Ecosystem Management Assessment Team (Assessment Team), Also referred to as Appendix A of the draft SEIS.

Specific EPA recommendations are *italicized*.

**WATER QUALITY**

Riparian Reserves and Watershed Analysis

Watershed analysis plays an extremely critical role in the successful implementation and the final configuration of Riparian Reserves. In fact, watershed analysis may be the most important component of the Aquatic Conservation Strategy to achieve the Clean Water Act objective "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

Page V-39 of the FEMAT Report states, "Watershed Analysis provides the basis for changing the size and location of Interim Riparian Reserves." On page V-45, it states: "Watershed analysis is expected to yield the contextual information needed to define ecologically and geomorphically appropriate Riparian Reserves. Analysis of site specific characteristics may warrant Riparian Reserves that are narrower or wider than interim widths." We agree with the need to provide field flexibility for implementing riparian reserves based on site-specific watershed conditions discovered through watershed analysis. Because these analyses are critical, the decision process for arriving at new Riparian Reserves widths, and the role of the Interagency Executive Group and Regional Ecosystem Office needs to be clearly delineated in the final SEIS and Record of Decision. If total acreage in reserves is significantly reduced, it has the potential for adverse cumulative effects on both aquatic and terrestrial species. *We recommend that the criteria or process for arriving at the criteria for adjusting riparian reserves upwards or downwards during watershed analysis be clearly delineated to ensure reductions in riparian reserve width do not cause adverse cumulative aquatic or terrestrial effects.*

The final SEIS should more clearly emphasize that watershed analysis may result in wider riparian reserve widths than outlined for interim riparian reserves. The FEMAT Report often links water quality and species viability to the size of riparian reserves and the types and amounts of activity allowed in them. For example, the importance of riparian reserves and Late Successional and Old Growth (LS-OG) reserves for salmonids is illustrated by the significantly lower likelihood of viability for alternatives with smaller riparian reserves like Alternatives 7 and 8. The draft SEIS reinforces the importance of riparian areas by projecting a significantly higher likelihood of viability for lichens, the northern spotted owl, mollusks, amphibians and reptiles, birds, and aquatic species under alternatives providing maximum protection of intermittent streams and wetlands less than one acre (pages S-10 through S-14).

The Assessment Team assumed that there would be a greater risk to aquatic systems with narrower reserves and that recovery rates might be slower in non-Key Watersheds due to less area in LS-OG and other reserves and limited restoration funds (draft SEIS, page 3&4-49). We expect that for degraded non-Key Watersheds decision-makers would first focus on increasing riparian reserve widths. A second priority would be restoration. The final SEIS should disclose all aspects of watershed analysis (discussion of alternatives, implementation, standards and guidelines) that riparian reserve widths may need to be wider following watershed analysis in order to achieve Aquatic Conservation Objectives.

#### Monitoring and Adaptive Management

In past forest plan and timber sale EIS reviews, EPA has identified the need for detailed environmental monitoring (especially for water quality and fisheries) before, during, and after the completion of an activity to determine whether effects were accurately predicted and beneficial uses were protected. Water quality monitoring is required to ensure compliance with water quality standards. We are pleased that monitoring was included as an integral component to watershed analysis in the FEMAT Report. However, this monitoring primarily addresses watershed-specific monitoring following the analysis. Monitoring needs outside of the scope of watershed analysis include: multi-agency coordination, baseline monitoring, reference watersheds, pre-watershed analysis monitoring, and long term monitoring. Monitoring needs are partially addressed on page V-62 of the FEMAT Report. In addition, the draft SEIS states that, "The specific monitoring protocols and guidelines will be developed for the selected alternative which will be used to revise existing monitoring plans." (page 2-7) *We recommend that a monitoring appendix be added to address monitoring protocols and guidelines (or a monitoring strategy) in the final SEIS. It should discuss specific minimum monitoring, (physical, chemical, and biological) that will be addressed in all aspects of implementation.*

The Clean Water Act directs the EPA (and States and Tribes) to develop programs that evaluate, restore and maintain the chemical, physical and biological integrity of the Nation's waters. Historically, the States and EPA have implemented water management programs primarily using physical and chemical indicators to protect water quality. Much of the discussion in the draft SEIS equates water quality with water chemistry. However, States and EPA are now including biological assessments (biological criteria) as part of their water quality management programs. Cumulative effects may best be detected through biological monitoring. Because of the number of watersheds on federal lands, Rapid Bioassessment Protocols could be an effective means of assessing current conditions and future cumulative impacts. Though the states already have these reference sites, more will be needed to obtain good representation for all physiographic provinces. Biological monitoring should be emphasized in the monitoring strategy.

The FEMAT Report includes significant efforts to ensure species viability. However, if monitoring shows that actual results differ from the FEMAT Report assumptions, then appropriate planning and management adjustments should be triggered. In addition, if monitoring shows assumptions are incorrect, then future decisions should not be based on the same assumptions in similar circumstances. Monitoring goals and objectives must be

clearly articulated and include thresholds of change that trigger adjustment in standards and guidelines, land allocations, BMPs, proposed projects, restoration priorities, harvest levels, and/or other management decisions. *We recommend the final SEIS expand the discussion on how monitoring and adaptive management together with watershed analysis will guide management decisions.*

### Nonfederal Lands

*We recommend that the final SEIS provide a more specific framework for incorporation of nonfederal land management activities with implementation of this management direction.* If these lands are included, truly comprehensive forest ecosystem management can take place. "Nonfederal lands are an integral part of any strategy that seeks to address the overall landscape as an ecosystem." (FEMAT Report, page II-93) Appendix V-K provides a good summary of the significant differences between forest practices regulations on state and private lands and the recommendations in the FEMAT Report. Addressing these differences will be critical to the success of implementation. As recognized in both the FEMAT Report and the draft SEIS, nonfederal lands must be included as a part of the planning and implementation at the physiographic province and watershed level. The framework for encouraging nonfederal participation should include a description of the regulatory provisions of the Clean Water Act and Endangered Species Act which apply to nonfederal lands. It is important for the physiographic province teams and the proposed Interagency Executive Group charged with overseeing implementation to work with state, tribal and other representatives.

### Implementation

*We recommend that the final SEIS include more specific information on plans for implementation, including a summary of major steps or tasks, lead agency or group roles, budget, and timelines.* The major tasks and budget may need to be grouped in levels of implementation related to alternative scenarios based on anticipated funding.

It is difficult to get a clear sense of the major implementation tasks needed, timeframes and costs from either the draft SEIS or FEMAT Report. The final SEIS should be the public document that provides the framework for implementing the FEMAT Report and assessing progress and accountability. While we understand the programmatic nature of this EIS, it is important that the ecosystem approach be well-outlined, and the feasibility of major future implementation steps such as province planning be fully explored.

### Restoration

Restoration is one of the key components of the Aquatic Conservation Strategy. *We recommend that a specific framework for restoration, including budget estimates, be included in the final SEIS.* We recognize that specific projects and budgets must be developed based on watershed analyses, however, the final SEIS should provide the overall context for developing these projects and budgets.

Restoration may be particularly important for species with restricted distribution and species found in degraded habitat. It may also contribute to improvement of water

quality and Clean Water Act compliance, particularly over a short time-frame. *We recommend the final SEIS include clarification on how the absence of a watershed restoration program might affect the likelihood of meeting habitat conditions associated with viability and how attainment of water quality standards and beneficial uses will be affected in the event restoration is not funded.* If watershed restoration is a significant factor in achieving either habitat goals related to viability or in meeting water quality standards, the final SEIS should discuss potential adjustments of other management tools (e.g., riparian reserves, matrix and other allocation management prescriptions) that would ensure that species viability and water quality goals are achieved.

### Adaptive Management Areas

The draft SEIS indicates that incorporating Adaptive Management Areas into Alternative 9 improves species viability for this alternative. However, specific standards and guidelines are not provided for Adaptive Management Areas, and it is unclear how the benefits of such areas were quantified for purposes of comparing Alternative 9 with other alternatives. Moreover, it is unclear whether Adaptive Management Areas would be managed so that the benefits would outweigh negative impacts to resources. *We recommend that the final SEIS provide additional information regarding Adaptive Management Areas to support and ensure a net positive influence to species viability and other environmental effects.* We believe the draft SEIS's vagueness regarding management of these areas may leave future, more specific, adaptive management decisions difficult to implement.

*We also recommend the final SEIS include detailed maps of the Adaptive Management Areas depicting all LS-OG and Riparian Reserves and Administratively Withdrawn Areas.* The final SEIS should identify the acreage of these areas within the Adaptive Management Areas and clarify whether these acreages are included in, or in addition to, the acreages listed for each category on page 2-21 of the draft SEIS. For example, Alternative 9 includes 7.053 million acres of LS-OG Reserves. Does that figure include the acreage of LS-OG Reserves located within Adaptive Management Areas? The final SEIS should also indicate how many acres of unreserved LS-OG forest are included in the Adaptive Management Areas.

### Mitigation

Chapter 3&4 of the draft SEIS identifies possible mitigation measures. The final SEIS should indicate whether these mitigation measures were assumed to be included in the alternatives when the expert panels were assigning likelihood ratings to viability/distribution for each species. *We recommend the final SEIS and Record of Decision include these mitigation measures.*

### Wetlands

*We recommend that the riparian standards and guidelines specify that all wetland identification be consistent with the 1987 Corps of Engineers Wetlands Delineation Manual and associated implementation guidance.* Any future changes in wetland identification concepts, methods or techniques that result or resulting from the current National Science

Foundation study that are adopted for use in implementing the Clean Water Act, should also be incorporated into forest management.

*We recommend that the term wetlands be specifically used and wetland discussions expanded in the final SEIS for several reasons: (1) "Riparian areas" and "wetlands" are not synonymous terms (see discussion in FEMAT Report, Appendix V-E). Many wetlands are not adjacent or contiguous to a stream and may be isolated from the typical streamside riparian area. (2) Wetlands are not always easily identified, particularly forested wetlands occurring on sloping landscapes. (3) Current inventories of wetlands in forested areas are incomplete, particularly for forested wetlands not adjacent to rivers.*

Where riparian areas are discussed, the text of the final SEIS should have additional language to clarify how wetlands are addressed in the plan. We have included several examples in our "OTHER PAGE SPECIFIC COMMENTS" Section.

#### Riparian Reserve Standards and Guidelines

(draft SEIS, pages B-84 through B-88; FEMAT Report, Appendix V-F)

In the first paragraph of standards and guidelines (omitted in the draft SEIS) the opening sentence is misleading. It states that the Standards and Guides were developed: "...to protect salmon and steelhead habitat..." Resident fish, other aquatic species, riparian species etc. should all be protected by the standards. The paragraph should be revised to clearly state that Standards and Guidelines were developed to protect aquatic, wetland and riparian resources.

While road and landing construction needs to avoid riparian reserves, some construction may be unavoidable. Wetlands contained within riparian reserves need to be avoided completely. We suggest that Standard and Guideline RF-2. a. be modified to read: "Minimizing road and landing locations in Riparian Reserves, and avoiding wetlands within these Riparian Reserves."

In the draft SEIS, page B-79, the text recommends that "no new roads will be constructed in roadless areas in Key Watersheds," "watershed analysis must be conducted in all non-Key Watersheds..." and "there will be no net increase in road mileage in Key Watersheds." These provisions need to be re-enforced by clearly including them in the Standards and Guidelines.

#### Intermittent Stream Definition

*To reduce implementation confusion, we recommend that the definition of intermittent and ephemeral streams used in the final SEIS match those stated in the U.S. Geological Survey Paper 1541-a titled: General Introduction and Hydrologic Definitions.*

Establishing riparian reserves during implementation will be governed by the definition of "intermittent stream" used in the field. The draft SEIS and FEMAT structures the definition of intermittent streams differently than the U.S. Geological Survey (USGS)

definition. Use of a commonly accepted definition like that used by USGS would reduce confusion during implementation and watershed analysis.

An example of the difference in the definition of intermittent stream in the draft SEIS is "any non-permanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria." The USGS definition separates intermittent and ephemeral as two types of streams. Based on the definition in the draft SEIS an ephemeral stream may not receive appropriate riparian reserve protection from field personnel familiar with the USGS definition.

*We recommend that intermittent and ephemeral streams be designated prior to the development of silvicultural options and practices.* USGS may be helpful in large scale efforts to identify intermittent streams. This will help ensure that land management decisions are consistent with the Aquatic Conservation Strategy.

Mapping constitutes an essential tool in the preparation of a silvicultural prescription. The USGS quadrangle map is the standard currently used in the preparation of silvicultural practices. However, intermittent streams have seldom been accurately mapped. The issue of intermittent stream definitions and their attendant riparian protection ought to be placed on the Regional Ecosystem Office agenda for further consideration.

#### Drinking Water

Water quality protection of public water supplies needs to be acknowledged in the final SEIS. It would probably fit best in the water quality discussion on page 3&4-118. *We recommend that the following language be added to the final SEIS:*

(Affected Environment)--A number of public water systems have their surface water sources originating on lands administered by the Forest Service and BLM. These systems must comply with various requirements of the Safe Drinking Water Act, including the Surface Water Treatment Rule (SWTR). Whether a system attempts to meet the SWTR criteria which would allow it to remain unfiltered, or if the system provides filtration, maintaining the highest water quality in its source water will enhance the water system's ability to meet the Safe Drinking Water Act's requirements and provide adequate public health protection.

(Environmental Consequences)--"The additional water quality protection provided by Alternative 9 should be beneficial to water systems whose surface water sources originate on Forest Service or BLM administered lands. It should be noted that for a water system to be allowed to remain unfiltered under the SWTR, source protection and watershed management are important factors. However, watershed control programs are only one of the eleven criteria considered in determining whether a water system may remain unfiltered, and would usually not be the determining factor in that decision. Additional analysis in site-specific National Environmental Policy Act (NEPA) documentation will be needed to

thoroughly assess the impact an activity will have on a water system's ability to comply with the requirements of the Safe Drinking Water Act.

*In addition, we recommend the next tier of planning (Provincial Conservation Plans), identify all water systems that use surface water from watersheds within the physiographic region, the level of water treatment provided, and whether the water system is in compliance with the Surface Water Treatment Rule. This information should provide an initial indication of whether activities proposed in the province would cause violations of drinking water regulations. Detailed analysis is still needed in site-specific NEPA documentation.*

## AIR QUALITY

### General

The draft SEIS discusses the need for forest management and prescribed fire without discussion of the resulting effects on air quality. In the summary and on page 2-49, the draft SEIS recognizes the importance of silviculture in restoring habitat in stating that, "the Assessment Team assumed that without restoration silviculture, the development of late-successional conditions would be retarded." Several areas of the document refer to the need for increased prescribed burning.

The draft SEIS describes the differing conditions and needs of forests west and east of the Cascades. These differences in ecology and the eastern Cascade's markedly shorter fire-return interval are recognized in the draft SEIS's different treatment of the eastern cascades and Klamath Provinces. On page 3&4-45, the draft SEIS describes the importance of the "use of active fire and fuels management, including thinning and prescribed fire, to reduce risk of large-scale loss of late-successional and old-growth forests and restore fire-dependent types of old-growth species." Both Alternative 3 and the Preferred Alternative 9 would incorporate underburning treatments to improve forest health.

### Regulatory Requirements

The final SEIS should clarify that the increased use of prescribed fire and underburning is a departure from past forest management practices that emphasized fire suppression. The use of increased prescribed fire including underburning will likely result in increased particulate emissions. These increased emissions might adversely affect many aspects of air quality covered by the Clean Air Act: national ambient air quality standards (NAAQS), prevention of significant deterioration (PSD), and visibility protection. *We recommend that the final SEIS specifically address and disclose the effects of air quality from prescribed burning.*

The Clean Air Act prohibits federal entities from taking actions that would seriously degrade air quality. This is commonly referred to as the conformity provision, section 176(c) of the Clean Air Act. EPA proposed a rule to implement Section 176(c) in March 1993. This proposed rule specifically identified prescribed burning as an activity that will

likely be affected by the conformity provision. Both Washington and Oregon have smoke management plans, visibility State Implementation Plans, and several particulate matter (PM<sub>10</sub>) nonattainment areas within the range of the northern spotted owl. In addition, conformity analyses and determinations need to quantify air quality impacts to the degree possible.

### Environmental Concerns

*We recommend that an assessment of potential air quality impacts be included in the final SEIS, as well as specific provisions for incorporating assessment of air quality issues in future NEPA documents.* This large-scale assessment could include regional totals of pollutant loading as well as project level examples of emissions and pollutant concentrations.

Because of the importance of fire to ecosystem health and timber management, the potential effects of smoke from prescribed burns on human health and the conflict between federal/state air quality regulations and prescribed burning should be discussed in the final SEIS.

Specifically, the discussion should address existing regulatory issues (examples: conformity, nonattainment area requirements, Class I and II increment protection, relationship of particulate matter to respiratory problems, and potential conflicts between ecosystem goals and regulatory compliance/human health benefits). Human and property safety issues associated with catastrophic fire events should also be addressed. A discussion on wildfire emissions would help illustrate some of the air quality tradeoffs. The final SEIS should also raise the baseline PSD issue.

Management activities can be used in some cases to reduce the effects and risk of major catastrophic events and to accelerate desirable ecosystem conditions. Management decisions should consider the natural range and variability of disturbance events and habitat types. This is important from an ecosystem health and water quality perspective (e.g., percent of watershed disturbed). Clear implementation direction should be provided in the final SEIS and/or subsequent physiographic province plans to ensure that management decisions reflect an acceptable range of natural disturbance events, habitat type representation, and successional stages. Past and potential future catastrophic events should be considered in developing and modifying management activities. Although management goals should be clearly defined, the evolving nature of ecosystem management and the dynamics of natural events supports development of a flexible management framework. As ecosystem conditions change, additional planning and analysis may need to accommodate the cumulative effects of management activities and natural events by adjusting levels or the nature of management activities.

### Needs for final SEIS and Implementation

*We recommend that the final SEIS include a broad discussion of implementation with regard to air quality issues. The discussion should include the following eight steps:*



- (1) Assessment of the need for burning as compared to alternate silvicultural and/or site preparation methods, (such as scarification, piling unmerchantable material, and yarding unmerchantable material);
- (2) Quantification of the amounts, types of material and acreage to be burned;
- (3) Description of the types of burn proposed (e.g. broadcast burns, pile burns, understory burns);
- (4) Description of measures to reduce emissions (e.g. management of fuel moisture content, site preparation, fuel removal through firewood programs);
- (5) Quantification of emissions of regulated air pollutants;
- (6) Description of applicable regulatory and/or permit requirements, including smoke management plans;
- (7) Qualitative description of air quality impacts focused on new or increased impacts on downwind communities and visibility impacts in Class I areas; and
- (8) Modeling of downwind concentrations of pollutants to document compliance with NAAQS, PSD increments (if applicable), and visibility impacts in Class I areas (if affected).

Recognizing the limitations of current models for determining impacts from prescribed burning, other qualitative or quantitative means could be employed in the absence of an appropriate model. We concur with the FEMAT Report's recommendation in stating that, "more detailed air quality analysis should be undertaken in Forest, District, or Physiographic Province level Planning." (page VI-19)

The final SEIS should outline the tiering process and the types of air quality analyses that will be conducted for provincial plans, and site-specific projects. Analysis using the eight steps above should be repeated at subsequent planning levels (province, watershed, site) with more site-specific detail.

Along with a more detailed discussion of air quality impacts, future planning should also address air monitoring concerns. *We recommend that the final SEIS emphasize the need to evaluate adequacy of air monitoring systems since there is extremely limited USFS and BLM monitoring of particulate emissions in most areas.*

## OTHER PAGE SPECIFIC COMMENTS

(Any of the specific comments on the FEMAT Report apply to the applicable sections of the draft SEIS.)

### Draft SEIS, Summary

Page S-5: Riparian Reserves: Change "wet areas" to "wetlands."

Page S-8 to S-18: Environmental Consequences: effects of forests, Threatened and Endangered species, Aquatic Ecosystems are discussed but the section does not mention wetlands. Wetlands should be dealt with under a main heading, but at a minimum it should be discussed under the Aquatic System section. Appropriate language can be extracted from the FEMAT Report.

### Draft SEIS, Chapter 2

Page 2-7: The draft SEIS indicates the need for a strong emphasis on monitoring for adaptive management but does not specify how monitoring results will be used to ensure that ecosystem goals and objectives are met. For example, if monitoring shows that sedimentation (related to harvest or roads) of spawning gravels is occurring where there are 300 foot riparian reserves along a stream, a decision to increase the riparian reserve width in similar situations, initiate restoration, and/or modify other planned sales and activities could be warranted.

Page 2-14 and 2-16: "Riparian Reserves": Change "wet areas" to "wetlands."

Page 2-20: According to the Council on Environmental Quality regulations, the final SEIS should identify an environmentally preferred alternative.

Page 2-20: Some young forest stands exist within the LS-OG reserves for 'recruitment' to LS-OG forest in future decades. An adequate amount of younger stands should be set aside to replace LS-OG stands as they die. The final SEIS should indicate the amount of younger stands within LS-OG reserves and other areas that would be managed for recruitment.

Page 2-22: The pie charts which display percentage of landscape devoted to various reserves, matrix etc. do not seem to match with text descriptions. For example, the riparian reserve scenario description for Alternative 1 is identical to Alternative 4 but the pie charts show 8 percent withdrawn for Alternative 1 and 12 percent for Alternative 4. It also appears that Alternatives 2 and 3 should show identical percentages withdrawn for riparian reserves. The explanation of why the numbers do not match the text descriptions should be explained in the introduction or in a footnote.

### Draft SEIS, Chapter 3&4

Page 3&4-3: The final SEIS should clearly describe the kind of cumulative effects analysis that was conducted and those expected in future NEPA analyses. The expert

panels cited in the draft SEIS included a quantitative evaluation of federal land. Nonfederal lands were discussed qualitatively. The draft SEIS and FEMAT Report did not include a quantitative cumulative effects analysis across all ownerships.

**Page 3&4-7, Figure 3&4-1:** We recommend that physiographic province boundaries not be constrained by state lines. We note that physiographic provinces cross watershed boundaries. This should not be a serious problem because, for example, ecologically streams in the coastal lowlands are more similar to one another than they are to streams in the upper portion of the same watershed. We suggest coordination with the EPA Corvallis Lab, as they have drafted subecological regions for the coast range and have ground truthed much of their information. While these sub-ecological regions may have been developed for different reasons (i.e. water quality - physical, chemical & biological) they appear to be quite similar to those discussed in the draft SEIS and FEMAT Report.

**Page 3&4-14:** The final SEIS needs to emphasize the importance of the hyporheic zone in the forest ecosystem. Protection of the hyporheic zone should also be discussed in the Preferred Alternative section titled Water, Soil, Riparian, and Wetland Resources.

**Page 3&4-22 to 3&4-28:** This entire discussion of "CURRENT AQUATIC CONDITIONS" contains no analysis of wetlands. Ample material regarding status, functions etc. is available in the FEMAT Report, Appendix 5-E.

**Page 3&4-28:** Current Aquatic Conditions - A discussion on biotic interactions should be added in the final SEIS.

**Page 3&4-38:** We recommend that Chapter 2 of the final SEIS include a discussion of viability and role of nonfederal lands. (See FEMAT Report pages II-30 and II-93 and draft SEIS 3&4-38) This discussion will be important for explaining the focus of the viability assessments (habitat on federal lands) as well as providing an accurate representation of the affected environment and environmental consequences of land management activities in the range of the northern spotted owl. This is important with respect to water quality and habitat values because, first, existing LS-OG habitat is extremely limited on nonfederal lands and a large number of water bodies on both federal and nonfederal lands are listed as impaired or water quality limited under the Clean Water Act. Second, timber harvest may increase on nonfederal lands due to reduced harvest levels under Alternative 9 and the other draft SEIS alternatives. This will create the potential for greater impacts to LS-OG habitat, species that depend on LS-OG habitat, and water quality on nonfederal lands.

**Page 3&4-48:** The discussion of environmental consequences discusses riparian areas associated with streams but not wetlands.

**Page 3&4-95:** What is meant by the "groups" that are being assessed? Does this mean genus? Family? Assemblages? Why are individual races/species/groups assessed, what about interactions between groups? An evaluation ecosystem should include individual population and community health assessments.

**Page 3&4-95:** This section is titled "AQUATIC SPECIES." However, the section is entirely devoted to discussion of fish. Environmental effects to other aquatic species should be added.

**Page 3&4-97:** This is labeled as an assessment of the environmental consequences on aquatic ecosystems - however, only salmonids were examined. This assessment of the aquatic ecosystem should look at an assemblage level, in addition to assessment of individual species of fish. Macroinvertebrates, need to be examined as well.

**Page 3&4-97:** Salmonids are indicators of environmental impacts, however relying on a single indicator has drawbacks. Due to their mobility, salmonids are exposed to a number of stressors not associated with timber harvest, such as overfishing, competition from hatchery fish and exotics. It is difficult to separate out effects from timber harvest versus those from other stressors. Examining the entire fish assemblage, in addition to individual groups (i.e. salmonids), plus other assemblages (such as macroinvertebrates and amphibians) strengthens impact assessments, as other organisms are less mobile than salmonids and respond to stresses differently.

**Page 3&4-101:** Economic and community mitigation (page 3&4-136) may include state and private lands programs that may in part address habitat needs for fisheries in these areas. This relationship may affect species viability and merit more discussion.

**Page 3&4-136:** The Economic and Community Mitigation Section should include be updated with current information on the Labor and Community Assistance package at the time of the final SEIS.

**Page 18 of Glossary:** The definition of wetlands used for implementation of the Clean Water Act is more standardized than the Executive Order 11990 definition. To use the 11990 definition creates an inconsistency between the FEMAT Report and the SEIS. The Clean Water Act definition of wetlands should be used. (See FEMAT Report, Appendix E-5.)

#### Draft SEIS, Appendix B

**Page B-1:** The context for this appendix should be clarified. For example, the introduction of each subsection should include an explanation of how each section relates to each alternative.

**Page B-70:** The text indicates that "some or all" of the recovery plan standards and guidelines on pages B-70 through B-74 are applied in Alternatives 2 through 10. The final SEIS should clarify which standards and guidelines apply to each alternative.

**Page B-75:** The first paragraph states that "the Aquatic Conservation Strategy was developed to protect salmon and steelhead habitat on all public lands". The third paragraph states that "this conservation strategy is aimed at restoring and maintaining the ecological health of watersheds". These two statements are not equivalent and the purpose of the Aquatic Conservation Strategy is unclear. We recommend that the broader objective of maintaining the ecological health of watersheds should be the primary goal.

**Page B-78:** One of the waterbody categories for Riparian Reserves is fish-bearing streams. The final SEIS should clarify if "fish-bearing streams" refers to all fish, game fish, and/or salmonids.

**Page B-79:** Modification and adjustment of Key Watershed boundaries is not discussed in the draft SEIS or FEMAT Report. The final SEIS needs to include resolution of: When is it appropriate to add, delete, or modify key watersheds, if at all? What criteria will be used and who would make the decision?

**Page B-79:** Several restrictions for road construction are recommended for Key Watersheds. How will water quality be protected in non-Key watersheds with no apparent restrictions on road construction?

**Page B-80:** Watershed analysis should examine not only biotic and abiotic processes as they influence aquatic habitat and species abundance, but should also examine how these processes influence individual health, assemblage interactions and the health of the entire stream ecosystem.

**Page B-80:** The text should be amended to clarify at what scale watershed analysis will be applied and how watershed analysis fits into the NEPA process and the requirements for a cumulative effects analyses.

**Page B-82:** It is critical that any watershed restoration that uses in-stream habitat structure, include monitoring of habitat, physical parameters, water chemistry, and biological communities to determine if the restoration is successful. Restoration is an inexact science, therefore, monitoring to confirm the degree to which aquatic ecosystems are being improved will ensure the success of future restoration efforts.

As with our earlier comments on restoration, to determine the effectiveness of restoration of a particular stream, it is necessary to compare it with a reference condition.

#### FEMAT Report, Overview and Summary, Chapter II

**Page II-8:** Both the second and third paragraphs should include "wetlands" in the opening sentence.

**Page II-12:** The paragraph under "Watershed Analysis" should include "wetlands" in the opening sentence.

**Page II-31:** Alternative 9 "incorporates a reserve design different from that specified in the [Northern Spotted Owl] Recovery Plan but tailored to meet owl population objectives." The FEMAT Report (Page II-32) also recognizes "areas of special concern where private, state, and federal lands are intermingled or federal lands are absent. In these areas of special concern, contributions by nonfederal lands remain important to recovery of the species and should be addressed in the final recovery plan..." The final SEIS should discuss the status of the Northern Spotted Owl Recovery Plan and how it will be used in concert with the selected alternative from this SEIS. The final SEIS should

identify and describe mitigation measures that are necessary for the preferred alternative to be consistent with the recovery plan.

**Page II-38: "Riparian Reserves"** The first paragraph gives the impression that all riparian reserves are directly coupled to rivers and streams. This is not the case for many important wetlands. The paragraph should be reworded to specifically discuss wetlands.

**Page II-94, Figure II-35:** This figure depicts species rated as 60 percent or more likelihood of having habitat on federal lands capable of supporting a viable population. This is outcome A. This is somewhat confusing as 80 percent likelihood of achieving outcome A is often what is focused on (page 3&4-38). The final SEIS should carefully explain these percentages when they are used.

#### FEMAT Report, Aquatic Ecosystem Assessment, Chapter V

**Pages V-11 to V-12:** The source of data and discussion for this section is unclear. Some of the information conflicts with that presented in Appendix V-E.

**Page V-12: Table V-1** appears to be inaccurate. Casual observation of plant species in a wetland in an old growth forest will yield over 50 species. The basis for the numbers in this table need to be verified. In addition, the occurrence of lichens and bryophytes appear also to be understated.

A comprehensive literature review on wildlife utilization of forested riparian habitats has been recently completed by O'Connell, Hallet and West (1993). Numerous northwest experts were consulted and all currently available literature was reviewed. Specific relation of species and species groups to riparian areas are discussed in some detail. Information from this source is cited in Appendix V-E and is inconsistent with Table V-1. For example, 78 bird species use riparian habitats and 127 species are associated with wetlands in western Washington according to the O'Connell report. Similar inconsistencies between Table V-1 and Appendix V-E exist for mammals and amphibians. Some of the inconsistencies might be explained by the fact that Table V-1 includes only those species exclusively associated with LS-OG forest systems. However, the plan alternatives are for all federal forest lands, not just those which currently exhibit old growth characteristics.

The O'Connell report represents a very recent and comprehensive effort to document the relation of wildlife species to riparian areas. The report also discusses the specific ways in which wildlife utilize riparian areas and their sensitivity to disturbance from forest practices. Information for all species is summarized in Table 4 of O'Connell et al. (1993). This table should be included in the final SEIS to reinforce the need for riparian reserves for species other than anadromous salmonids.

**Page V-32:** under "Riparian Reserves" Wetlands and wetland functions should be added to the discussion.

**Page V-35 and V-36:** The interim widths for Riparian Reserves use the definition "outer edges of riparian vegetation." We suggest that the phrase, "outer edges of riparian

vegetation, or to the extent of seasonally saturated soil" be deleted from this section for the following reasons: (1) There is no accepted definition of riparian vegetation. (2) Evidence of water in the root zone may not be evident much of the field season. (3) There is no list of "riparian" plant species, and (4) There are no methodologies for applying the definitions in the field.

**Page V-37, Table V-5:** This table is incomplete. The headings of "Stream class" should be changed to "Water Body Type." The table needs to be revised under this heading to include reservoirs, lakes, ponds and wetlands, as appropriate, for each Riparian Reserve Scenario.

**Page V-58:** Watershed restoration projects using in-stream habitat structure should include monitoring of habitat, water chemistry and biological communities to determine if the restoration is successful.

**Page V-58:** The final SEIS should discuss monitoring activities and results for the restoration examples of woody debris structures and road removal that are cited. In addition it should summarize what is currently known about and what has been learned from current restoration programs. The discussion should also identify any lessons learned in selection criteria, implementation guidelines, institutional arrangements and/or funding that could improve restoration effectiveness.

**Page V-62:** The final SEIS should clarify what is meant by water quality network since there are numerous types of monitoring networks. It appears that the report is referring to characterization of water column parameters at some scale.

**Page V-62:** Measurement of the biological condition of streams using the Rapid Bioassessment Protocols (RBPs) is referenced. Although based on sound ecological principals, the RBPs were developed primarily using research from the midwest and eastern United States. EPA Region 10 has adapted the RBPs to conditions in the northwest in the document titled "Region 10 In-stream Biological Monitoring Handbook: for wadable streams in the Pacific Northwest." The Region 10 document should be the cited reference along with the RBPs for conducting biological assessments in this portion of the U.S.

**Page V-62:** We disagree with the statement that "reference watersheds should represent a range of forest and stream conditions which have been exposed to natural and induced disturbance" and that the data from these watersheds will provide "a gauge by which to assess trends in stream conditions". Reference watersheds should represent biological potential based on the best attainable watershed condition, habitat structure, water quality and biological parameters for a similar streams of a particular ecological region. Selecting watersheds that are exposed to induced disturbance as a gauge to assess stream condition sets expectations unnecessarily low and is therefore less protective of aquatic life.

Reference watersheds should be selected with care because the resultant database will be used as a benchmark against which test sites will be compared. The overall goal in the characterization of the reference condition from carefully selected reference sites is to

describe the biota that are optimal for the area of interest. Test sites can then be compared to this benchmark to determine: whether an impact exists, restoration successes, and trends in the status of stream conditions. The characteristics of appropriate reference sites will vary among ecological regions and for different waterbody and habitat types.

One particularly problematic aspect about the use of minimally impacted areas as references is what to do if an area is extensively degraded. In this case there may be no minimally impacted sites and even the least impacted sites might indicate significant deterioration. Hughes et al. (1986, 1990) cautioned that some regions (or subregions, or stream types) may be so disturbed that no, or few suitable reference sites exist for them. In such cases, it will be necessary to use some reference sites from similar streams in different ecological regions. Without this option, we run the risk of setting goals too low in highly disturbed regions.

#### Appendix V-I Watershed Analysis and its Role in Ecosystem Management.

Page 1: The Watershed Analysis Guidelines should be clearly consistent with the development of Total Maximum Daily Loads (TMDL) under Section 303(d) of the Clean Water Act (FEMAT Report, Appendix V-D).

Pages 8 and 15, The aquatic conservation strategy leaves the cumulative watershed effects related to road and timber harvest density to future watershed analysis. The final SEIS should explain the cumulative effect assumptions in the aquatic conservation strategy, including the implied assumptions that: (1) to a certain degree riparian reserves, key watersheds, and watershed restoration can ensure avoidance of cumulative water quality effects by themselves, and (2) the extent to which complete determinations of cumulative effects will be based on road and timber harvest density estimates at the time of an individual watershed or site analysis.



SUMMARY OF THE EPA RATING SYSTEM  
FOR DRAFT ENVIRONMENTAL IMPACT STATEMENTS:  
DEFINITIONS AND FOLLOW-UP ACTION \*

Environmental Impact of the Action

LO--Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities with no more than minor changes to the proposal.

EC--Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EO--Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU--Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category I--Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2--Insufficient Information

The draft EIS does not contain sufficient information for EPA fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3--Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

\*From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment

# Appendix G

## **Final Biological Opinion**

# Appendix G

## Biological Opinions and Biological Assessment

This appendix consists of three parts:

Part 1 consists of the Biological Opinion for Alternative 9 of the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl* (Final SEIS). The Biological Opinion is the U.S. Fish and Wildlife Service's evaluation of the biological assessment.

Part 2 contains correspondence between the SEIS Interdisciplinary Team and the National Marine Fisheries Service. This includes a letter received from the National Marine Fisheries Service stating their concurrence that adoption of Alternative 9 would not affect the four anadromous fish species currently listed under the Endangered Species Act and known to occur within the range of the northern spotted owl.

Part 3 consists of two portions. The first portion is an addendum to the October 1993 biological assessment which analyses the effect of the modifications to Alternative 9. The second portion is the uncirculated October 1993 biological assessment for the preferred alternative as that alternative was described in the Draft SEIS. The biological assessment and this addendum are the documents prepared by the SEIS Interdisciplinary Team that describe the team's determination of the effects of the proposed action on species listed under the Endangered Species Act. To receive a copy of the October 1993 biological assessment, send a written request to:

October 1993 Biological Assessment  
Interagency SEIS Team  
P.O. Box 3623  
Portland, Oregon 97208-3623





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Interagency SEIS Team • (503)326-7883

October 8, 1993

Marvin Plenert  
Regional Director  
U.S. Fish and Wildlife Service  
911 N.E. 11th Ave.  
Portland, Oregon 97232

Dear Marv:


Enclosed is a Biological Assessment for the preferred alternative identified in the Draft 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 (DSEIS). The Assessment was prepared for the listed species identified in your July 2, 1993 letter.

The Forest Ecosystem Management Assessment Team (FEMAT) and this Assessment found Alternative 9 (the preferred alternative) to be consistent with the overall strategy to provide for the continued survival of northern spotted owls (i.e. the ISC and Final Draft Recovery Plan management concepts). The alternative was considered by the FEMAT to have an 83 percent likelihood of providing habitat to support a well distributed population of the species on federal lands in one hundred years time. Alternative 9 would allocate a portion of the Federal forests containing spotted owl habitat into a "matrix" where timber harvest, road construction and other management activities would be permitted in accordance with certain prescriptions. Since these activities may affect listed species, initiation of formal consultation under the Endangered Species Act is requested in accordance with 50 CFR 402.12(k). Consultation will allow your agency to provide an opinion as to the effects of the action on the affected species. We suggest that the Interagency Implementation Team work with your staff to clarify the information needs in preparing subsequent activity plans which may involve incidental take associated with the potential implementation of the preferred alternative.

It is our determination that the preferred alternative may affect the following species: the northern spotted owl and its critical habitat, marbled murrelet, grizzly bear, gray wolf, peregrine falcon, bald eagle, Columbian white-tailed deer, Lost River sucker, shortnose sucker, Oregon silverspot butterfly, Oregon chub, MacDonald's rockcress, and Nelson's sidalcea. The remaining listed species (see attached table) would not be affected by the preferred alternative.

Based on these determinations, we are requesting formal consultation on the northern spotted owl and spotted owl critical habitat and the other listed species which we have determined may be affected by the preferred alternative.

As we have discussed with Dale Hall, the EIS Team will need the final Biological Opinion no later than November 10, 1993. Therefore, we look forward to receiving the draft Opinion no later than November 1, 1993.

*For*   
ROBERT T JACOBS  
Interagency SEIS Team Leader

Enclosures: Table of listed and proposed species assessed  
Biological Assessment  
DSEIS  
FEMAT Report



IN REPLY REFER TO:

# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

911 NE. 11th Avenue  
Portland, Oregon 97232-4181

FEB 10 1994

In Reply Refer To:      1-3-94-F-01 (Washington)  
                             1-7-94-F-14 (Oregon)  
                             1-1-94-F-03 (California)

Robert T. Jacobs, Team Leader  
Interagency SEIS Team  
P.O. Box 3623  
Portland, Oregon 97208-3623

Dear Mr. Jacobs:

Enclosed is the final biological opinion for the preferred alternative (Alternative 9) of the Supplemental Environmental Impact Statement on Management of Habitat for Late Successional and Old-Growth Forest Related Species on Federal Lands within the Range of the Northern Spotted Owl. The Service recognizes the extensive work done by the SEIS Team, and all Federal agencies in the northwest to develop a management strategy that attempts to end the controversy over management of northwest forests and move towards holistic ecosystem management. This effort has solidified the agencies as a Federal team, working together to ensure the health of forest ecosystems.

The cooperation and teamwork on the part of the Federal agencies involved not only facilitated completion of this consultation, but should also serve as a model for future consultations on forest ecosystem planning.

The biological opinion, provided under Section 7 of the Endangered Species Act (ESA), fully analyzes the effects of Alternative 9 on species listed under the ESA and spotted owl critical habitat. The opinion concludes that Alternative 9 will accomplish or exceed the standards expected for the Federal contribution to recovery of the northern spotted owl and assurance of adequate habitat for its reproduction and dispersal. The question of overall recovery of the species will be evaluated further to determine the recovery needs on non-Federal lands. In addition, the Service intends to approach the public to re-examine the need for critical habitat if Alternative 9 is adopted.

We greatly appreciate the cooperative spirit in which this process has been undertaken and look forward to moving into the future with the Forest Service, BLM, and other Federal agencies to assure healthy ecosystems for the present

and generations to come. If you have questions concerning this final opinion, please contact H. Dale Hall (503-231-6159) or me (503-231-6118).

Sincerely,

A handwritten signature in cursive script, appearing to read "Merrill L. Bennett".

MERRILL L. BENNETT

Regional Director

cc: USFS-John Lowe, Regional Forester (R-6)  
USFS-Ronald Stewart, Regional Forester (R-5)  
BLM-Dean Bibbes, State Director (Oregon)  
BLM-Ed Hastey, State Director (California)




BIOLOGICAL OPINION  
for the  
PREFERRED ALTERNATIVE (ALTERNATIVE 9) OF THE  
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT ON MANAGEMENT  
OF HABITAT FOR LATE SUCCESSIONAL AND OLD GROWTH FOREST RELATED  
SPECIES ON FEDERAL LANDS  
WITHIN THE RANGE OF THE NORTHERN SPOTTED OWL

Agencies: U.S. Forest Service (Region 5 & 6)  
Bureau of Land Management (Oregon, Washington, California)

Consultation Conducted By: U.S. Fish and Wildlife Service, Region 1

Date Issued: FEB 10 1994

  
MARVIN L. PLUMMER

BIOLOGICAL OPINION  
for the  
PREFERRED ALTERNATIVE (ALTERNATIVE 9) OF THE  
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT ON MANAGEMENT  
OF HABITAT FOR LATE SUCCESSIONAL AND OLD-GROWTH FOREST  
RELATED SPECIES ON FEDERAL LANDS  
WITHIN THE RANGE OF THE NORTHERN SPOTTED OWL

I. INTRODUCTION

This biological opinion is in response to the interagency Supplemental Environmental Impact Statement (SEIS) team's request for formal consultation on Alternative 9 of the Draft Supplemental Environmental Impact Statement on Management of Habitat for Late Successional and Old-Growth Forest Related Species on Federal lands Within the Range of the Northern Spotted Owl (*Strix occidentalis caurina*) (DSEIS). The letter requesting consultation and transmitting the biological assessment was dated October 8, 1993, and received by the U.S. Fish and Wildlife Service (Service) on October 13, 1993. Prior to receipt of the biological assessment, the U.S. Forest Service (Forest Service), Bureau of Land Management (BLM), and the Service shared information and guidance through the informal consultation process. This consultation is being conducted pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act). A draft of the biological opinion, dated November 30, 1993, was provided to the SEIS team for review. Modifications to the originally proposed action have been made since that time and this biological opinion is on the revised SEIS (see DESCRIPTION OF THE PROPOSED ACTION).

II. BACKGROUND

As a result of over a century of logging, forests in the Pacific Northwest presently consist of a highly fragmented mosaic of recent clearcuts, thinned stands and young plantations interspersed with uncut natural stands. In an effort to address the controversy over management of these forests, the Administration commissioned the Forest Ecosystem Management Assessment Team (FEMAT) to formulate and assess an array of management options. The Assessment effort focused on late-successional forests on Forest Service and Bureau of Land Management (BLM) lands within the range of the northern spotted owl (spotted owl) in western Oregon and Washington, and northwestern California. A set of options were developed, based primarily on previous studies, to provide habitat to support viable populations of forest and forest-related species on Forest Service and BLM lands. Over 1,000 species associated with late-successional forests were evaluated as to the relative efficacy of the various options in providing habitat to maintain their viability on these lands.

The options were intended to address a wide range of species associated with late-successional forests and were primarily developed from the current state

of knowledge about the spotted owl, the marbled murrelet (*Brachyramphus marmoratus marmoratus*), anadromous fish, and late-successional forests (see FEMAT report, chapter 3, for a full description of methods and information used).

The options developed by the FEMAT are presented as the alternatives in the DSEIS. The DSEIS analyzes impacts of a range of alternatives to management of habitat for late-successional and old-growth conifer forest-related species within the range of the spotted owl. The action to be taken in the SEIS is to adopt a coordinated management direction for the lands administered by the Forest Service and BLM within the range of the spotted owl and to protect and enhance late successional and old-growth forest ecosystems.

This approach is intended to provide a strong contribution to the management and conservation of a wide range of species, including listed species. The Service was an active partner in the development of this strategy and strongly supports the approach taken.

In consultation under section 7, the Service must assess the effects of proposed actions, taking into account the status of listed species on Federal and non-federal lands, and must evaluate both short- and long-term effects of proposed actions. In addition, the current condition is factored into the evaluation. If a species' status is tending downward because of past actions, the Service must evaluate how the effects of those past actions affect the listed species' status as a baseline for considering the effects of the proposed action-at-hand.

This consultation will address the preferred alternative, Alternative 9, and its effect from a programmatic standpoint only on listed species which may be affected by the action. The species reviewed in this biological opinion represent only a fraction of the total number of species considered in the development of the FEMAT report (over 1,000 species were considered in FEMAT, including about one third of the 300 species within the range of the owl which are currently listed, proposed, petitioned, or candidates under the Act). Anadromous fish species were not included in the Service's review; these species are under the responsibility of the National Marine Fisheries Service.

Alternative 9 provides the "backbone" for ecosystem management of forests on Forest Service and BLM lands within the range of the spotted owl by constructing a network of late-successional forests and a scheme for protection of aquatic and riparian habitats (USDA et al. 1993, p. I-1). Implementation of Alternative 9 would result in a region-wide management strategy that provides guidance to be considered as forest and district plans are developed. This would include the future proposed planning approach at the physiographic province or river basin level, and include watershed analyses to assess appropriate actions at the local level (USDA et al. 1993, p. II-88-II-89).

A large amount of information was accumulated through the FEMAT process about forest and forest-related species. Although this information was sufficient to allow a general assessment of the benefits to these species over their respective ranges, for a variety of reasons it could not include a level of review which would address the specific needs of every individual species at lower planning levels. As management plans are developed and future on-the-ground projects identified, the level of review will become more species and site-specific with adjustments made through the adaptive management process. Inclusion of regulatory review early in the planning process is an integral component of the proposed adaptive management process.

In December 1993, the SEIS Team completed an additional analysis to look more closely at specific needs of some individual species or groups of species. This additional analysis was the basis for several of the modifications to the original Alternative 9 described in the DSEIS. These modifications were evaluated in the development of this opinion, where applicable to listed species.

### III. BIOLOGICAL OPINION

It is the biological opinion of the Service that the adoption of Alternative 9, as modified, is not likely to jeopardize the continued existence of any listed species, or result in the destruction or adverse modification of any designated critical habitat for those listed species. The late-successional and riparian reserve features of Alternative 9 are particularly important contributions to the conservation of the spotted owl and marbled murrelet. They will also aid the conservation of other listed, proposed, and candidate species. The Service is also encouraged by the watershed analysis and province level planning aspects of Alternative 9 which will allow for more efficient and effective management of listed species. Other important features of Alternative 9 are its commitment to research and monitoring and an adaptive management process that collectively allow for appropriate adjustments in forest management in response to a growing information base. All these elements contribute to the Service's opinion of the importance of this approach to ecosystem management and its benefits to listed species.

The Service strongly supports the adoption and implementation of Alternative 9. The agencies and the SEIS team have done an admirable job of providing the Service with as much information as possible in the biological assessment and in recent information updates. Alternative 9 represents a new and comprehensive approach to the management of Forest Service and BLM forests, but does not quantify the "on-the-ground" impacts of specific future management actions which will require planning and review before decisions can be made. For this reason, the Service did not provide an incidental take statement in this biological opinion (see section VIII.). Such statements will be provided with future biological opinions which address the implementation of the selected alternative, as district and forest plans and/or province plans are developed.

## ASSUMPTIONS

To ensure that the analysis under section 7 of the Act had a measurable baseline, or starting point, the following assumptions were identified to assist in the development of this opinion:

1. Riparian and Late-Successional Reserves (LSRs) will retain reserve status and will not be available for timber production other than as provided in Alternative 9 (i.e., salvage and silvicultural treatments beneficial to the creation of late-successional conditions).
2. The current condition, abundance, and distribution of habitat available to listed species has not changed from the situation analyzed for the Final Draft Northern Spotted Owl Recovery Plan or other recent plans; the modifications to Alternative 9 from the draft to the final SEIS will result in less impact to listed species.
3. Alternative 9 applies to Forest Service and BLM lands; all future actions on these lands would be consistent with Alternative 9, as adopted in the Record-of-Decision (ROD).
4. The Service will work cooperatively with other Federal agencies in future watershed analyses and project and province level planning efforts to facilitate future section 7 consultations.
5. Research and monitoring will be initiated and will provide information critical to the watershed analysis process and in evaluating the recovery of listed species. The adaptive management feature of Alternative 9 will allow for adjustments in forest management based on information developed and conclusions reached through research, monitoring, and future section 7 consultation.
6. Federal actions such as already planned timber sales, which are still in the process of section 7 consultation, have not been included within the environmental baseline and have not been analyzed in this opinion for their impacts to listed species or to designated critical habitat.

## IV. DESCRIPTION OF THE PROPOSED ACTION

There are 24,455,300 acres of Federal land within the range of the northern spotted owl. The remaining acreage of nonfederal land in the range (32,548,200 acres) is largely forested and will be addressed in an EIS being prepared for a proposed 4(d) rule. The management proposal in this SEIS allocates these acres to one of six categories of designated areas, or to the matrix. The alternative applies to lands administered by the Forest Service

and Bureau of Land Management within the range of the northern spotted owl and is fully described in the FSEIS.

Like other recent strategies for management of northern spotted owl habitat or old-growth forests of the Pacific Northwest, the alternatives presented in this SEIS propose a network of designated areas managed primarily to protect and enhance habitat for the northern spotted owl and other late-successional and old-growth forest related species (hereafter referred to as designated areas), and nondesignated areas referred to as the matrix. Within each of these areas, standards and guidelines set management direction and apply to management activities. Appendix B of the FSEIS contains additional information about particular standards and guidelines or processes.

The proposed action (Alternative 9) includes: 1) the adoption of a coordinated management direction for the lands administered by the Forest Service and BLM within the range of the northern spotted owl; and 2) protection and enhancement of late-successional and old-growth forest ecosystems. Alternative 9 affects approximately 22 million acres of Federal land. The strategy incorporates components developed during previous efforts, including the Interagency Scientific Committee's Conservation Strategy for the northern spotted owl (Thomas et al. 1990), the Scientific Panel on Late-Successional Forest Ecosystems report (Johnson et al. 1991), the Final Draft Recovery Plan for the Northern Spotted Owl (USDI 1992a), and the Scientific Analysis Team's Report (Thomas et al. 1993). The key components incorporated into Alternative 9 include land allocations, implementation strategies and monitoring as described below. The standards and guidelines which will apply to the allocations are described in detail in Chapter 2 and Appendix B of the DSEIS.

#### CONGRESSIONALLY RESERVED AREAS (CRAs)

These areas are land allocations of Congressionally reserved, or other Federal land designations. They include designated Wilderness, Wild and Scenic Rivers, National Wildlife Refuges, National Parks, certain Research Natural Areas and lands managed by the Department of Defense. Management of these lands would follow direction written in the applicable legislation or plans. These areas account for approximately 7.3 million acres.

#### LATE-SUCCESSIONAL RESERVES (LSRs)

Late-Successional Reserves would be managed to protect and enhance habitat for late-successional and old-growth related species including the northern spotted owl and marbled murrelet. Some level of silvicultural treatment (such as thinning young stands) is permitted in certain age stands to accelerate the development of old-growth habitat characteristics, subject to review by the Regional Ecosystem Office. The Regional Ecosystem Office may develop criteria that would exempt some activities from review. Stand and vegetation management of any kind, including prescribed burning, is considered a silvicultural treatment and is subject to review. An exception would be made for reforestation activities legally required by, and planned as part of,

existing sold timber sales, where the reforestation prescription has been modified as appropriate to meet the new objectives of the Late-Successional Reserve. Standards and guidelines for multiple-use activities other than silviculture appear in Appendix B7 of the FSEIS. Research Natural Areas and activities required by Recovery Plans for listed threatened and endangered species take precedence over Late-Successional Reserve standards and guidelines. These reserves are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem.

A management plan should be developed for each large Late-Successional Reserve (or group of smaller Late-Successional Reserves) before habitat manipulation activities are designed and implemented. These will be based on results of watershed analysis and may be developed as part of province level planning, or as stand-alone plans. In any case, land management agencies may choose to conduct the plans as components of legally-mandated plans (e.g., Forest or District Plans). Late-Successional Reserve planning should generally include: 1) a history and inventory of overall vegetative conditions within the reserve; 2) a list of late-successional associated species found within the Late-Successional Reserve and information on their locations; 3) a history and description of current land uses within the reserve; 4) a fire management plan; 5) criteria for determining appropriate treatments; 6) identification of specific areas that could be treated under those criteria; and 7) an implementation schedule tiered to higher order (i.e., at a larger scale) plans. Individual Late-Successional Reserve plans should propose monitoring and evaluation components to help assure that activities are carried out as intended and achieve desired results. Late-Successional Reserve plans are subject to review by the Regional Ecosystem Office.

Late-Successional Reserves contain a total of 7,430,000 acres. The 192 mapped reserves range from 39 acres to 508,000 acres in size and provide the backbone of Alternative 9 by ensuring aggregation of habitat over time for late successional species. The reserves do not entirely consist of older forest at this time, but include extensive areas of younger forest that would be allowed or managed to grow into late-successional condition.

#### Occupied Marbled Murrelet Sites

Protection is prescribed for all forest sites occupied by marbled murrelets found outside the mapped LSRs. This consists of conducting surveys to a Service-endorsed protocol and designating as LSR the contiguous marbled murrelet nesting and recruitment habitat (stands capable of becoming suitable within 25 years) within 0.5 miles of the area where murrelet activity is detected. In addition, any timber activity within the 0.5 mile circle should be designed to protect and enhance nesting and recruitment habitat which is retained.

### Spotted Owl Activity Centers

Spotted owl activity centers which occur within the matrix and adaptive management areas will be protected by retention of 100 acres of the best habitat around the site.

Thinning or other silvicultural treatments inside all reserves are subject to review by the Regional Ecosystem Office to ensure that the treatments are beneficial to the creation of late-successional forest conditions. The Regional Ecosystem Office may develop criteria that would exempt some activities from review. Activities that would be permitted in the western and eastern portions of the northern spotted owl's range are described separately below. Salvage of dead trees would be based on guidelines adapted from the Final Draft Spotted Owl Recovery Plan, limited to areas where catastrophic loss exceeds 10 acres, and subject to review by the Regional Ecosystem Office.

#### West of the Cascades:

There is no entry allowed in stands over 80 years old. Thinning (precommercial and commercial) may occur in stands up to 80 years old regardless of the origin of the stands (plantations planted after logging or stands naturally regenerated after fire or blowdown). The purpose of these silvicultural treatments is to be beneficial to the creation and maintenance of late-successional forest conditions.

#### East of the Cascades and in the Oregon and California Klamath Provinces:

Given the increased risk of fire in these areas due to lower moisture conditions and the rapid accumulation of fuels in the aftermath of insect outbreaks and drought, additional management activities are allowed in Late-Successional Reserves. Guidelines to reduce risks of large-scale disturbance are adapted from the Final Draft Spotted Owl Recovery Plan.

#### **ADAPTIVE MANAGEMENT AREAS (AMAs)**

The objective for each of these areas is to develop and test new management approaches to integrate and achieve ecological and economic health, and other social objectives. Each area has a different emphasis to its prescription, such as maximizing the amount of late-successional forests or improving riparian conditions through silvicultural treatments.

Adaptive Management Areas are landscape units identified in, and unique to, Alternative 9. They are designated to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives. Ten areas of Federal lands ranging from about 84,000 to nearly 400,000 acres have been identified. Within the boundary of several AMAs, there is LSR acreage which has specific guidance.



Standards and guidelines for Congressionally Reserved Areas or Late-Successional Reserves must be followed when they occur within Adaptive Management Areas. However, flexibility is provided to meet objectives for Riparian Reserves and Key Watersheds. For the remaining acreage of Adaptive Management Areas, standards and guidelines are to be developed to meet the objectives of the specific Adaptive Management Area.

These areas, ranging in size from 84,000 to nearly 400,000 acres, were designated "for the development and testing of technical and social approaches to integration and achievement of desired ecological, economic, and other social objectives" (USDA et al. 1993, p. II-11). The main objective is to improve knowledge of how to do ecosystem management. In these areas, the Federal agencies would be expected to pursue a variety of approaches to achieving the conservation objectives of Alternative 9. The AMAs account for approximately 1.5 million acres and have varying direction regarding management of threatened and endangered species habitat. Several AMAs also have inclusions of LSR with varying management direction.

#### **MANAGED LATE-SUCCESSIONAL AREAS (MLSAs)**

Managed Late-Successional Areas are identified in areas where regular and frequent fire was a natural part of the ecosystem. They include about 102,200 acres. The objective for these areas is to produce and maintain an optimum level of late-successional and old-growth stands on a landscape scale. MLSAs have been identified around specific known northern spotted owl sites outside of other allocations in the Washington Eastern Cascades and California Cascades Provinces and for a variety of other species throughout the spotted owl's range. In these areas, certain silvicultural treatments and fire hazard reduction treatments are allowed to help prevent complete stand destruction from large catastrophic events such as high intensity, high severity fires, or disease or insect epidemics. As with Late-Successional Reserves, each Managed Late-Successional Area should receive specific management analysis. Standards and guidelines for multiple-use activities other than silviculture, which are found in FSEIS Appendix B7, Late-Successional Reserve Standards and Guidelines, also apply to Managed Late-Successional Areas.

In addition to the MLSAs illustrated in the SEIS maps, there are a variety of species-specific protection buffers described to protect candidate and other special status species (also see Administratively Withdrawn Areas).

#### **ADMINISTRATIVELY WITHDRAWN AREAS (AWAs)**

Except as otherwise noted, standards and guidelines of the current plans and draft plan preferred alternatives apply where they are more restrictive or provide greater benefits to late-successional and old-growth related species than the provisions of Alternative 9. Administratively Withdrawn Areas are

### Effects on Marbled Murrelets

In an effort to provide guidance for management of Federal habitat for the marbled murrelet, the FEMAT Marbled Murrelet Working Group (Working Group) developed three general goals:

1. stabilize or improve nesting habitat through protection of all occupied sites (both current and future);
2. develop future habitat in large blocks (creating more interior habitat and possibly decreasing avian predation); and
3. improve distribution of habitat, thereby improving distribution of marbled murrelet populations.

To address these goals, Alternative 9 includes the following measures for marbled murrelets:

1. provision of an LSR network that protects and maintains approximately 1,300,000 acres of marbled murrelet nesting habitat;
2. the survey for and protection of all sites occupied by marbled murrelets in Marbled Murrelet Zones 1 and 2; and
3. management of the occupied sites to improve habitat conditions around those occupied sites and reduce fragmentation.

Each of these measures plays an integral part in meeting the three goals developed by the Working Group. Following is a brief discussion of each management category, the level of protection afforded to marbled murrelets within them, and the contribution each is expected to provide. The marbled murrelet habitat acreage figures presented in the following paragraphs are taken from the biological assessment and supplemental information provided by the SEIS Team. These figures were derived from timber-type data bases that were not specifically designed to identify marbled murrelet habitat; therefore, true habitat conditions may differ from those presented. However, the Service considers these acreage figures to be the best available information, and therefore, has used them to complete consultation.

### Marbled Murrelet Critical Habitat

Critical habitat was proposed for the marbled murrelet on January 27, 1994, and the Service will receive comments and take appropriate action as a result of public involvement. The proposal identifies only lands within Late Successional Reserves for possible designation. The Service has not identified any potential conflicts between Alternative 9 and the proposed murrelet critical habitat designation.

The protective measures included in Alternative 9 for LSRs will preclude negative effects through the Regional Ecosystem Office review process for all planned silvicultural activities in LSRs.

Late-Successional Reserves:

Alternative 9 designates the designation of a network of LSRs constructed, in part, around older forests containing suitable marbled murrelet nesting habitat and areas known to be currently occupied by marbled murrelets. This network is distributed throughout the marbled murrelet's range, and contains approximately 51 percent of the estimated marbled murrelet habitat on Federal lands. Another 6 percent of the habitat is within Riparian Reserves. An additional 32 percent of the estimated marbled murrelet habitat is contained within congressionally (29 percent) and administratively (3 percent) withdrawn areas; therefore, approximately 89 percent of the estimated marbled murrelet suitable habitat on Federal lands is contained within areas designated for protection. Approximately 79 percent of the known occupied sites on Federal land are in mapped LSRs, with an additional 8 percent within congressionally and administratively withdrawn areas. Therefore, approximately 87 percent of the known marbled murrelet occupied sites on Federal lands are contained in areas designated for protection within large reserve areas. This percentage is to some extent a result of the relatively low level and patchy distribution of survey effort conducted throughout the range of the species, and the use of known marbled murrelet occupied sites in the development of the LSR system.

Though much of the forest habitat contained within LSRs is not currently suitable for marbled murrelet nesting, it would be allowed to grow and develop characteristics that would make it suitable. With minor exceptions, timber harvest within LSRs would be limited to harvest related to catastrophic disturbance (salvage) and harvest in stands less than 80 years of age. Harvest activities in these younger stands would be limited to those that would decrease the time required to develop suitable nesting habitat (i.e., beneficial) and would be undertaken with the assistance of the Service. Exceptions are LSRs contained within the Northern Coast Range AMA. In this area harvest would be limited to stands of less than 110 years and would be under the same constraints of decreasing the time required to develop suitable habitat.

The LSR network would provide two important functions for the conservation of the marbled murrelet: 1) it would provide immediate protection against further removal and fragmentation of marbled murrelet nesting areas on Federal lands throughout the range of the spotted owl; and 2) over time, as currently unsuitable habitat matures and develops qualities of suitable nesting habitat, there should be a decrease in the fragmentation and an increase in the size of marbled murrelet nesting areas contained within LSRs. This second function would increase the amount of interior habitat and should decrease predation in these areas.

### Adaptive Management Areas:

Alternative 9 includes six AMAs totaling 266,600 Federal acres within Marbled Murrelet Zone 1 and 548,300 Federal acres within Marbled Murrelet Zone 2. These AMAs contain approximately 75,400 acres of suitable marbled murrelet nesting habitat. Also, these areas contain an estimated 8 percent of the known occupied marbled murrelet sites. Effects to the marbled murrelet would vary by AMA. Management direction for two AMAs (Northern Coast Range and Finney) states that the LSR acreage will remain LSR until an AMA management plan is prepared. The AMA management plan may propose management within the LSR if it is consistent with the Marbled Murrelet Recovery Plan and section 7 consultation.

Regardless of the management direction for individual AMAs, all potentially suitable marbled murrelet habitat would be surveyed prior to harvest; areas occupied by marbled murrelets would be afforded protection equivalent to that designated for sites within the Matrix (see 'Matrix' section below). In addition, the decision to protect areas identified by Johnson et al. (1991) as "most ecological significant late-successional/old-growth forests" and "ecologically significant late-successional/old-growth forests" within Marbled Murrelet Zone 1 would lessen the potential impacts to marbled murrelets.

### Matrix:

An estimated 13 percent of the known marbled murrelet occupied sites and slightly more than 8 percent of the mapped suitable nesting habitat on Federal lands are contained within the Matrix. However, as stated above, there are questions regarding the accuracy of habitat typing; therefore, it should be noted that 8 percent is an approximation. The Service has determined that harvest of habitat suitable for marbled murrelet nesting is likely to adversely affect marbled murrelets, and in certain situations, may also harm or harass ("take") marbled murrelets.

Alternative 9 provides for the protection of all known and future occupied marbled murrelet sites, including those in the matrix. However, undiscovered marbled murrelets may be adversely affected by future timber harvest actions. Several assumptions are key in the evaluation of the effects to marbled murrelets of management within the Forest Matrix:

1. The Service, in consultation with the marbled murrelet research community, would revise the survey protocol to adequately enhance the likelihood of discovering low densities of reproducing birds; and
2. Future projects that may affect marbled murrelets would undergo further consultation to ensure that all measures necessary to avoid take at each individual site would be implemented. These measures should adequately provide for the survival of the marbled murrelet.

In summary, the greatest concern relating to marbled murrelets is the species' ability to survive in the short-term (next 50 to 100 years). The delineation and protection of LSRs would beneficially affect the marbled murrelet by decreasing forest fragmentation and increasing the amount of forest interior habitat in the long term, and ensuring an adequate distribution of suitable habitat. In addition, the protection that would be afforded occupied sites found outside the reserve system would decrease the likelihood of further loss of marbled murrelet nesting areas.

While the short-term viability of the marbled murrelet is still a concern, the biological information currently available to the Service indicates that the combination of the LSR network (the protection of areas designated in Johnson et al. (1991) as described above) and the protection that would be afforded occupied sites within AMAs and the Matrix, should provide for the survival of a marbled murrelet population that is well distributed on Federal lands throughout the planning area. Alternative 9 also preserves adequate options for adjustments that may be required as more is learned regarding the condition and requirements of the species, while providing a solid foundation upon which the Marbled Murrelet Recovery Team can build.

#### BALD EAGLE SPECIES ACCOUNT, ENVIRONMENTAL BASELINE AND EFFECTS

The bald eagle (*Haliaeetus leucocephalus*) is listed as endangered in 43 of the 48 conterminous United States and as threatened in the other 5. The population in the Pacific Northwest (Oregon and Washington) is listed as threatened, in California it is listed as endangered. Its present status is a result of past and present destruction of habitat, illegal harassment and disturbance, shooting, electrocution, poisoning, a declining food base, and environmental contaminants. Currently, the primary threat to bald eagles in the 7-state Pacific recovery area (Washington, Oregon, California, Montana, Wyoming, Idaho, and Nevada) is habitat degradation (USDI 1986). In addition, environmental contaminants are affecting some local populations. Despite these problems, Oregon and Washington remain a stronghold for bald eagles. More than two-thirds of the nesting population and almost one-half of the wintering population occur in Washington, Oregon, and California. Consequently, the two states are key to regional and national recovery efforts. Washington has the largest nesting population of bald eagles in the 7-state recovery area. In 1990, of 474 bald eagle nesting territories surveyed, 398 nests were occupied and 403 young were produced. In Oregon, 237 breeding territories were surveyed in 1993; 221 territories were occupied with 174 young being produced. In California, 110 breeding territories were surveyed in 1992; 99 territories were occupied with 98 young being produced.

In the Pacific Northwest, bald eagles typically nest in multi-layered, coniferous stands with old growth trees that are located within 1 mile of large bodies of water. Availability of suitable trees for nesting and perching is critical for maintaining bald eagle populations. The Pacific Northwest is a key area for wintering bald eagles and supports over 25 percent of the wintering bald eagles in the lower 48 states. Wintering sites are

typically in the vicinity of concentrated food sources such as anadromous fish runs, high concentrations of waterfowl or sources of mammalian carrion.

A number of habitat features are desirable. Perch trees are needed by eagles for hunting and resting. These trees typically provided an unobstructed view of the surrounding area and are in proximity of feeding areas. Winter roost sites provide protection from inclement weather conditions and are characterized by more favorable microclimatic conditions.

Bald eagles are opportunistic foragers throughout their range. Bald eagles in the Pacific Northwest consume a range of food items, including a variety of fish, waterfowl, small mammals, and carrion. Fish tend to be the preferred food source (Stalmaster 1987), but diet tends to be related to availability. Mammalian carrion and waterfowl are important alternative food sources where concentrations are significant.

#### Effects on Bald Eagles

Late-successional reserves and riparian reserves proposed under the preferred alternative would benefit nesting, roosting and foraging habitat for the bald eagle. The expected improvement in aquatic ecosystems under Alternative 9 would benefit anadromous fish species in some locales, which in turn would improve foraging conditions for bald eagles. Management direction for agencies under the preferred alternative would not change from established direction to implement measures provided in the Bald Eagle Recovery Plan. Administrative withdrawals for bald eagles under current land management plans would be retained where they provide greater protection than Alternative 9.

While the adoption of Alternative 9 may benefit the bald eagle and, therefore, be in compliance with the Endangered Species Act, this opinion does not alleviate Federal agencies from responsibility under the Golden and Bald Eagle Act.

#### **PEREGRINE FALCON SPECIES ACCOUNT, ENVIRONMENTAL BASELINE AND EFFECTS**

The American peregrine falcon (*Falco peregrinus annatum*) was Federally listed as endangered in 1970. The peregrine's range extends beyond the range of the northern spotted owl. It breeds in several concentrations in the Rocky Mountains, Southwest, and northern California. A recovery plan was developed by The Pacific Coast American Peregrine Falcon Recovery Team (USDI 1982a). The species is making progress toward recovery throughout its range in the western United States.

Although peregrine falcon populations were declining prior to World War II, their decline accelerated in the early 1950's with the widespread use of chlorinated hydrocarbon pesticides (USDI 1982a). While the peregrine falcon is not closely associated with late-successional forests, it often nests on cliffs that are situated among coniferous forests. It forages in and around coniferous forests, and its diverse prey base is often associated with

openings around forested areas. Peregrine falcons are also particularly sensitive to disturbance near the nest cliff during the breeding season. Within the range of the northern spotted owl, most land management agencies (as well as timber and utility companies) are cooperating in implementation of the peregrine falcon recovery plan.

#### Effects on Peregrine Falcons

Potential threats to the peregrine include habitat alteration and disturbance as a result of timber harvest activities, road management, recreation development, mineral exploration, grazing allotments, and increased recreation pressure and/or development including off-road vehicle use (USDI 1982a).

Late-successional reserves and riparian reserves should benefit foraging habitat (providing better habitat for prey species) and may provide for increased protection from disturbance related to timber harvest activities. Management direction for agencies would not change from established direction to implement the Peregrine Falcon (Pacific Population) Recovery Plan.

#### **GRIZZLY BEAR SPECIES ACCOUNT, ENVIRONMENTAL BASELINE AND EFFECTS**

The grizzly bear (*Ursus arctos*) was classified as threatened on July 28, 1975. The Service made a warranted, but precluded finding, on a petition to reclassify the grizzly bear's status from threatened to endangered in 1992. The grizzly bear was originally distributed in various habitats throughout western North America from central Mexico to the Arctic Ocean. The current distribution is less than 2 percent of its former range south of Canada. Population decline is related to habitat loss and direct and indirect human-caused mortality. Within the range of the spotted owl, the grizzly bear is found only in the Washington Cascades Province. Currently the population in the North Cascades Ecosystem (NCE) is very small, with an estimated 10-20 bears in the U.S. portion (USDI 1990c).

A planning document for the NCE is currently being prepared and will be appended to the Grizzly Bear Recovery Plan. The NCE is one of seven grizzly bear ecosystems that either have or recently had the potential to provide adequate space and habitat to maintain the grizzly bear as a viable and self-sustaining species.

The grizzly has a broad range of habitat tolerance. It is not exclusively associated with late-successional forests. Most areas where the species remains are characterized as vast areas of contiguous, relatively undisturbed mountainous habitat having a high level of topographic and vegetative diversity. Habitats include open areas such as lowland wet meadows and marshes, shrub fields, high-elevation sedge or heath meadows, and stream flood plains. Forested areas are used for resting and hiding cover as well as for foraging.

While considered generalists, grizzly bears do rely on specific habitat types during different seasons. A concern throughout the current range of the bear is the availability of spring range. Upon emergence from high elevation dens, bears move to low elevations to feed on new vegetation (often in riparian areas) or to feed on winter-killed or weakened ungulates (USDI 1990c).

GBMUs must contain some areas isolated from areas highly impacted by humans. Grizzly bear populations require a level of safety from human depredation and competitive use of habitat such as roading, logging, mining, human settlement, grazing, and recreation. Grizzly bears have no competitors that restrict their use of habitat except humans, and it appears that they have not evolved behavioral adaptations to contend with the scope of current human influences. The density and management of roads is one of the most powerful tools available to balance the needs of people with the needs of bears (revised Draft Recovery Plan). The Service believes security habitat is important to grizzly bears and should be one of the basic considerations in grizzly bear management.

#### Effects on Grizzly Bears

The Grizzly Bear Recovery Plan identifies Actions Needed to achieve recovery for the grizzly bear. Three of these are pertinent to an evaluation of effect of Alternative 9 on NCE grizzly bears: 1) minimize sources of human-bear conflict; 2) limit habitat loss or degradation as a result of human actions such as road building, timber harvest, oil and gas exploration and development, mining and recreation; and 3) improve habitat and/or security where applicable. The following is an evaluation of how the main components of Alternative 9 address these areas to achieve grizzly bear recovery.

The LSR network would improve habitat conditions for the grizzly bear. Although the creation of late succession conditions does not have direct benefit to grizzlies per se, the reduction of timber harvest activities and associated road building and human disturbance within the reserves could improve habitat conditions for the bear, increase available security habitat, and could to some extent reduce human/bear interactions and increased mortality often associated with these interactions.

Two Adaptive Management Areas fall within the NCE: Finney and Snolquamie Pass. Although affording less advantages than the LSR network (due to the fact that some additional timber harvest can occur) these areas would still have an emphasis on restoring or providing late-successional forest. The reduction in disturbances associated with timber harvest should have a positive effect on bear security habitat.

Like the LSRs, proposed management in Riparian Reserves should further reduce human-bear conflicts, reduce habitat loss as a result of timber harvest, and improve habitat and security conditions. The restriction of no new roads in designated roadless areas of key watersheds would be particularly positive. Any further reduction in existing road mileage within these areas (as



recommended in Alternative 9) could contribute directly to grizzly bear recovery. Improving and retaining the quality of riparian areas would provide foraging and travel corridors.

With the information available to the Service, it is difficult to predict the effects to the grizzly bear from projects that may occur in the Matrix, AWAs and AMAs. When planning projects in these areas, the Federal agencies would need to implement measures that minimize project effects to the grizzly bear.

Although Alternative 9 was not specifically designed to improve conditions for the grizzly bear, it does complement grizzly bear recovery planning efforts in the North Cascades Ecosystem.

#### GRAY WOLF SPECIES ACCOUNT, ENVIRONMENTAL BASELINE AND EFFECTS

The gray wolf (*Canis lupus*) is federally listed as endangered in the 48 conterminous States, except for Minnesota where it is listed as threatened. It was believed that wolves had been extirpated in the west by the 1930's as a result of an intensive campaign by stockmen and government trappers to eradicate the wolf (Hansen 1986). Since 1990, extensive monitoring efforts indicate wolves have reappeared in the North Cascades of Washington, and numerous sightings suggest the presence of wolves in the southern portion of the Washington Cascades. Reports of large wolf-like canids also continue to be made in the vicinity of Oregon's Rogue River National Forest (Fritts 1992), although the identity of the animals is currently unknown. These areas are within the range of the northern spotted owl.

There is currently no recovery plan for wolves in Washington and Oregon. When the Northern Rocky Mountain Wolf Recovery Plan was finalized in 1987, wolves were not known to occur in Washington and Oregon except possibly in areas near or adjacent to Idaho. The Northern Rocky Mountain Wolf Recovery Plan is currently being revised by the Service to include the population of wolves in Washington.

Wolves can live in essentially any habitat that supports adequate numbers of ungulates and provides safety from excessive human exploitation (Fritts 1992). They utilize a broad spectrum of habitats provided there is an abundance of natural prey and minimal conflict with human interests/uses. The key components of wolf habitat are: 1) a sufficient, year-round prey base of ungulates and alternate prey; 2) suitable and somewhat secluded denning and rendezvous sites; and 3) sufficient space with minimal exposure to humans (USDI 1987b).

#### Effects on Gray Wolves

In the portion of the project area where gray wolves are known to occur, the preferred alternative would result in a reduced timber harvest program compared to the current forest plans. Management direction under the preferred alternative would not change from established direction which is to

cooperate in the development of a recovery plan for the gray wolf population in Washington.

Road construction can affect the gray wolf by allowing increased likelihood of illegal poaching. The reduction in timber harvest should result in less road construction, thus benefitting the gray wolf in general.

No new roads would be constructed in designated roadless areas in Key Watersheds. At a minimum there shall be no net increase in road mileage in Key Watersheds, and it is further recommended that there be a reduction in existing road mileage (USDA et al. 1993, p. V-51). Because there would be less timber harvest in LSRs, there should be less roading and thus less affect on gray wolves and their prey.

It is difficult to predict the effects to the gray wolf from projects that may occur in adaptive management areas, administratively withdrawn areas, and the matrix. When planning projects in these areas, the Federal agencies would need to minimize effects to the wolf and the wolf's prey by avoiding new road construction and implementing stringent closures for roads.

Although Alternative 9 was not specifically designed to improve conditions for the gray wolf, it does positively complement wolf recovery efforts.

#### **COLUMBIAN WHITE-TAILED DEER SPECIES ACCOUNT, ENVIRONMENTAL BASELINE AND EFFECTS**

The Columbian white-tailed deer (CWTD) (*Odocoileus virginianus leucurus*) was listed as an endangered species in 1967 (USDI 1967). The CWTD populations and habitat are addressed in a recovery plan. This species prefers oak woodland/grassland ecotones and riparian habitat in coniferous forests. Almost all habitat for the CWTD is on private lands. The highest densities of CWTD are found in Douglas County, Oregon along the south bank of the North Umpqua River within about 1 kilometer of the river. The Douglas County population was not officially recognized as part of this subspecies until 1977 (USDI 1983).

Lands in the Roseburg District of the BLM fall within the current range of the CWTD. The Roseburg District revised preferred alternative in the Resource Management Plan stated that timber harvest or other vegetation-altering activities on all Bureau-managed lands within the distribution of the CWTD would only occur if they are determined to be beneficial to the species or until such time that definitive information is available describing the use level and value of these lands in the context of meeting recovery plan goals. In addition, acquisition of lands within the core area for the Douglas County population through exchange has been achieved. A recently announced land exchange in the BLM Roseburg District will secure 6,585 acres of suitable habitat. A habitat management plan would be prepared for existing Bureau-managed lands determined to be of significant value to CWTD or any lands acquired specifically for this species.

The major threat to the Columbia River population has been identified as degradation of riparian habitats through logging and brush removal (USDI 1983). Lesser threats include automobile collisions, poaching, entanglement in barbed wire fences, and competition with livestock. Natural threats include flooding, high tides, disease, parasites, and competition with black-tailed deer (*Odocoileus hemionus columbianus*) and Roosevelt elk (*Cervus canadensis roosevelti*). The primary threat to the Roseburg population is the subdivision and residential development of native riparian habitats, particularly along the North Umpqua River. Additional threats come from livestock development activities in the lowland river valleys.

#### Effects on Columbian White-tailed Deer

The preferred alternative would have little effect on the Columbian white-tailed deer because its habitat is primarily located in valley bottoms away from Federal timber harvest activities. Also, this species is not closely associated with old-growth forest conditions. On those Federal lands where the species occurs, the majority of these lands are not in the timber base, with the riparian areas being more oak-savannah and not actively managed for timber. Management direction under the preferred alternative would not change from established direction to cooperate in implementation of the CWTDR recovery plan.

#### **LOST RIVER AND SHORTRIVER SUCKER SPECIES ACCOUNT, ENVIRONMENTAL BASELINE AND EFFECTS**

The Lost River sucker (*Deltistes luxatus*) and the shortnose sucker (*Chasmistes brevirostris*) were listed as endangered species in 1988 (USDI 1988). The recovery plan for these species was completed in 1993. Critical Habitat has not been designated for these species, but the Service has been ordered by the court to designate critical habitat by April 1994. Much of the habitat for the suckers is found within the boundaries of the Klamath Falls Resource Area of the BLM Lakeview District, on the Winema and Fremont National Forests in Oregon, and on the Klamath and Modoc National Forests of California.

The present distribution of Lost River suckers includes Upper Klamath Lake and its tributaries (Buettner and Scoppettone 1990), Clear Lake Reservoir and its tributaries (Buettner and Scoppettone 1991), Tule Lake and the Lost River up to Anderson-Rose Dam (Scoppettone, pers. com.), and the Klamath River downstream to Copco Reservoir (Beak 1987). A few individual Lost River suckers were observed spawning in the Lost River below the Anderson-Rose Dam in 1991, presumably migrating from Tule Lake, where 20 adults and one juvenile were captured in 1992 (Scoppettone, pers. com.). Large suckers that could be Lost River suckers were reported in Iron Gate Reservoir in 1992 (Maria, pers. com.). In the Upper Klamath Lake watershed, spawning runs are primarily limited to the Sprague and Williamson Rivers. However, larval Lost River suckers were collected in the Wood River and Crooked Creek in 1991 (Markle 1992), which indicates a spawning run still occurs in these streams. Suckers

reported from Sheepy Lake in 1988 may represent a resident population but positive species identifications were not made (Johnson, pers. com.).

The present distribution of the shortnose sucker includes Upper Klamath Lake and its tributaries, Klamath River downstream to Iron Gate Reservoir, Clear Lake Reservoir and its tributaries, Gerber Reservoir and its tributaries, the Lost River, and Tule Lake. The Gerber Reservoir population is considered to have been introduced, although the timing of the introduction is not known (Buettner, pers. com.). Shortnose suckers have also been collected in the Upper Klamath River from Link River Dam to Copco Reservoir in recent years (USDI 1992d; Maria, pers. com.). A shortnose sucker was collected at the head of Iron Gate Reservoir in 1973 by California Department of Fish and Game biologists. The distribution of shortnose sucker is very similar to that of the Lost River sucker except the shortnose sucker appears to be more widely distributed in the Lost River system.

The primary threats to the species are related to watershed impacts from land management activities that have resulted in degradation of water quality and hyper-eutrophication of Upper Klamath Lake. Land management activities have degraded habitats through destruction of riparian systems, impacts due to agricultural land use, diversion of water into canals through unscreened diversions, and disruption of migration corridors.

#### Effects on Lost River and Shortnose Suckers

Several causes for the decline of Lost River and shortnose suckers are addressed by the preferred alternative. They are insularization of habitat and water quality problems associated with timber harvest, removal of riparian vegetation, and livestock grazing. Riparian Reserves in combination with other Reserves such as CRAs and LSRs would provide a high level of protection for all streams in them. This in turn would provide the ecological functions and processes required for the amelioration of these causes and thus the creation and maintenance of fish habitat. Additionally, streams in Reserves could serve as cores of good habitat. The core areas would serve as refugia and population centers for recolonization as degraded areas recovered in the future.

This conclusion is based on the assumption that following watershed analysis, the boundaries of Riparian Reserves, particularly in intermittent streams, could change and some management actions would be allowed within them. However, it was also assumed that watershed analysis would not always reduce the final Riparian Reserve boundaries and that the management activities allowed within them would be limited to activities designed to achieve riparian and aquatic habitat objectives. The Service recommends that habitat conditions for suckers be considered in the watershed analysis.

Management direction is not expected to change from the established agency direction which is to cooperate in implementation of the Lost River and Shortnose Sucker Recovery Plan.

## OREGON CHUB SPECIES ACCOUNT, ENVIRONMENTAL BASELINE AND EFFECTS

The Oregon chub (*Oregonichthys crameri*) was federally listed as endangered on October 18, 1993 (effective November 17, 1993) (USDI 1993a). The Oregon chub is a small cyprinid fish that formerly inhabited sloughs, overflow ponds, and other slack-water habitats throughout the Willamette River drainage in Oregon (Pearson 1989). Remaining established populations are primarily restricted to a 30-kilometer stretch of the Middle Fork Willamette River drainage, just 2 percent of its historic range. Recently, small numbers of chubs (one to four fish) have also been found on the lower North Santiam River, in Gray Creek within the Finley National Wildlife Refuge in Benton County, and in a tributary to Lake Creek in Linn County (USDI 1993a).

Decline of the Oregon chub is attributed to the loss of its backwater habitat. Construction of flood control projects have altered the historical flooding patterns and eliminated much of the Willamette River's braided channel pattern. In addition, the introduction of nonindigenous species (e.g., bass, crappie, mosquito fish) may have exacerbated the species' decline and may limit the potential for the Oregon chub to expand beyond its present restricted range (USDI 1993a). Habitat at the remaining population sites is typified by low- or zero-velocity water flow conditions, depositional substrates, and abundant aquatic, or overhanging riparian vegetation.

Existing populations are potentially threatened by: 1) direct mortality from chemical spills or applications adjacent to existing habitat; 2) competition with or predation by introduced fishes; and 3) continued loss and physiochemical alterations of habitat.

### Effects on Oregon Chub

Riparian Reserves and LSRs as proposed under the preferred alternative should benefit the Oregon chub by improving stream habitat and water quality in some drainages inhabited by this species. Management direction under the preferred alternative would not change from established direction which is to continue development of the current management plan for the Oregon chub.

## OREGON SILVERSPOT BUTTERFLY SPECIES ACCOUNT, ENVIRONMENTAL BASELINE AND EFFECTS

The Oregon silverspot butterfly (*Speyeria zerene hippolyta*) was federally listed as a threatened subspecies of silverspot butterfly in 1980 (USDI 1980). It is endemic to the coastal zone along the southern Washington and central and northern Oregon coast, and the northern California coast. A recovery plan was completed for the Oregon silverspot butterfly in January 1982, and a revised plan is in preparation. Of 17 historically known populations, 6 disjunct population centers currently exist. The known viable colonies are located in Clatsop County, Lane County and Tillamook County, Oregon; Del Norte County in California; and Grays Harbor County in Washington.

The Oregon silverspot has adapted to a highly specialized and restricted environment, which is an early successional meadow habitat highly modified by the physical influences of the Pacific Ocean and its attending climate. The climate is characterized by mild temperatures, heavy rainfall, and fog with a salt-spray influence from the adjacent ocean. The surrounding conifer forest also plays a role in the overall habitat requirements of this butterfly by providing cover from wind, an overwhelming force in or near ocean habitat. The most important feature of the habitat is the presence of the western blue violet (*Viola adunca*) which is normally the only plant on which the Oregon silverspot can successfully feed and develop as a larva in the wild (USDI 1982b).

The major limiting factors affecting this subspecies are related to the limitation of suitable habitat (USDI 1982b). The specialized salt-spray habitat presently occurs in a patchy distribution partially due to encroachment by urban development. Excessive use of these meadows by grazing animals or off-road vehicles has also directly eliminated habitat. Secondary impacts of people's activities, introduction of exotic plants, and alteration of the natural fire regime with subsequent succession of meadows to brush and stunted woodland, have also contributed to a reduction in suitable habitat. The Siuslaw National Forest has developed implementation plans for managing the species' habitat on Federal lands and this direction would continue under the preferred alternative.

#### Effects on Oregon Silverspot Butterflies

The three types of grassland habitats that Oregon silverspot butterflies inhabit are coastal salt spray meadows, stabilized dunes, and montane grasslands. Currently, the greatest threats to the species are development, agriculture and natural succession throughout its range. Alternative 9 should have little effect on Oregon Silverspot butterflies because of the lack of association between late-successional forests and the species. Current management for the butterfly by the Forest Service and implementation of the recovery plan (and future revisions) should minimize any potential impacts from implementation of Alternative 9.

#### **OREGON SILVERSPOT BUTTERFLY CRITICAL HABITAT BASELINE AND EFFECTS**

Critical Habitat for the Oregon silverspot butterfly was designated at the time of listing. The lands included in the designation consist of portions of two sections in western Lane County, Oregon, adjacent to the coast. These are grassland areas that are expected to be maintained in that condition.

#### Effects on Oregon Silverspot Butterfly Critical Habitat

Within the project area there is critical habitat for the Oregon silverspot butterfly but the area only accounts for portions of two sections. Because maintenance of this area in a grassland condition is the critical concern, Alternative 9 should have no effect on this habitat.

**NELSON'S CHECKER-MALLOW SPECIES ACCOUNT, ENVIRONMENTAL BASELINE AND EFFECTS**

Nelson's checker-mallow (*Sidalcea nelsoniana*) was listed as threatened in February 1993 (USDI 1993b). A recovery plan is currently being developed. This species occurs along streams in meadows and other relatively open areas such as along some roadsides in the Coast Range and Willamette Valley. The Oregon Coast Range supports Douglas-fir forests with western hemlock, western red cedar and red alder as frequent components. The Willamette Valley portion of the species range is characterized by prairies interspersed with oak and ash woodlands and coniferous, primarily Douglas-fir, forests (USDI 1993b).

Nelson's checker-mallow occurs primarily in open areas with little or no shade and will not tolerate encroachment of woody species (Glad et al. 1987). Presently, woody encroachment is not threatening to the plant. It primarily occurs where soil dries in early summer but where standing water exists in April to early May or where soils are relatively dry throughout the year. It does not occur where soils are wet throughout the year (Glad et al. 1987).

Nelson's checker-mallow is known from 48 sites within five population centers in Oregon and at least one site in the population center in Washington (USDI 1993b). There are few populations on Federal land (BLM Salem DO Walker Flat Proposed ACEC and BLM's South Maguire and Neverstill transplant populations in the Coast Range; W.L. Finley National Wildlife Refuge in the Willamette Valley).

Federal Coast Range populations of Nelson's checker-mallow occur on lands identified in Adaptive Management Areas in FEMAT. All Federal land in the Willamette Valley is in the Matrix.

Mowing, plowing, stream channel alteration, recreational use, roadside spraying and reservoir construction are identified in the final rule as threats (USDI 1993b). In addition, hydrological and substrate level changes may affect the species given its restrictive soil moisture requirements. Woody encroachment and canopy closure can also adversely impact the species.

Effects on Nelson's Checker-mallow

As mentioned on p. IV-124 of FEMAT, modification of hydrology, shading, and microclimate of rare plant sites could result in extirpation of locally adapted species with highly specific habitat requirements. Nelson's checker-mallow is a species which could be adversely or positively affected by changes to these physical environment factors.

Direct effects from activities pursuant to Alternative 9 are not expected to impact Nelson's checker-mallow especially if Aquatic Conservation Objectives and Watershed Analysis includes this species and its habitats. Guidelines for the Matrix identify "protective buffers for other species" (USDA and USDI

1993a, p. 2-42). Riparian buffers also afford some protection to the species, but do not negate indirect flooding and sedimentation effects. Depending upon the specific direction for particular buffers, retention of specific trees which restrict light to Nelson's checker-mallow populations could adversely impact the population. Selected tree removal may be required in some places, including in riparian buffers, to maintain habitat light conditions for the species.

Indirect effects on Nelson's checker-mallow could result from management practices in the Matrix or Adaptive Management Areas, e.g. thinning and selective cuts, which could affect water flows in springs, intermittent streams and ground water levels feeding meadows where the plant occurs. These were discussed in the effects of the alternatives on aquatic ecosystems (USDA and USDI 1993a, p. 2-50). Sediment deposition resulting from such actions could bury populations, cause the Nelson's checker-mallow to grow above its suitable hydrological regime or could create new suitable habitat within its hydrological requirements thus also affecting this species. Not all thinning and harvests would cause these indirect effects. Effects would vary based on the amount of trees removed, the evapo-transpiration rates of the species removed, amount of sediment transport, expected change in base and peak flows and timing of these events. Each action to a tributary, or spring which feeds a tributary, affecting the ground water of any Federal or private population of Nelson's checker-mallow would need to be analyzed for the impact of the action on the listed plant population. In the foreseeable future there are no planned activities causing such hydrologic or sediment related effects.

#### **MCDONALD'S ROCK-CRESS SPECIES ACCOUNT, ENVIRONMENTAL BASELINE AND EFFECTS**

McDonald's rock-cress (*Arabis mcdonaldiana*) is listed as a threatened species (USDI 1990d). It is a long-lived perennial herb of the mustard family (Brassicaceae). Its lavender to purplish flowers appear in late winter through early summer. Flowering stems are produced from a basal rosette of glabrous, obovate to broadly oblanceolate leaves with wavy or few-toothed, bristle-tipped margins. The seed pods are winged at the distal end (USDI 1990d). McDonald's rock-cress is restricted to a 3 square-mile area on Red Mountain, Mendocino County, California. The taxonomic uniqueness of the Red Mountain *Arabis* populations remains unsettled. The most recent taxonomic treatment (Vorobik 1993) expands the taxonomic limits, and therefore the geographic distribution, of *A. mcdonaldiana* as described by Rollins (1973) and subsequently listed by the Service, by synonymizing *A. serpenticola*. The Service has been unable to fully assess the status and distribution of the latest delimitation of *A. mcdonaldiana*, and will therefore address in this biological opinion only the Red Mountain populations on which the listing and recovery plan are based. The Service has considered the Del Norte County, California, and Curry County, Oregon plants reported by Goforth as a different taxon with Category 2 candidate status pending further taxonomic work (USDI 1990d), and this conclusion is borne out in Vorobik's (1993) work.



McDonald's rock-cress prefers open, rocky areas on shallow ultramafic (primarily peridotite) substrate at about 4,000 feet in elevation on Red Mountain. The vegetation on the ultramafic soils of Red Mountain consists of relatively open-canopied forest with overstory consisting of mixes of ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*Pinus jeffreyi*), sugar pine (*Pinus lambertiana*), and incense cedar (*Calocedrus decurrens*), and an understory of which evergreen shrubs such as dwarf silk-tassel (*Garrya buxifolia*), huckleberry oak (*Quercus vaccinifolia*), and hoary manzanita (*Arctostaphylos canescens*) are important components. Land ownership is approximately half Federal (Bureau of Land Management) and half private, but most of the individuals occur on Federal lands (USDI 1990d). The habitat of McDonald's rock-cress managed by the Bureau of Land Management on Red Mountain has been designated an Area of Critical Environmental Concern (ACEC). This designation indicates that activities that occur within the ACEC must be compatible with management objectives designed to protect the unique soil and vegetation resource values of the area. The private lands on which some populations occur are owned by a mining company which is interested in mining nickel-containing ore from ultramafic substrates.

#### Effects on McDonald's Rock-cress

The ultramafic soils that support McDonald's rock-cress do not produce commercial-quality timber and are unlikely to be included in future timber sale areas. The majority of the Red Mountain area is either in CRAs or LSRs, although there are small, scattered parcels in the vicinity that are included in the matrix. McDonald's rock-cress habitat exists, however, in the midst of non-ultramafic soils that support commercial-quality stands of mixed evergreen forest. The potential for adverse effects on McDonald's rock-cress from Alternative 9 is low.

## VI. SUMMARY OF EFFECTS

### SPOTTED OWL

- o Overall, the LSRs and MLSAs under Alternative 9 would provide protection for more known spotted owl sites (1,801 vs. 1,593) and currently suitable habitat (3,244,300 acres vs. 2,684,700 acres) than the Final Draft Recovery Plan, although this varies across the range (e.g., numbers are lower in the Washington Cascades). Including spotted owls which occur on CRAs (368 sites) and AWAs (107 sites), all or portions of 2,276 spotted owl home ranges are likely to be protected under this alternative, which is 64 percent of the known Federal owl population.
- o In most instances where the LSRs and other reserves would not be a direct match for reserves proposed in prior owl management strategies (i.e., DCAs), additional LSR acres in the vicinity were added to accomplish the intended function of those areas.

- o Under Alternative 9, the risk of loss of a well-distributed, reproducing population of spotted owls due to lack of NRF habitat appears to be less than that which would occur if the Final Draft Recovery Plan was implemented.
- o For all provinces the number of acres subject to matrix management would be less with Alternative 9 than under the Final Draft Recovery Plan.
- o Impacts to dispersal habitat condition from Alternative 9 should be significant only in the short term and only where habitat quantity and distribution is inadequate.
- o Spotted owl dispersal habitat would be provided through the provision of riparian reserves, plus other provisions in the Matrix, rather than through an established threshold of amount and distribution of dispersal habitat. Dispersal habitat will be addressed during watershed analysis and province planning efforts.
- o All provinces, except the eastern and western Oregon Cascades, averaged greater than 70 percent of the acres of individual CHUs being included inside LSRs under Alternative 9. Some small CHUs had no overlap.
- o Approximately 6.9 million acres of Federal land are within the CHUs, versus 7.5 million acres in the Alternative 9 LSR/MLSA network. Slightly over five million acres of CHUs occur within the boundaries of the LSRs. Over 70 percent of suitable habitat in CHUs is in LSRs.
- o Alternative 9 is similar in function to spotted owl critical habitat. The LSR/MLSA network of the preferred alternative is a reasonable match with CHUs, with only 30% of CHU acreage in the Matrix and in AMAs which may be important for successful dispersal. This will be addressed in watershed analysis and subsequent planning efforts.

#### MARBLED MURRELET

- o Approximately 89 percent of the estimated marbled murrelet habitat on Federal lands is contained within areas designated for protection.
- o Approximately 87 percent of the known occupied sites on Federal land are contained in areas designated for protection within large reserve areas. The remaining 13 percent are protected by specific allocations at the occupied sites outside the larger reserves.
- o In the Matrix, Alternative 9 would provide protection of occupied sites and contiguous suitable and recruitment habitat within 0.5 miles of the occupied site. The only timber entry into the 0.5 mile radius would be intended to protect and enhance the habitat to be retained. Suitable

but unoccupied habitat outside the 0.5 mile radius would be available for harvest following surveys to current protocol.

#### **BALD EAGLE**

- o LSRs and Riparian Reserves would benefit nesting, roosting and foraging habitat.
- o Management direction for the agencies would not change from established direction to implement the Bald Eagle Recovery Plan.

#### **PEREGRINE FALCON**

- o LSRs and Riparian Reserves should benefit foraging habitat (providing better habitat for prey species) and may provide for increased protection from disturbance related to timber harvest activities.
- o Management direction for the agencies would not change from established direction to implement the Peregrine Falcon (Pacific Population) Recovery Plan.

#### **GRIZZLY BEAR**

- o The LSR network, although not directly affecting grizzly bears, would reduce disturbance within the reserves by reducing timber harvest activities and associated road building. This would increase available security habitat.

#### **GRAY WOLF**

- o Although the gray wolf occurs in only a small portion of the range of the spotted owl, the reduced harvest levels and associated road building should decrease the likelihood of poaching and potential displacement of the wolf's prey base (mostly ungulates).
- o Management direction would not change from established direction which is to cooperate in the development of a recovery plan for the gray wolf population in Washington.

#### **COLUMBIAN WHITE-TAILED DEER**

- o Alternative 9 would have little effect on Columbian white-tailed deer because its habitat is primarily located in valley bottoms away from Federal timber harvest activities.
- o Management direction would not change from established direction to cooperate in implementation of the CWTD Recovery Plan.

**LOST RIVER AND SHORTNOSE SUCKERS**

- o Riparian Reserves and LSRs within the range of the suckers would provide a high level of protection for all streams within these reserves.
- o Management direction is not expected to change from the established agency direction which is to cooperate in implementation of the Lost River and Shortnose Sucker Recovery Plan.

**OREGON CHUB**

- o Riparian Reserves and LSRs, where they occur near Oregon chub populations, should benefit the chub by improving stream habitat and water quality.
- o Management direction would not change from established direction which is to continue development of the current management plan for the Oregon chub.

**OREGON SILVERSPOT BUTTERFLY**

- o Alternative 9 should have little effect on the butterfly because of the lack of association between late-successional forests and the species.
- o Current management for the butterfly by the Forest Service and implementation of the recovery plan (and the future revision) should minimize any potential impacts from implementation of Alternative 9.

**MCDONALD'S ROCK-CRESS**

- o The majority of the Red Mountain areas is either in Congressionally Reserved areas or LSRs, although there are small, scattered parcels containing the species in the vicinity that are included in the Matrix. Any proposed road construction in this vicinity would need to be addressed.

**NELSON'S CHECKER-MALLOW**

- o Aquatic Conservation Objectives and Watershed analysis have the potential to positively affect this species.

**VII. CUMULATIVE EFFECTS**

Cumulative effects are defined as those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area (50 CFR 402.2). The cumulative effects of future Federal actions would be considered during the section 7 consultations

required for those actions and, therefore, are not considered cumulative to the proposed action.

The FSEIS presents an overview of management on non-federal lands adequate to allow certain assumptions to be made regarding the probable fate of habitat for listed species on non-federal lands within the range of the northern spotted owl. Late successional forests continue to be harvested on non-federal lands throughout the range of the northern spotted owl; however, to varying degrees, compliance with the Act's section 9 take prohibition would be expected to result in the maintenance of minimal habitat around centers of activity of known northern spotted owls. Compliance with section 9 could also be expected to maintain some marbled murrelet habitat.

Virtually all late-successional forest on private lands in Washington, Oregon and California is targeted for harvest. Historically, private land-owners practiced even-aged management (clearcutting) of timber over extensive acreage on these lands, although current practice in California includes less than 10 percent clearcutting. These past management practices are likely to continue in Oregon and Washington, thus reducing the amount of late-successional forest on these lands over time.

State forest lands interspersed with and adjacent to Federal lands are also primarily managed for timber harvest. Those lands containing marketable timber have been harvested at a rate commensurate with harvest rates on private lands. The Service believes that the quantity of late-successional forest on these lands would continue to decline. Harvest activities on State and private lands can be expected to impact marbled murrelets and spotted owls located within Federal lands through the reduction and fragmentation of the late-successional forest. Other species were evaluated where data were available.

The Service advised the public that it intends to propose a special rule pursuant to section 4(d) of the Endangered Species Act on December 29, 1993 (58 Federal Register 69132). The 4(d) rule affects only non-federal lands in the range of the northern spotted owl, while the subject of this biological opinion affects only Forest Service and BLM lands in the owl's range. The action evaluated in this biological opinion has been and will continue to be closely coordinated with the 4(d) rule proposal, so that cumulative effects on listed species are appropriately considered at each step, to the extent practicable. The environmental impact statement prepared on the 4(d) proposal will fully evaluate the cumulative effects of Alternative 9 and the final 4(d) rule.

#### Cumulative Effects Specific to the Spotted Owl

Non-federal landowner compliance with the take prohibition of the Act does not assure the maintenance of spotted owl dispersal habitat within Areas of Concern and checkerboard ownership nor provide for improvement of existing

populations. Consequently, it is likely that a reduction in dispersal habitat would occur on non-federal lands in certain areas.

The spotted owl is listed as an endangered species by the Washington Department of Wildlife. The State's administrative code addresses activities within the 500 acres surrounding an owl site and requires site-specific plans and consultation with various agencies. The Washington Department of Wildlife maintains an extensive database and mapping base for spotted owl sites. The Washington Department of Wildlife manages Colockum Wildlife Area with one nesting pair of spotted owls. Washington State Parks manage a number of areas such as Beacon Rock State Park on the Columbia Gorge, two parks in the I-90 Corridor, and others that provide nesting, roosting, and foraging habitat in localized areas. These parks provide important links of spotted owl habitat for the adjoining Federal lands. The State Parks do not harvest trees larger than 10 inches dbh unless it conflicts with road, trail or campground use.

The City of Seattle is managing for a permanent watershed reserve of 73,000 acres in the west Cascades near North Bend. Lands within the watershed will be exchanged to the City with provisions to protect all late- and old-growth forests. Three single and one reproductive spotted owl pair are located in the watershed.

Approximately 138 spotted owl sites are known to occur on State and private lands. A number of owl sites on Federal lands are located within 2 miles of private lands, so these spotted owls likely use available habitat on private lands. Information on the status of owl habitat is unknown, but it is assumed, due to market values and supply, harvest will remove all of this habitat except for that protected by administrative code regulations. An habitat conservation plan has been developed and approved for Murray Pacific, and the State is involved in development of an HCP for State lands.

The spotted owl is listed as threatened in Oregon by the Fish and Wildlife Commission and requires protection on State lands. The Oregon Forest Practices Act governs operations on State and private lands and requires an approved plan for any forest operation within 300 feet of a known site of a listed species. For owl sites, 70 acres must be maintained. The Oregon Department of Fish and Wildlife maintains a statewide database on owls to track the population and assist in decision-making processes. The Oregon State Parks contain four known spotted owl pairs. Due to the State's Parks size, few are large enough to support pairs, but they do provide dispersal and foraging habitat to adjacent Federal lands. The Oregon Board of Forestry manages 786,000 acres of Forest.

About 80 pairs of spotted owls are known to occur on private lands. As in Washington, it is expected, due to market conditions, most old-growth or late-successional forest will be harvested on private lands, except that protected by Forest Practices Act rules. A couple of HCPs are underway for large landowners in Oregon.

When the spotted owl was listed as threatened in 1990, the California Board of Forestry adopted special Forest Practice Rules to ensure that take of spotted owls would not result from timber harvest activities conducted by the State or by private landowners. These rules apply to approximately 6 million acres of State and private timberlands, of which 99 percent is in private ownership. Under these rules, all proposals for timber harvest on non-federal lands are reviewed by the Department of Fish and Game. Applicants must provide survey information, protect spotted owl activity centers, and leave sufficient foraging habitat around activity centers.

Over 700 spotted owl locations on non-federal lands in California had been reported to the State's interagency data base by late 1992. Pairs were confirmed at 489 of these sites (Dietrich et al. 1993). In 1992, the Simpson Timber Company completed the first section 10(a) Conservation Plan for the spotted owl, and received an incidental take permit from the Service. Three other large timber companies have prepared "no-take" spotted owl management plans in coordination with the Service. In addition, the Board of Forestry has prepared a draft section 10(a) Conservation Plan that, when completed and approved, would guide management of the species on non-federal lands.

All take of spotted owls under HCPs would be considered part of the current environmental baseline for owls.

#### Cumulative Effects Specific to Spotted Owl Critical Habitat

Non-federal lands were not included in the designation of spotted owl critical habitat, therefore, no cumulative effects were considered.

#### Cumulative Effects Specific to the Marbled Murrelet

The Oregon Department of Fish and Wildlife was petitioned to list the marbled murrelet in 1988, but the petition was rejected. There are currently no measures in place under Oregon state law for the protection of marbled murrelets. The state of Washington listed the marbled murrelet as threatened as of October 1993. The state of California listed the marbled murrelet as endangered during the summer of 1992. Currently the California Department of Fish and Game, with the assistance of the Service, reviews proposed timber harvest plans in an attempt to ensure that no take of this species would occur. While this may be preventing the removal of occupied sites, it is allowing the further fragmentation of the landscape upon which the species depends. In addition, because a significant portion of this species' range is on non-federal lands, it may not be possible to provide for the recovery of this species without contribution from these areas. Therefore, timber harvest that is currently occurring on non-federal lands in all three states may be contributing to a future inability to recover the marbled murrelet.

This is a particular concern in California where substantial numbers of marbled murrelets and high quality nesting habitat are on non-federal lands.

In addition, non-federal lands in this state are strategically located throughout the species range.

Marbled murrelets are susceptible to entanglement in nearshore fishing nets such as gillnets and purse seines. Of the three states where murrelets are listed as threatened, only Washington has a significant gillnet fishery. Tribal and non-tribal gillnet and purse seine fisheries occur within the Puget Sound, Strait of Juan de Fuca, Cape Flattery, Grays Harbor, Willapa Bay, and lower Columbia River areas. Although mortality of marbled murrelets due to net entanglement has been documented (Carter and Sealy 1982), there are currently few data available for the Service to reasonably evaluate the severity of this threat within United States waters. Annual gillnet mortality may have serious ramifications, however, if it occurs within small breeding populations.

#### Cumulative Effects Specific to McDonald's Rock-cress

Adverse effects of private activities on McDonald's rock-cress include potential killing or damage of plants from herbicides applied for forest management purposes, and mining activities. To the best of the Service's knowledge, no mining currently is occurring or imminent on the privately-owned colonies of McDonald's rock-cress. Given the reduced availability of commercially harvestable timber in the future on Federal lands under the proposed action, the likelihood that timber harvest may occur on adjacent private lands cannot be ruled out, nor therefore the possibility that privately-owned colonies of McDonald's rock-cress could be adversely affected by herbicide application, road construction, and erosion associated with this activity. It is unlikely that cumulative effects, together with the adverse impacts of the proposed action, would appreciably reduce the likelihood of the survival and recovery of McDonald's rock-cress.

### VIII. INCIDENTAL TAKE

This consultation addresses adoption of an approach to forest management described in Alternative 9. It does not address "on-the-ground" effects of specific future actions that would be planned as part of implementation of Alternative 9. The amount of incidental take of listed species would depend on future planning and decisions that would undergo consultation under section 7. Therefore, no incidental take is authorized at this time. Under Alternative 9, local teams would be formed to ensure that watershed analyses, cooperative planning, and the formulation of plans will be accomplished for the management of forests. The Service anticipates providing section 7 consultations that will address planning at larger scales than individual projects. Therefore, consultation and evaluation of incidental take may be done at the province, watershed or project level basis as more detailed information becomes available. Efforts will be made to consult on the largest area practicable to eliminate unnecessary delays in management planning.



## IX. CONSERVATION RECOMMENDATIONS

The term "conservation recommendations" has been defined as suggestions of the Service regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (see 50 CFR 402.14(j)).

The Service has evaluated Alternative 9 in an effort to identify additional actions that would be appropriate to satisfy Federal agency responsibilities to further the conservation of listed species. Restricting harvest activities in LSRs to thinning and other silvicultural treatments that are beneficial to creation of late successional forests as identified in Alternative 9 is believed, at the present time, to be necessary to promote the conservation and recovery of listed species consistent with Section 7(a)(1) of the Endangered Species Act. The Service further recognizes that the monitoring and adaptive management process built into the plan would provide a continuing process for evaluation of affirmative conservation and recovery measures necessary for the spotted owl and other listed species.

This concludes formal consultation on Alternative 9 of the SEIS on "Management of Habitat for Late Successional and Old-Growth Forest Related Species on Federal Lands Within the Range of the Northern Spotted Owl." Further consultation will be necessary to authorize incidental take at the province, watershed, forest/district, or site planning levels, as necessary as plans are developed for implementation of the forest plan. Reinitiation of this formal consultation is required if new information reveals effects of this action that may affect listed species in a manner or to an extent not considered in this biological opinion, if the action is subsequently modified in a manner that causes an effect to a listed species that was not considered in this biological opinion, or if a new species is listed or critical habitat designated that may be affected by the action.

Table 1. Comparison of Final Draft Recovery Plan for the Northern Spotted Owls (Alternative 7) and the Preferred Alternative (Alt. 9) in relation to owl pair and owl habitat protection.

Province	Congressional NRF Acres (Activity Cntrs)	Alternative 7 LSR <sup>1</sup> NRF Acres (Activity Cntrs)	Alternative 9 LSR <sup>1</sup> NRF Acres (Activity Cntrs)	Alternative 9 AMA <sup>2</sup> NRF Acres (Activity Cntrs)	Alternative 7 Admin. NRF Acres (Activity Cntrs)	Alternative 9 Admin. NRF Acres (Activity Cntrs)	Alternative 7 Matrix NRF Acres (Activity Cntrs)	Alternative 9 Matrix NRF Acres (Activity Cntrs)
Washington Eastern Cascades	213,500 (27)	338,100 (130)	295,300 (100)	44,900 (13)	51,800 (1)	42,000 (6)	101,600 (10)	69,900 (39)
Washington Western Cascades	345,200 (51)	499,900 (172)	516,400 (172)	41,700 (21)	78,800 (13)	49,300 (11)	174,800 (53)	91,300 (22)
Olympic Peninsula	341,300 (74)	184,600 (78)	213,900 (85)	8,100 (4)	5,500 (1)	100 (0)	29,900 (10)	300 (0)
Washington Lowlands	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
<b>TOTAL</b>	<b>900,000 (152)</b>	<b>1,022,600 (380)</b>	<b>1,025,600 (357)</b>	<b>94,700 (38)</b>	<b>136,100 (15)</b>	<b>91,400 (17)</b>	<b>306,300 (73)</b>	<b>161,500 (61)</b>
Oregon Klamath	75,100 (13)	234,200 (145)	377,400 (196)	72,000 (80)	58,600 (38)	13,000 (8)	402,900 (225)	162,800 (130)
Oregon Eastern Cascades	102,800 (34)	114,100 (76)	146,100 (89)	0 (0)	48,400 (14)	37,700 (12)	167,900 (69)	101,600 (58)
Oregon Western Cascades	243,800 (92)	619,500 (446)	774,000 (508)	134,100 (86)	116,600 (59)	86,400 (46)	1,018,000 (709)	499,400 (585)
Oregon Coast Range	13,000 (5)	331,400 (204)	422,400 (246)	13,600 (6)	3,200 (2)	1,300 (1)	176,400 (71)	47,800 (23)
Oregon Willamette Valley	0 (0)	200 (0)	600 (0)	100 (0)	200 (0)	100 (0)	5,200 (0)	2,800 (0)
<b>TOTAL</b>	<b>434,700 (144)</b>	<b>1,299,400 (871)</b>	<b>1,720,500 (1039)</b>	<b>219,800 (172)</b>	<b>227,000 (113)</b>	<b>138,500 (67)</b>	<b>1,770,400 (1,074)</b>	<b>814,400 (796)</b>
California Klamath	310,900 (64)	304,700 (282)	438,600 (341)	54,900 (66)	130,300 (38)	81,200 (18)	306,200 (217)	104,200 (133)
California Coast	1,300 (8)	2,900 (24)	3,300 (24)	0 (0)	300 (1)	100 (1)	2,900 (0)	1,600 (0)
California Cascades	1,000 (0)	54,600 (36)	56,300 (40)	6,900 (3)	2,700 (2)	1,900 (4)	15,900 (5)	5,400 (12)
<b>TOTAL</b>	<b>313,200 (72)</b>	<b>362,200 (342)</b>	<b>498,200 (405)</b>	<b>61,800 (69)</b>	<b>133,300 (41)</b>	<b>83,200 (23)</b>	<b>325,000 (222)</b>	<b>111,200 (145)</b>
<b>3-STATE TOTAL</b>	<b>1,647,900 (368)</b>	<b>2,684,200 (1,593)</b>	<b>3,244,300 (1,801)</b>	<b>376,300 (279)</b>	<b>496,400 (169)</b>	<b>313,100 (107)</b>	<b>2,401,700 (1,369)</b>	<b>1,087,100 (1,002)</b>

<sup>1</sup> Late-Successional Reserves include Managed Late-Successional Reserve acres and activity centers.

<sup>2</sup> Matrix include Riparian Reserves.

Table 2. Comparison of Final Draft Recovery Plan for the Northern Spotted Owl (Alternative 7) and the Preferred Alternative (Alternative 9)  
A comparison of total acreage in each of the management categories.

State/ Physiographic province	Fed. Land Non-Cong. Reserved	Federal Forest Non-congress. Reserved	Alt. 7		Alt. 9 Late- Successional Reserves*	Alt. 9 Late- Successional Reserves	Alt. 7 Admin. Withdrawn Areas	Alt. 9 Admin. Withdrawn Areas	Alt. 7 Managed Late-Successit Areas	Alt. 9 Managed Late-Succ. Areas	Alt. 7 Adaptive Manage. Areas	Alt. 9 Riparian Reserves	Alt. 7 Riparian Reserves	Alt. 9 Riparian Reserves	Alt. 7 Matrix	Alt. 9 Matrix
			Reserves	Reserves												
Washington																
Eastern Cascades	1,991,000	1,509,200	611,200	877,800		877,800	409,600	221,100	118,800	92,100	99,000	54,600	247,000	247,000	796,700	453,900
Western Cascades	1,965,900	1,703,800	896,200	1,101,600		1,101,600	331,200	193,600	84,800	0	164,500	52,500	218,100	218,100	601,300	288,000
Western Lowlands	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0
Olympic Peninsula	540,700	480,300	352,700	414,600		414,600	10,500	300	0	0	123,800	14,900	1,000	1,000	162,600	1,000
<b>Total:</b>	<b>4,497,600</b>	<b>3,693,300</b>	<b>1,860,100</b>	<b>2,394,000</b>		<b>2,394,000</b>	<b>751,300</b>	<b>415,000</b>	<b>203,600</b>	<b>92,100</b>	<b>387,300</b>	<b>122,000</b>	<b>466,100</b>	<b>466,100</b>	<b>1,560,600</b>	<b>742,900</b>
Oregon																
Klamath	1,857,600	1,731,100	456,600	880,300		880,300	217,100	60,000	30,700	0	241,800	75,400	267,000	267,000	1,077,800	408,500
Eastern Cascades	1,145,900	1,080,200	194,400	384,700		384,700	264,100	194,700	22,000	0	0	29,400	159,000	159,000	636,000	407,500
Western Cascades	3,764,400	3,573,300	1,110,000	1,369,900		1,369,900	320,600	275,900	1,100	0	227,800	156,300	767,300	767,300	2,176,500	1,123,500
Coast Range	1,388,100	1,329,200	588,800	930,000		930,000	42,900	35,800	98,400	0	78,300	52,600	161,700	161,700	605,400	182,300
Willamette Valley	17,500	16,700	1,100	1,100		1,100	200	100	0	0	100	1,200	7,500	7,500	15,000	8,700
<b>Total:</b>	<b>8,173,500</b>	<b>7,730,500</b>	<b>2,350,900</b>	<b>3,566,000</b>		<b>3,566,000</b>	<b>844,900</b>	<b>566,500</b>	<b>152,200</b>	<b>0</b>	<b>548,000</b>	<b>314,900</b>	<b>1,362,500</b>	<b>1,362,500</b>	<b>4,510,700</b>	<b>2,130,500</b>
California																
Coast Range	281,800	108,700	118,100	118,300		118,300	44,300	42,600	0	0	0	7,200	44,500	44,500	112,300	76,400
Klamath	3,220,500	2,571,400	875,900	1,248,000		1,248,000	510,700	356,900	19,800	0	392,900	134,100	564,700	564,700	1,680,000	658,000
Cascades	961,300	712,200	217,800	235,600		235,600	130,600	96,100	4,900	10,100	166,800	44,100	189,700	189,700	564,000	263,200
<b>Total:</b>	<b>4,463,600</b>	<b>3,392,300</b>	<b>1,211,800</b>	<b>1,601,900</b>		<b>1,601,900</b>	<b>685,600</b>	<b>495,600</b>	<b>24,700</b>	<b>10,100</b>	<b>559,700</b>	<b>185,400</b>	<b>798,900</b>	<b>798,900</b>	<b>2,356,300</b>	<b>997,600</b>
<b>Three-State Total:</b>	<b>17,134,700</b>	<b>14,816,100</b>	<b>5,422,800</b>	<b>7,561,900</b>		<b>7,561,900</b>	<b>2,281,800</b>	<b>1,477,100</b>	<b>380,500</b>	<b>102,200</b>	<b>1,495,000</b>	<b>622,300</b>	<b>2,627,500</b>	<b>2,627,500</b>	<b>8,427,600</b>	<b>3,871,000</b>

Table 3. Comparison of Final Draft Recovery Plan for the Northern Spotted Owl (Alternative 7) and the Preferred Alternative (Alternative 9)  
A comparison of total acreage in 11-40 condition or greater in each of the management categories.

State/ Physiographic province	Fed. Land Non-Cong. Reserved	Federal Forest Non-congress. Reserved	Alt. 7		Alt. 9 L-S Reserves Total	Administrative Withdrawn > 11-40	Administrative Withdrawn > 11-40	Managed Late-success. > 11-40	Managed Late-success. > 11-40	Alt. 9 AMAs Total	Alt. 7 Riparian Reserves > 11-40	Alt. 9 Riparian Reserves > 11-40	Alt. 7 Matrix > 11-40	Alt. 9 Matrix > 11-40
			Late-Success. Reserves > 11-40	Late-Success. Reserves > 11-40										
Washington														
Eastern Cascades	1,991,000	1,509,200	441,100	562,000	109,300	179,900	109,300	58,200	83,700	47,000	25,000	111,900	359,000	192,800
Western Cascades	1,965,900	1,703,800	648,300	780,300	111,500	205,100	111,500	0	50,900	112,400	32,600	132,800	371,300	171,000
Western Lowlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olympic Peninsula	540,700	480,300	250,400	278,200	200	6,700	200	0	0	75,200	8,300	600	89,700	600
Total:	4,497,600	3,693,300	1,339,800	1,620,500	221,000	391,700	221,000	58,200	134,600	234,600	65,900	245,300	820,000	364,400
Oregon														
Klamath	1,857,600	1,731,100	312,300	577,200	29,100	120,700	29,100	0	18,600	150,200	45,000	153,100	637,700	224,400
Eastern Cascades	1,145,900	1,080,200	170,800	333,100	154,700	215,400	154,700	0	19,800	0	23,400	125,900	495,400	311,100
Western Cascades	3,764,400	3,573,300	773,500	995,800	219,000	254,400	219,000	0	700	132,500	97,100	469,300	1,351,000	660,400
Coast Range	1,388,100	1,329,200	399,800	647,000	8,200	13,200	8,200	0	66,300	37,400	30,900	87,300	354,600	84,800
Willamette Valley	17,500	16,700	300	500	100	100	100	0	0	0	500	2,700	5,700	3,100
Total:	8,173,500	7,730,500	1,656,700	2,553,600	411,100	603,800	411,100	0	105,400	320,100	196,900	838,300	2,844,400	1,283,800
California														
Coast Range	281,800	108,700	23,800	24,400	1,900	1,900	2,200	0	0	0	600	3,700	8,700	4,900
Klamath	3,220,500	2,571,400	561,100	812,300	170,500	259,100	170,500	0	8,800	157,800	62,700	256,000	788,000	283,100
Cascades	961,300	712,200	123,100	127,100	14,100	22,400	14,100	4,900	4,500	120,500	16,300	43,900	203,700	59,900
Total:	4,463,600	3,392,300	708,000	963,800	186,800	283,400	186,800	4,900	13,300	278,300	79,600	303,600	1,000,400	347,900
Three-State Total:	17,134,700	14,816,100	3,704,500	5,137,900	818,900	1,278,900	818,900	63,100	253,300	833,000	342,400	1,387,200	4,664,800	1,996,100

Table 4: Comparison of Late-Successional Reserves and Critical Habitat, by Unit

CHU Name	Total CHU Acres	Federal CHU Acres	Federal NSO Habitat Acres	Federal LSR Acres	%CHU in LSR	Federal LSR NSO Habitat Acres	%NSO Habitat in LSR	Federal AMA Acres	Federal AMA NSO Habitat Acres
California Cascades									
CA-1	41,586	36,289	5,337	36,211	1.00	5,337	1.00	0	0
CA-2	90,634	76,759	10,784	29,680	0.39	6,083	0.56	0	0
CA-3	33,515	21,338	3,829	21,062	0.99	3,829	1.00	0	0
CA-4	89,809	79,334	24,544	77,440	0.98	24,348	0.99	0	0
CA-6	4,619	4,580	790	3,634	0.79	790	1.00	0	0
CA-7	16,871	16,635	1,026	5,647	0.34	315	0.31	0	0
CA-8	19,317	18,093	3,239	12,407	0.69	2,924	0.90	0	0
CA-9	2,133	2,094	355	2,094	1.00	355	1.00	0	0
Total	298,484	255,122	49,904	188,175	0.74	43,981	0.88	0	0
California Klamath									
CA-10	12,126	9,637	1,064	6,281	0.65	433	0.41	0	0
CA-11	3,118	2,961	552	2,882	0.97	552	1.00	0	0
CA-12	5,525	3,511	1,578	3,472	0.99	1,539	0.98	0	0
CA-13	55,375	42,331	9,641	41,069	0.97	9,563	0.99	0	0
CA-14	6,441	6,362	474	5,058	0.80	474	1.00	0	0
CA-15	66,632	63,039	18,379	60,596	0.96	18,143	0.99	1143	39
CA-16	15,333	12,844	1,580	12,647	0.98	1,580	1.00	0	0
CA-17	46,489	46,450	11,860	44,515	0.96	11,663	0.98	0	0
CA-18	6,273	6,273	1,856	3,671	0.59	1,817	0.98	512	0
CA-19	54,612	54,100	25,730	22,607	0.42	10,554	0.41	2407	1303
CA-20	23,389	23,389	15,493	21,460	0.92	14,427	0.93	78	0
CA-21	48,621	48,503	22,218	39,058	0.81	18,660	0.84	0	0
CA-22	13,315	13,276	5,651	7,944	0.60	3,913	0.69	0	0
CA-23	1,816	1,816	593	1,777	0.98	593	1.00	0	0
CA-24	52,529	52,292	24,705	34,747	0.66	17,236	0.70	12411	4506
CA-25	60,757	57,834	19,094	52,422	0.91	17,237	0.90	0	0
CA-26	2,524	2,485	868	1,579	0.64	434	0.50	0	0
CA-27	2,884	2,805	1,186	2,805	1.00	1,186	1.00	0	0
CA-28	3,988	3,949	1,422	3,634	0.92	1,343	0.94	0	0
CA-29	37,898	37,148	15,019	34,864	0.94	14,547	0.97	1695	394
CA-38	60,821	55,763	31,657	47,946	0.86	28,658	0.91	0	0
CA-39	11,568	6,905	0	2,841	0.41	0	ERR	0	0
CA-40	113,046	108,937	20,828	95,187	0.87	19,920	0.96	0	0
CA-41	4,932	3,708	0	3,314	0.89	0	ERR	0	0
CA-42	29,638	25,527	5,294	24,584	0.96	5,216	0.99	0	0
CA-43	44,737	43,751	8,535	40,753	0.93	8,378	0.98	0	0
CA-44	8,881	8,447	1,695	8,173	0.97	1,695	1.00	0	0
CA-45	20,342	19,553	4,778	18,963	0.97	4,463	0.93	0	0
CA-46	1,460	1,223	0	750	0.61	0	0.00	0	0
Total	815,070	764,819	251,750	645,599	0.84	214,224	0.85	18246	6242
California Coast Range									
CA-47	8,060	3,830	0	3,633	0.95	0	0.00	0	0
CA-48	1,734	1,221	0	828	0.68	0	0.00	39	0
CA-49	2,250	2,093	0	2,093	1.00	0	0.00	0	0
CA-5	3,118	3,000	788	0	0.00	0	0.00	0	0
CA-50	24,896	23,513	0	22,764	0.97	0	0.00	0	0
CA-51	6,479	1,973	0	1,895	0.96	0	0.00	0	0
CA-52	1,260	1,064	0	1,064	1.00	0	0.00	0	0
CA-53	2,129	787	0	552	0.70	0	0.00	0	0
CA-54	23,631	14,302	0	13,198	0.92	0	0.00	0	0
CA-55	19,249	15,019	0	13,716	0.91	0	0.00	0	0
CA-56	5,370	3,514	0	3,199	0.91	0	0.00	0	0
CA-57	947	789	0	0	0.00	0	0.00	0	0
CA-58	14,939	10,276	0	9,605	0.93	0	0.00	0	0
CA-59	985	867	0	828	0.96	0	0.00	0	0
CA-60	1,183	749	0	749	1.00	0	0.00	0	0
CA-61	3,594	3,160	0	3,121	0.99	0	0.00	0	0
Total	119,824	86,157	788	77,245	0.90	0	0.00	39	0
Oregon West Cascades									

OR-9	121,858	116,249	83,684	98,154	0.84	71,553	0.86	0	0
OR-10	89,243	88,849	48,102	50,276	0.57	29,171	0.61	0	0
OR-11	49,480	49,480	34,070	11,496	0.23	7,823	0.23	0	0
OR-12	77,734	76,591	43,358	40,984	0.54	26,165	0.60	0	0
OR-13	93,117	86,794	40,037	46,125	0.53	22,806	0.57	0	0
OR-14	110,714	100,990	58,658	72,459	0.72	44,631	0.76	0	0
OR-15	42,674	38,644	20,981	1,812	0.05	1,458	0.07	0	0
OR-16	103,199	97,590	63,326	22,128	0.23	18,181	0.29	73489	43842
OR-17	41,367	40,658	26,871	25,333	0.62	17,667	0.66	2565	1777
OR-18	107,557	107,401	54,233	61,193	0.57	31,228	0.58	0	0
OR-19	113,079	113,000	60,277	60,950	0.54	31,978	0.53	0	0
OR-20	78,018	71,181	37,983	49,801	0.70	30,989	0.82	0	0
OR-21	3,755	2,055	869	0	0.00	0	0.00	0	0
OR-22	8,102	5,374	1,461	0	0.00	0	0.00	0	0
OR-23	18,418	9,009	1,500	0	0.00	0	0.00	0	0
OR-24	10,194	6,715	1,936	0	0.00	0	0.00	0	0
OR-25	102,935	58,658	36,327	48,780	0.83	30,874	0.85	0	0
OR-26	41,614	39,840	30,160	27,035	0.68	21,345	0.71	0	0
OR-27	19,759	14,226	8,102	0	0.00	0	0.00	0	0
OR-28	121,068	120,871	71,189	62,057	0.51	37,868	0.53	0	0
OR-29	97,196	95,935	61,785	27,946	0.29	21,425	0.35	44631	25459
OR-30	70,425	70,425	39,839	46,206	0.66	27,037	0.68	0	0
OR-34	66,637	46,239	23,281	34,387	0.74	18,934	0.81	0	0
OR-35	69,114	67,022	27,066	45,766	0.68	21,973	0.81	0	0
OR-36	10,350	6,559	3,992	0	0.00	0	0.00	0	0
OR-37	117,623	103,238	50,748	68,855	0.67	31,420	0.62	0	0
OR-38	59,882	40,944	13,950	19,998	0.49	6,639	0.48	0	0
Total	1,845,112	1,674,537	943,785	921,741	0.55	551,165	0.58	120,685	71,078

#### Oregon Coast Range

OR-39	18,255	7,422	3,001	6,991	0.94	2,923	0.97	236	39
OR-40	8,489	7,503	2,646	5,095	0.68	2,449	0.93	2408	197
OR-41	102,381	84,633	28,382	78,946	0.93	27,751	0.98	5214	631
OR-42	3,037	2,762	0	2,211	0.80	0		551	0
OR-43	52,013	43,714	18,338	42,257	0.97	18,143	0.99	1064	156
OR-44	48,501	28,061	5,965	27,076	0.96	5,808	0.97	788	118
OR-45	17,152	6,873	2,685	6,599	0.96	2,568	0.96	235	117
OR-46	65,812	56,960	27,077	53,210	0.93	25,024	0.92	0	0
OR-47	73,599	43,278	20,394	41,740	0.96	19,922	0.98	0	0
OR-48	110,925	87,245	40,401	83,810	0.96	39,810	0.99	0	0
OR-49	68,149	59,847	28,857	57,875	0.97	28,187	0.98	315	118
OR-50	87,944	72,608	38,023	69,690	0.96	36,919	0.97	0	0
OR-51	4,580	3,790	1,185	1,263	0.33	474	0.40	0	0
OR-52	72,065	34,585	16,088	32,769	0.95	15,536	0.97	0	0
OR-53	98,986	50,593	21,385	41,148	0.81	19,568	0.92	0	0
OR-54	10,077	8,456	4,110	7,786	0.92	3,952	0.96	0	0
OR-55	52,284	40,981	28,417	39,838	0.97	27,707	0.98	0	0
OR-56	9,760	6,163	3,437	4,386	0.71	2,529	0.74	0	0
OR-57	15,215	10,392	5,967	8,536	0.82	5,454	0.91	0	0
OR-58	73,097	51,036	26,724	50,524	0.99	26,488	0.99	0	0
OR-59	6,954	4,780	2,647	4,702	0.98	2,608	0.99	0	0
OR-60	111,912	72,771	34,430	57,398	0.79	27,593	0.80	0	0
OR-61	3,753	2,607	1,620	2,489	0.95	1,541	0.95	0	0
Total	1,114,940	787,060	361,779	726,339	0.92	342,954	0.95	10,811	1,376

#### Oregon East Cascades

OR-1	48,962	48,923	31,377	20,784	0.42	12,683	0.40	0	0
OR-2	31,532	31,257	16,994	6,082	0.19	4,149	0.24	0	0
OR-3	22,444	21,300	7,745	20,986	0.99	7,667	0.99	0	0
OR-4	18,726	18,570	7,390	14,701	0.79	7,193	0.97	0	0
OR-5	8,571	8,177	2,844	7,350	0.90	2,648	0.93	0	0
OR-6	14,816	14,816	6,637	14,777	1.00	6,637	1.00	0	0
OR-7	31,542	31,542	9,485	31,147	0.99	9,485	1.00	0	0
OR-8	37,893	37,735	18,453	24,659	0.65	13,555	0.73	0	0
Total	214,486	212,320	100,925	140,486	0.66	64,017	0.63	0	0

#### Oregon Klamath

OR-31	2,369	1,737	1,185	0	0.00	0	0.00	0	0
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OR-32	114,000	71,265	35,653	45,615	0.64	23,717	0.67	0	0
OR-33	5,765	5,529	3,674	5,293	0.96	3,477	0.95	0	0
OR-62	100,011	49,562	27,470	37,234	0.75	20,238	0.74	0	0
OR-63	10,945	8,534	4,900	0	0.00	0	0.00	0	0
OR-64	7,585	5,531	3,833	0	0.00	0	0.00	0	0
OR-65	91,497	86,322	55,578	56,211	0.65	33,523	0.60	236	118
OR-66	8,176	8,098	4,939	8,059	1.00	4,939	1.00	0	0
OR-67	102,443	97,189	50,316	74,354	0.77	37,040	0.74	551	355
OR-68	12,758	12,758	8,493	11,339	0.89	7,823	0.92	39	0
OR-69	26,785	26,785	12,447	23,668	0.88	11,263	0.90	39	0
OR-70	36,782	36,310	17,623	30,986	0.85	14,861	0.84	0	0
OR-71	53,872	53,519	16,994	52,138	0.97	16,323	0.96	0	0
OR-72	79,791	57,655	29,005	48,574	0.84	23,555	0.81	1498	907
OR-73	11,247	11,247	6,276	9,198	0.82	5,290	0.84	591	0
OR-74	31,773	30,509	13,553	2,999	0.10	2,724	0.20	27510	10829
OR-75	22,130	19,326	5,809	0	0.00	0	0.00	18260	5454
OR-76	62,161	56,787	22,642	40,351	0.71	17,705	0.78	9046	4543
Total	780,090	638,663	320,390	446,019	0.70	222,478	0.69	57,770	22,206

Washington East Cascades

WA-1	19,589	19,589	9,479	12,719	0.65	5,885	0.62	0	0
WA-2	37,464	37,464	10,591	26,598	0.71	7,588	0.72	0	0
WA-3	9,992	9,992	1,538	9,638	0.96	1,499	0.97	0	0
WA-4	11,140	10,982	1,737	7,073	0.64	1,264	0.73	0	0
WA-5	19,836	19,836	4,424	17,112	0.86	3,675	0.83	0	0
WA-6	101,019	93,751	54,861	75,657	0.81	44,233	0.81	0	0
WA-7	36,376	36,102	22,003	28,606	0.79	17,584	0.80	0	0
WA-8	7,100	5,721	3,511	4,934	0.86	2,880	0.82	0	0
WA-9	23,973	17,218	4,500	10,664	0.62	3,515	0.78	0	0
WA-10	5,248	4,775	1,736	4,106	0.86	1,500	0.86	0	0
WA-11	11,920	8,684	2,248	5,725	0.66	1,223	0.54	0	0
WA-12	129,405	116,919	61,661	87,437	0.75	54,116	0.88	0	0
WA-13	85,560	55,008	30,865	9,160	0.17	4,343	0.14	45,219	26,128
WA-14	95,362	62,477	39,560	54,464	0.87	34,744	0.88	1,379	748
WA-15	15,681	14,377	8,650	13,117	0.91	7,665	0.89	0	0
WA-16	8,882	8,843	2,406	6,358	0.72	1,894	0.79	0	0
WA-17	19,593	19,593	6,435	12,326	0.63	4,858	0.75	0	0
WA-18	10,063	9,826	4,181	8,174	0.83	3,276	0.78	0	0
WA-42	37,067	35,645	26,084	12,803	0.36	11,263	0.43	0	0
Total	685,270	586,802	296,470	406,671	0.69	213,005	0.72	46,598	26,876

Washington West Cascades

WA-19	42,787	42,432	14,653	38,730	0.91	13,790	0.94	197	79
WA-20	9,873	9,755	4,147	9,441	0.97	4,069	0.98	0	0
WA-21	85,720	84,221	39,124	78,266	0.93	36,838	0.94	78	0
WA-22	22,046	21,967	11,696	20,865	0.95	11,263	0.96	0	0
WA-23	18,725	18,725	8,495	17,820	0.95	8,377	0.99	0	0
WA-24	92,385	92,109	42,377	86,736	0.94	41,430	0.98	5,373	947
WA-25	13,748	13,630	4,542	13,158	0.97	4,227	0.93	0	0
WA-26	15,951	15,675	8,687	13,192	0.84	6,952	0.80	0	0
WA-27	42,515	42,319	16,276	39,283	0.93	15,411	0.95	236	78
WA-28	25,087	25,087	10,981	24,734	0.99	10,785	0.98	0	0
WA-29	34,520	33,533	15,996	23,033	0.69	10,706	0.67	5,292	3,278
WA-30	54,444	45,987	17,974	28,411	0.62	12,092	0.67	1,657	552
WA-31	5,959	5,920	3,631	5,528	0.93	3,514	0.97	0	0
WA-32	19,506	18,678	14,260	16,039	0.86	12,487	0.88	235	157
WA-33	33,539	18,481	10,900	14,339	0.78	8,493	0.78	3,867	2,368
WA-34	142,764	103,231	46,673	76,525	0.74	32,926	0.71	4,145	2,922
WA-35	51,418	33,197	15,373	31,739	0.96	15,098	0.98	0	0
WA-36	75,636	72,519	36,516	44,267	0.61	22,252	0.61	0	0
WA-37	69,346	68,874	37,382	37,863	0.55	22,964	0.61	20,588	8,851
WA-38	170,015	168,278	100,131	133,066	0.79	83,652	0.84	78	39
WA-39	9,634	8,689	3,909	0	0.00	0	0.00	0	0
WA-40	12,006	10,467	4,026	10,152	0.97	3,750	0.93	0	0
WA-41	173,847	169,421	88,426	88,073	0.52	47,951	0.54	0	0
Total	1,221,471	1,123,195	556,175	851,260	18	429,027	19	41,746	19,271

Olympic Peninsula

WA-43	6,633	5,963	3,317	5,094	0.85	3,317	1.00	869	0
WA-44	4,615	3,710	2,645	3,671	0.99	2,606	0.99	0	0
WA-45	24,854	22,603	6,479	14,423	0.64	6,361	0.98	8180	118
WA-46	354	315	158	315	1.00	158	1.00	0	0
WA-47	52,486	52,250	29,366	49,489	0.95	29,210	0.99	2644	117
WA-48	9,279	8,253	5,924	7,701	0.93	5,924	1.00	0	0
WA-49	69,207	67,746	25,928	54,233	0.80	23,994	0.93	12213	1461
WA-50	38,810	38,652	19,287	38,061	0.98	19,129	0.99	394	0
WA-51	144,680	140,017	79,184	132,477	0.95	77,844	0.98	6675	907
WA-52	47,825	47,392	26,878	46,605	0.98	26,603	0.99	433	39
Total	398,743	386,901	199,166	352,069	0.91	195,146	0.98	31408	2642
Washington Lowlands									
WA-53	62,309	59,819	0	0	0.00	0	0.00	0	0
Totals	266,489	250,655	112,644	193,001	0.77	88,123	0.78	0	0



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USDA Forest Service



USDI Bureau of Land Management

FISH AND WILDLIFE SERVICE ■ NATIONAL PARK SERVICE ■ ENVIRONMENTAL PROTECTION AGENCY ■ NATIONAL MARINE FISHERIES SERVICE

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Interagency SEIS Team • (503)326-7883

October 20, 1993

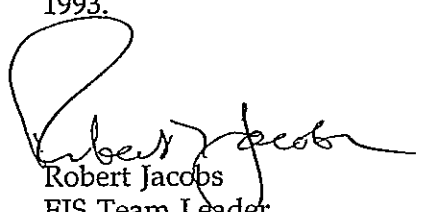
Gary Smith  
Acting Regional Director  
Northwest Region  
National Marine Fisheries Service  
7600 Sand Point Way N.E.  
Seattle, WA 98115

Dear Gary:

Enclosed is a Biological Assessment for the preferred alternative identified in the Draft 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 (DSEIS).

The Assessment includes discussion of Sacramento River winter run chinook salmon, Snake River sockeye salmon, Snake River fall chinook salmon and Snake River spring/summer chinook salmon. You will notice that this Assessment is different from the preliminary assessment on pages 3&4-50 through 3&4-62 of the Draft SEIS. The change is reflected in the further analysis of Sacramento River winter run chinook, from which we concluded that the preferred alternative will not affect this species. The Final SEIS will be rewritten to reflect this new information. The determination of no affect for the other three species, which was made in the Draft SEIS, remains unchanged.

We request your concurrence that adoption of the preferred alternative will not affect the four listed anadromous fish species occurring in the range of the northern spotted owl. In order to met our deadlines, we look forward to receiving your concurrence no later than November 10, 1993.



Robert Jacobs  
EIS Team Leader

Enclosures: Table of listed and proposed species assessed  
Biological Assessment



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
Northwest Region  
7600 Sand Point Way N.E.  
BIN C15700 Bldg. 1  
Seattle, WA 98115

JAN 13 1994

Robert Jacobs, Team Leader  
Interagency SEIS Team  
P.O. Box 3623  
Portland, OR 97208-3623

Re: Draft 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 (DSEIS)

Dear Mr. Jacobs: *Bob*

In response to recent conversations between National Marine Fisheries Service (NMFS) and SEIS Team staff, I am sending this letter to confirm NMFS' concurrence with your determination that adoption of the preferred alternative will not affect the four anadromous fish species currently listed as threatened or endangered within the range of the northern spotted owl. These species are the Sacramento River winter chinook salmon, Snake River fall chinook salmon, Snake River spring/summer chinook salmon and Snake River sockeye salmon. NMFS' comments on the DSEIS stated that these species are not affected by federal land management activities within the range of the northern spotted owl.

Sincerely,

*J. Gary Smith*  
J. Gary Smith  
Acting Regional Director

cc:  
Jim Lecky  
Mike Tehan

INTERAGENCY SEIS

JAN 18 1993



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## I. Introduction

The purpose of this addendum is to provide further analysis of the effectiveness of Alternative 9 in addressing the recovery issues identified in the *Final Draft Recovery Plan for the Northern Spotted Owl* (USDI unpub). Much of the discussion is pertinent to all of the alternatives analyzed in the Final SEIS, as they were based on the same design logic as Alternative 9 (the biological principles from the Recovery Plan). The addendum is intended to accompany the biological assessment dated October 1993. It will elaborate on the expected effectiveness of Alternative 9 to provide the habitat conditions and management standards and guidelines which were described by the Recovery Plan as necessary to achieve recovery of the spotted owl. It will also provide further discussion of the effects of the alternatives, especially Alternative 9, on the marbled murrelet. While this addendum provides additional information on effects to these species, it does not change the determinations of October 1993 that the alternatives may affect the northern spotted owl and the marbled murrelet.

Other threatened, endangered and proposed species are discussed in the October 1993 Biological Opinion and in the text of Chapter 3&4 and the determinations of those documents has not changed. Additional information on those species is provided in the U.S. Fish and Wildlife Service Biological Opinion and in the National Marine Fisheries Service concurrence letter in Appendix G of the Final SEIS.

This addendum will describe modifications made to Alternative 9 since the Draft SEIS and the effects of those changes to spotted owl and marbled murrelet habitat. It will provide updated data on Alternative 9, and address other new information pertinent to the SEIS selection of alternative (specifically, the reanalysis of spotted owl demographic data and the proposed 4(d) rule for nonfederal lands). It will also compare the reserves and other standards of Alternative 9 against the Final Draft Recovery Plan, which is reflected to a large extent by Alternative 7 of the SEIS (Tables G-1, G-2).

Table G-1. Land Allocation Comparison Between Alternative 7 and Alternative 9

State/ Physiographic province	Total Acres Federal Land	ALTERNATIVE 7			ALTERNATIVE 9			% increase in reserves from Alt 7 to Alt 9***	% decrease in matrix from Alt 7 to Alt 9
		All Reserved Areas*		Matrix	All Reserved Areas*		Matrix**		
		Acres	%		Acres	%			
Washington									
Eastern Cascades	3,470,400	2,673,600	77%	796,700	2,949,500	85%	520,800	10%	-35%
Western Cascades	3,719,400	3,118,200	84%	601,300	3,331,500	90%	387,800	7%	-36%
Western Lowlands	126,300	126,300	100%	0	126,300	100%	0	0%	0%
Olympic Peninsula	1,530,000	1,367,400	89%	162,600	1,466,800	96%	63,200	7%	-61%
Total:	8,846,100	7,285,500	82%	1,560,600	7,874,100	89%	971,800	8%	-38%
Oregon									
Klamath	2,118,900	1,041,100	49%	1,077,800	1,543,600	73%	575,300	48%	-47%
Eastern Cascades	1,573,600	937,600	60%	636,000	1,159,800	74%	413,800	24%	-35%
Western Cascades	4,488,100	2,311,700	52%	2,176,500	3,163,500	70%	1,324,600	37%	-39%
Coast Range	1,411,900	806,500	57%	605,400	1,182,000	84%	229,900	47%	-62%
Willamette Valley	26,200	11,200	43%	15,000	17,400	66%	8,800	55%	-41%
Total:	9,618,700	5,108,100	53%	4,510,700	7,066,300	73%	2,552,400	38%	-43%
California									
Coast Range	471,300	359,100	76%	112,300	394,900	84%	76,400	10%	-32%
Klamath	4,511,700	2,831,700	63%	1,680,000	3,622,600	80%	889,100	28%	-47%
Cascades	1,007,500	443,600	44%	564,000	647,100	64%	360,600	46%	-36%
Total:	5,990,500	3,634,400	61%	2,356,300	4,664,600	78%	1,326,100	28%	-44%
Three-State Total:	24,455,300	16,028,000	66%	8,427,600	19,605,000	80%	4,850,300	22%	-42%

\* All reserved areas include Congressionally Reserved Areas, Late-Successional Reserves, Managed Late-Successional Areas, Administrative Withdrawn Areas, and Riparian Reserves.

\*\* Matrix acres include portion of AMA outside of riparian reserves.

\*\*\* Alt 9 reserve acres minus Alt 7 reserve acres divided by Alt 7 reserve acres

**Table G-2. Comparison of the Final Draft Recovery Plan for the Northern Spotted Owl (Alternative 7) and the preferred alternative (Alternative 9) in relation to owl pair and owl habitat protection**

Province	Congressional NRF Acres (Activity Cntrs)	Alternative 7 LSR <sup>1</sup> NRF Acres (Activity Cntrs)	Alternative 9 LSR <sup>1</sup> NRF Acres (Activity Cntrs)	Alternative 9 AMA NRF Acres (Activity Cntrs)	Alternative 7 Admin. NRF Acres (Activity Cntrs)	Alternative 9 Admin. NRF Acres (Activity Cntrs)	Alternative 7 Matrix NRF Acres (Activity Cntrs)	Alternative 9 Matrix NRF Acres (Activity Cntrs)
Washington Eastern Cascades	213,500 (27)	338,100 (130)	295,300 (100)	44,900 (13)	51,800 (1)	42,000 (6)	101,600 (10)	69,900 (39)
Washington Western Cascades	345,200 (51)	499,900 (172)	516,400 (172)	41,700 (21)	78,800 (13)	49,300 (11)	174,800 (53)	91,300 (22)
Olympic Peninsula	341,300 (74)	184,600 (78)	213,900 (85)	8,100 (4)	5,500 (1)	100 (0)	29,900 (10)	300 (0)
Washington Lowlands	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
<b>TOTAL</b>	900,000 (152)	1,022,600 (380)	1,025,600 (357)	94,700 (38)	136,100 (15)	91,400 (17)	306,300 (73)	161,500 (61)
Oregon Klamath	75,100 (13)	234,200 (145)	377,400 (196)	72,000 (80)	58,600 (38)	13,000 (8)	402,900 (225)	162,800 (130)
Oregon Eastern Cascades	102,800 (34)	114,100 (76)	146,100 (89)	0 (0)	48,400 (14)	37,700 (12)	167,900 (69)	101,600 (58)
Oregon Western Cascades	243,800 (92)	619,500 (446)	774,000 (508)	134,100 (86)	116,600 (59)	86,400 (46)	1,018,000 (709)	499,400 (585)
Oregon Coast Range	13,000 (5)	331,400 (204)	422,400 (246)	13,600 (6)	3,200 (2)	1,300 (1)	176,400 (71)	47,800 (23)
Oregon Willamette Valley	0 (0)	200 (0)	600 (0)	100 (0)	200 (0)	100 (0)	5,200 (0)	2,800 (0)
<b>TOTAL</b>	434,700 (144)	1,299,400 (871)	1,720,500 (1039)	219,800 (172)	227,000 (113)	138,500 (67)	1,770,400 (1,074)	814,400 (796)
California Klamath	310,900 (64)	304,700 (282)	438,600 (341)	54,900 (66)	130,300 (38)	81,200 (18)	306,200 (217)	104,200 (133)
California Coast	1,300 (8)	2,900 (24)	3,300 (24)	0 (0)	300 (1)	100 (1)	2,900 (0)	1,600 (0)
California Cascades	1,000 (0)	54,600 (36)	56,300 (40)	6,900 (3)	2,700 (2)	1,900 (4)	15,900 (5)	5,400 (12)
<b>TOTAL</b>	313,200 (72)	362,200 (342)	498,200 (405)	61,800 (69)	133,300 (41)	83,200 (23)	325,000 (222)	111,200 (145)
<b>3-STATE TOTAL</b>	1,647,900 (368)	2,684,200 (1,593)	3,244,300 (1,801)	376,300 (279)	496,400 (169)	313,100 (107)	2,401,700 (1,369)	1,087,100 (1,002)

<sup>1</sup> Late-Successional Reserves include Managed Late-Successional Reserve acres and activity centers.

## II. Relationship of SEIS Alternatives to Goals and Objectives of Final Draft Spotted Owl Recovery Plan

The following excerpts from the *Final Draft Recovery Plan for the Northern Spotted Owl* are provided as a baseline for the comparison of the alternatives of this SEIS, especially Alternative 9, against the recovery goal, selected strategic principles, and the biological principles which were developed by the Northern Spotted Owl Recovery Team. The recovery goal described by the Recovery Team was delisting of the northern spotted owl throughout its range.

### *a. Strategic Principles*

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#### *The recovery plan should be comprehensive.*

Secretary Lujan directed the Recovery Team to develop a recovery plan that "will serve as a guide to future federal, state, and private activities affecting the owl." These activities will include research, monitoring, habitat protection, development of conservation plans, and numerous other efforts to bring about recovery. The Recovery Team attempted to integrate all of these activities into a single, well-coordinated plan for achieving recovery using all tools available under the Endangered Species Act.

.....

#### *The recovery plan should be responsive to new information.*

As new information is produced by the monitoring and research program, more efficient ways to bring about recovery may be developed. New data may indicate that DCAs need to be larger or could be smaller; modification of the monitoring program may be required; improved silvicultural methods may be demonstrated to create and maintain owl habitat, or for integrating timber production with owl protection; and new, more effective administrative procedures may be devised. The development and implementation of these improvements is encouraged. Specific recommendations are included for revising the recovery plan periodically and for assuring that proposed modifications to the plan are considered fully and implemented when appropriate.

### *b. Biological Principles*

This recovery plan is based on biological principles that are widely accepted by conservation biologists. The application of these principles to northern spotted owls first was described in the *Conservation Strategy of the Interagency Scientific Committee* (Thomas et al. 1990). The most important of these principles are that 1) species are more secure from extinction if habitat and local populations are distributed throughout their entire range, 2) providing for species in large habitat blocks is superior to providing small blocks, and 3) movement of individuals throughout the landscape is vital to the maintenance of all local populations within the range. A summary of the reasons behind each of these principles and their application to northern spotted owls follows.

*The risk of local or widespread extirpation of northern spotted owls will be reduced by managing for owls throughout their entire range and the variety of ecological conditions within that range.*

*Four primary reasons can be cited for the importance of maintaining the full range of the species. First, any significant range reduction most likely would reduce the total number of local populations in the species' metapopulation. A metapopulation is defined as a set of local populations linked by dispersing individuals. The security of the metapopulation is directly related to the number of local populations. A reduction in local populations increases the risk of extinction for the whole metapopulation. Second, a reduction in range also would reduce the overall range of environments occupied by the species, making the species more vulnerable to environmental stochasticity. Habitats at different elevations, in different forest types, in different ownerships, and in different parts of the owl's geographic range may act as refugia for the species in the face of catastrophes, rapid environmental change, chronic degradation of habitat from causes such as forest diseases, or unforeseen changes in interactions among species. Populations distributed throughout the geographic and ecological conditions within the spotted owl's range provide a higher likelihood that the subspecies will survive such events. For these two reasons, Thomas et al. (1990) concluded that species well-distributed throughout their range are less prone to extinction than species confined to smaller portions of their range. Third, range reduction around the fringes of a species' geographic or elevational range could have serious consequences because these areas are often the sites of the most rapid adaptations within a species. Eliminating the fringes of the range might reduce the evolutionary capability of the species. Fourth, the elimination of the geographic or elevational fringe portions of a species' range might be considered unwise in the face of possible widespread climatic changes, especially where the direction and magnitude of those changes are uncertain. For example, some scientists believe that global warming could result in some local cooling points in the Pacific Northwest rather than a universal warming effect (Smith 1990). If the climate cooled, it could place increasing importance on the southern parts of the range and on low-elevation habitats. If the climate warmed, it could place increasing importance on the northern extent of the range.*

*Emphasis should be placed on management for clusters, or local population centers, of owls in large habitat blocks rather than for individual pairs.*

*Empirical evidence and modeling show that clusters of 15 to 20 breeding pairs have much higher persistence rates than small, isolated clusters. These clusters, or local population centers, can be defined as groups of breeding owls where pairs have overlapping or nearly overlapping territories. The evidence and rationale supporting this principle are described in detail in Thomas et al. (1990).*

*One of the advantages of local population clusters is that they can provide for a population structure that can sustain itself for many generations. This contrasts with extremely small local populations, composed of one or two pairs, that are highly susceptible to local extinction (Diamond 1984). In order to realize this advantage, the local populations must be large enough to hold multiple breeding pairs, and to support juveniles, subadults, and "floaters." Floaters are nonbreeding individuals without established territories. It is thought that they serve as ready replacements for spotted owls that die or vacate their territories for other reasons (Thomas et al. 1990). This ready replacement of spotted owls in breeding territories should help maintain the populations within the local population centers.*

*Within each local population center, it is critical to provide for stable or improving habitat conditions. This will reverse the trend of increasing loss and fragmentation of habitat which has been experienced in most areas throughout the range. Fragmentation of habitat is associated with lowered spotted owl densities, decreased productivity of spotted owl populations (Bart and Forsman 1992), increased susceptibility of forest stands to windthrow, decreased success of juvenile dispersal, and possibly increased competition with barred owls and predation by great horned owls (Thomas et al. 1990).*

*For a strategy based on local populations to be successful, those populations must be capable of acting as sources of surplus owls for the species' metapopulation. A source area is one that has a positive rate of population increase and is capable of contributing individuals to the metapopulation. Local populations might cease to act as sources if they are too small or if they occupy highly fragmented habitat (Thomas et al. 1990). It is important to note that each local population does not have to act as a source each year. It is expected that there will be some variation across populations and across years, and that a portion of the local populations would not act as sources in some years. The strategy of managing for many local populations within the metapopulation should allow maintenance of a nondeclining trend in the metapopulation despite this variation.*

*The management for local populations within the metapopulation also should be designed to reduce the risk of local or widespread extirpation of owl populations due to catastrophic destruction of habitat. Such destruction could result from natural causes including windthrow, fire, flooding, insects, diseases, volcanic action, or climatic change. The risk to the overall population from large-scale disturbances is reduced by distributing local population centers throughout the species' range, and by providing redundancy of habitats. Additional security from catastrophic loss can be provided by reducing the risk within local population centers. The risk of catastrophic loss within a given population center can be influenced by the size, configuration, and management of that center. Larger areas are less susceptible to complete elimination from fire and windthrow. The likelihood of fire, and the likely impacts of fire, can be reduced through management of fuels within the population center and in the surrounding forest matrix. In some ecological conditions, the risk of serious insect and disease losses may be reduced through appropriate management.*

***Habitat conditions and spacing between local populations must provide for survival and movement of northern spotted owls.***

*The northern spotted owl metapopulation is composed of local populations that are linked by dispersing individuals. While each local population might be subject to extirpation over the long term, individuals dispersing among the areas help to reestablish local populations after severe local declines or extirpations. The interbreeding provided by dispersing individuals also provides insurance against deleterious effects of inbreeding. To allow for movement of northern spotted owls among source areas, those areas must be spaced appropriately; there must be redundant linkages among areas; and the intervening habitat must provide the dispersal needs of adults and juveniles.*

*Studies of dispersing juvenile owls (Miller 1989, Gutierrez et al. 1985) indicated that the juveniles' initial movements have a strong random component. The probability of a juvenile finding suitable habitat is related to the amount of suitable habitat in the landscape around its natal area and the distance of that habitat from its starting point. Increasing the number of blocks*

*of suitable habitat within the dispersal distance of any given local population center will increase the chance for success of dispersing juveniles. Also, having each block within the dispersal distance of two or more other blocks allows the system of local population centers to retain connectivity even if a given local population is eliminated. In this case, that population center can be reoccupied by owls coming from two or more other centers.*

*The connecting zones among local population centers must contain habitat that will allow movement of juvenile and adult dispersers and provide for basic life needs during the dispersal period. Key elements for survival include roosting opportunities, protection from predators, and adequate foraging opportunities (Thomas et al. 1990).*

### **c. Integration of Strategic and Biological Principles**

*The northern spotted owl has been placed at risk by management actions that have seriously depleted its habitat. The habitat conditions that would best support an owl population would be similar to those that existed before timber harvest began. However, recreating such habitat conditions would not be feasible. Efforts to restore habitat conditions in any part of the owl's range would have large economic effects, and those economic consequences force difficult biological choices in the design of a recovery strategy. The strategy developed here places large blocks of habitat on federal lands off-limits to regular timber harvest and should provide a reasonable assurance of success of recovering the northern spotted owl. However, it required consideration of many compromises in conservation area size and spacing and in the structure of intervening forests. Such compromises are inevitable in a strategy that calls for blocks of superior habitat distributed within a landscape of lower-quality habitat. The situation for owls could be made more secure if favorable habitat conditions could be spread more evenly throughout the landscape. Such a solution would be possible if it can be demonstrated that silvicultural techniques can create and maintain suitable habitat conditions while harvesting timber. The Recovery Team supports the change over time toward such a solution when supported by appropriate data. If such change is appropriate, it would occur through the adaptive management process (section III.K.).*

The alternatives for consideration in this SEIS were developed using these strategic and biological principles as a basis. This basis was appropriate because the northern spotted owl population and habitat conditions have not changed significantly since the Final Draft Recovery Plan was developed.

## **III. Summary of Modifications to Alternative 9**

Since the October biological assessment was prepared, modifications have been made to Alternative 9 of the SEIS. These modifications to the Alternative were primarily prompted by: 1) boundary and other changes proposed by Administrative units and public comments; 2) issues raised in the Draft Biological Opinion; and 3) additional analysis of selected species.

Changes relevant to spotted owl and marbled murrelet habitat management were:



- 1) The addition of Managed Late-Successional Areas in the Washington Eastern Cascades and California Cascades provinces around the owl home ranges which had been proposed as "Managed Pair Areas" in the Recovery Plan.
- 2) The addition of approximately 25,000 acres of Late-Successional Reserve to the Olympic Peninsula.
- 3) Allowance for a change in the delineation of Late-Successional Reserves within the Finney and North Coast AMAs.
- 4) Proposed direction by the BLM to delineate 7 "Managed Pair Areas" and 2 "Reserved Pair Areas" for designation as Connectivity Blocks, and to strengthen the owl dispersal conditions through selected BLM lands (see Appendix B9 of the Final SEIS).
- 5) Application of Riparian Reserve Scenario 1 to the matrix and AMA lands.
- 6) Dropping the 180 year rotation for California Forests and replacing it with the rotations proposed in the new Forest Plans for four California Forests.
- 7) Adoption of Residual Habitat Areas of 100 acres around owl activity centers documented as of January 1, 1994 in the matrix and AMAs.

## **IV. Other New Information Pertinent to Selection of an Alternative**

Chapter 3&4 and Appendix J of the Final SEIS provide discussion of an analysis of the spotted owl demographic data. These analyses confirmed that spotted owl populations are declining throughout the owl's range and provide an argument for a conservative approach to owl habitat management. The results also emphasize the need for continued monitoring and research on the northern spotted owl.

On December 20, 1993, the U.S. Fish and Wildlife Service issued a notice of intent to prepare an environmental impact statement to analyze a proposed 4(d) rule on the spotted owl. The proposed rule is intended to redefine the Federal protective measures for spotted owls on nonfederal lands in Washington, Oregon and California. It would retain a high level of protection against the incidental take of spotted owls located on nonfederal lands in "special emphasis areas". The proposed special emphasis areas in Washington and Oregon generally correspond with areas identified by the Spotted Owl Recovery Team as areas where nonfederal contributions would be required to achieve recovery of the spotted owl. In California the proposal would likely retain most spotted owls on nonfederal lands.

The 4(d) notice of intent also solicited public comment on the possibility of describing the regulatory guidance regarding the incidental take of marbled murrelets.

In January 1994, the U.S. Fish and Wildlife Service published a proposal to designate critical habitat for the marbled murrelet. The proposal is that the Late-Successional Reserves of Alternative 9 be designated.

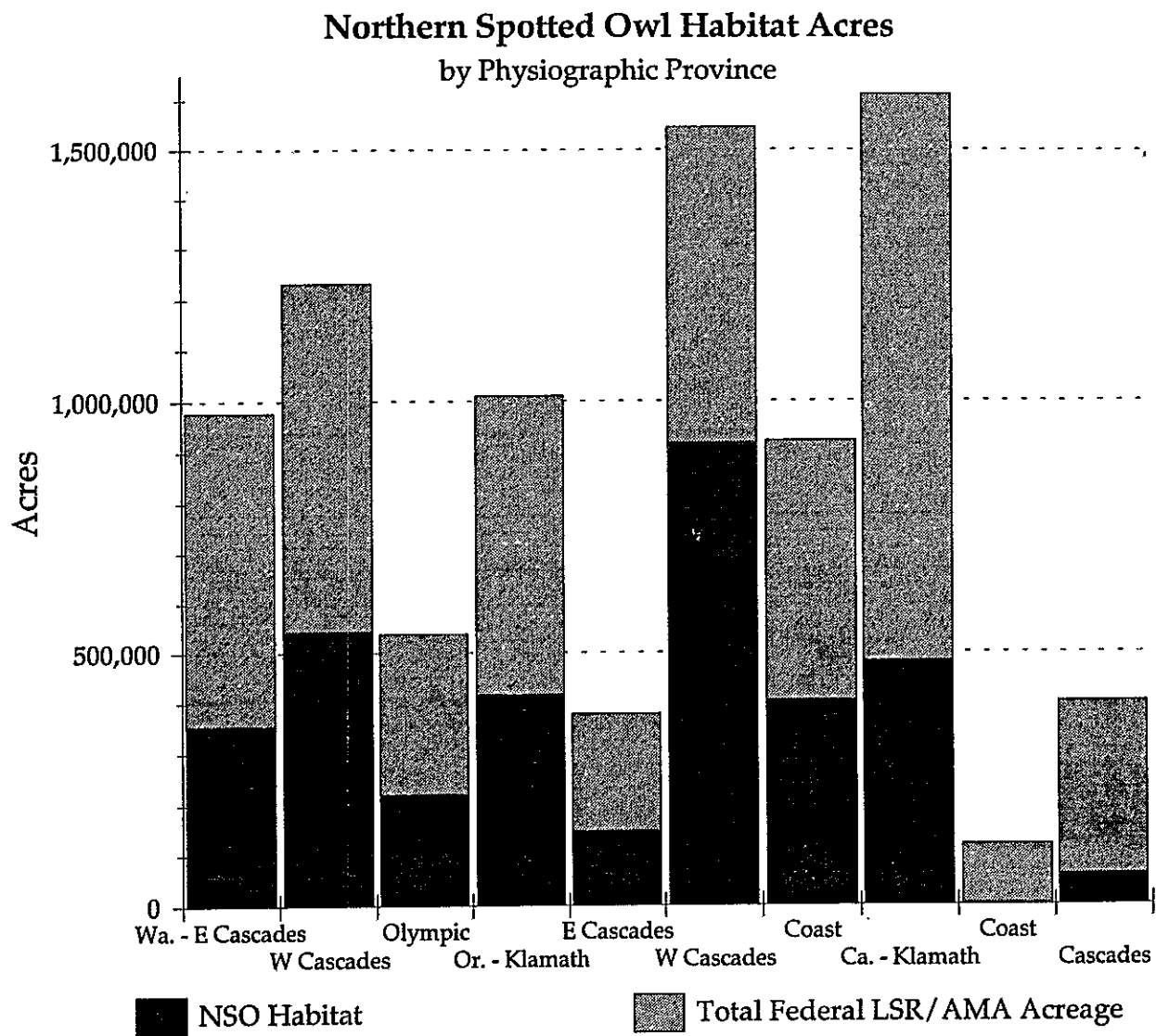
## V. Ability of Alternative 9 to Provide Large Clusters

The second biological principle of the spotted owl Final Draft Recovery Plan was that forest management should be directed at creating and maintaining habitat for clusters of reproductive pairs of spotted owls. The assessment panel which rated the alternatives for the FEMAT were confident that all of the alternatives provided adequate large clusters of owl pairs (refer to the first and second biological principles of the Recovery Plan). This is due to the guidance FEMAT was given, which was to devise options which would at least nominally provide for owl recovery. Chapter 3&4 of the Final SEIS includes a discussion of the "Transition Period" and the possible need to provide large source areas with good quality and quantity of owl habitat, and large numbers of spotted owl pairs. Table G-3 and Figure G-1 were prepared to assess this need.

Table G-3 reflects the habitat and owl activity centers known at this time. The future situation inside Late-Successional Reserves is expected to improve as harvested areas regrow into owl habitat, allowing for an increase in the number of reproductive pairs in the LSRs. The Final Draft Recovery Plan provided methods to calculate the projected improvement which could be expected.

Some provinces have few, if any, large clusters. This is a result of the lack of federal lands (such as in the California coast) or due to naturally sparse habitat and owl populations.

Figure G-1. Northern spotted owl habitat acres by physiographic province



**Table G-3. Acreage, spotted owl habitat and number of spotted owls known in individual Late-Successional Reserves and Adaptive Management Areas of Alternative 9**

State	Physiographic Province	LSR/AMA Number	Federal Acres	NSO Hab Acres	% NSO Habitat	Owls Singles	Owls Pairs	Total Activity Centers
<b>Late-Successional Reserves</b>								
Wa	Eastern Cascades	150	15,182	12,849	85%	0	4	4
Wa	Eastern Cascades	125	67,055	56,300	84%	0	13	13
Wa	Eastern Cascades	134	50,568	30,246	60%	0	3	3
Wa	Eastern Cascades	126	13,680	8,066	59%	0	2	2
Wa	Eastern Cascades	129	105,366	59,266	56%	1	15	16
Wa	Eastern Cascades	135	99,910	50,370	50%	1	11	12
Wa	Eastern Cascades	133	13,443	4,823	36%	0	4	4
Wa	Eastern Cascades	153	39,735	11,031	28%	0	8	8
Wa	Eastern Cascades	130	34,002	9,291	27%	0	2	2
Wa	Eastern Cascades	132	11,387	2,649	23%	0	1	1
Wa	Eastern Cascades	128	10,319	2,214	21%	0	3	3
Wa	Eastern Cascades	141	34,634	4,547	13%	0	1	1
Wa	Eastern Cascades	142	193,138	21,469	11%	0	4	4
Wa	Eastern Cascades	136	76,188	6,800	9%	0	4	4
Wa	Eastern Cascades	139	68,280	672	1%	0	1	1
Wa	Eastern Cascades	127	9,252	1,779	19%	1	2	3
Wa	Eastern Cascades	138	8,461	2,491	29%	0	0	0
Wa	Eastern Cascades	131	6,879	1,502	22%	0	3	3
Wa	Eastern Cascades	152	6,128	751	12%	0	1	1
Wa	Eastern Cascades	140	5,140	0	0%	0	0	0
Wa	Eastern Cascades	151	3,835	2,491	65%	0	1	1
Wa	Eastern Cascades	143	2,491	870	35%	0	0	0
Wa	Eastern Cascades	137	1,700	79	5%	0	0	0
			<b>876,773</b>	<b>290,556</b>	<b>33%</b>	<b>3</b>	<b>83</b>	<b>86</b>
<b>Adaptive Management Areas</b>								
Wa	Eastern Cascades	903	99,791	65,394	66%	0	13	13
Wa	Eastern Cascades	904	593	0	0%	0	0	0
			<b>100,384</b>	<b>65,394</b>	<b>65%</b>	<b>0</b>	<b>13</b>	<b>13</b>
Wa	Eastern Cascades	<b>Total</b>	<b>977,157</b>	<b>355,950</b>	<b>36%</b>	<b>3</b>	<b>96</b>	<b>99</b>
<b>Late-Successional Reserves</b>								
Wa	Western Cascades	122	16,250	12,731	78%	0	2	2
Wa	Western Cascades	149	120,864	70,494	58%	0	25	25
Wa	Western Cascades	144	45,191	26,213	58%	0	9	9
Wa	Western Cascades	123	15,064	8,619	57%	1	2	3
Wa	Western Cascades	113	24,197	12,573	52%	0	2	2
Wa	Western Cascades	146	31,827	16,092	51%	3	11	14
Wa	Western Cascades	145	50,568	24,948	49%	0	7	7
Wa	Western Cascades	152	118,294	56,933	48%	1	23	24
Wa	Western Cascades	112	85,281	40,209	47%	0	11	11
Wa	Western Cascades	114	20,401	9,291	46%	0	3	3
Wa	Western Cascades	119	34,476	15,419	45%	1	3	4
Wa	Western Cascades	147	28,269	12,612	45%	0	5	5
Wa	Western Cascades	125	68,676	29,178	42%	3	12	15
Wa	Western Cascades	117	57,012	22,852	40%	2	3	5
Wa	Western Cascades	116	113,352	44,953	40%	1	8	9
Wa	Western Cascades	115	46,614	16,882	36%	3	3	6
Wa	Western Cascades	111	74,685	24,355	33%	2	5	7
Wa	Western Cascades	148	8,896	7,472	84%	0	2	2
Wa	Western Cascades	121	6,800	4,072	60%	0	1	1
Wa	Western Cascades	118	7,077	2,333	33%	0	1	1
Wa	Western Cascades	120	1,581	712	45%	0	0	0
Wa	Western Cascades	124	2,807	79	3%	0	1	1

Table G-3. (continued)

State	Physiographic Province	LSR/AMA Number	Federal Acres	NSO Hab Acres	% NSO Habitat	Owls Singles	Owls Pairs	Total Activity Centers
			978,182	459,022	47%	17	139	156
Adaptive Management Areas								
Wa	Western Cascades	903	13,719	7,275	53%	1	5	6
Wa	Western Cascades	802	85,518	41,593	49%	1	8	9
Wa	Western Cascades	904	142,768	33,290	23%	1	14	15
Wa	Western Cascades	902	11,031	1,226	11%			0
Wa	Western Cascades	803	514	356	69%			0
			253,550	83,740	33%	3	27	30
Wa	Western Cascades	Total	1,231,732	542,762	44%	20	166	186
Wa	Western Lowlands	0	0	0	0%	0	0	0
Late-Successional Reserves								
Wa	Olympic Peninsula	104	50,726	29,850	59%	2	10	12
Wa	Olympic Peninsula	107	47,642	27,399	58%	2	9	11
Wa	Olympic Peninsula	108	160,441	84,016	52%	3	25	28
Wa	Olympic Peninsula	102	13,798	6,365	46%	1	1	2
Wa	Olympic Peninsula	109	99,910	42,739	43%	4	18	22
Wa	Olympic Peninsula	105	7,789	5,970	77%	0	3	3
Wa	Olympic Peninsula	103	5,456	3,716	68%	0	1	1
Wa	Olympic Peninsula	101	4,468	3,005	67%	0	1	1
Wa	Olympic Peninsula	110	3,914	1,977	51%			0
Wa	Olympic Peninsula	106	316	158	50%			0
			394,460	205,195	52%	12	68	80
Adaptive Management Areas								
Wa	Olympic Peninsula	801	24,869	10,082	41%	3	2	5
Wa	Olympic Peninsula	901	119,085	6,682	6%	1	3	4
			143,954	16,764	12%	4	5	9
Wa	Olympic Peninsula	Total	538,414	221,959	41%	16	73	89
Wa	Total for Washington		2,747,303	1,120,671	41%	39	335	374

Table G-3. (continued)

State	Physiographic Province	LSR/AMA Number	Federal Acres	NSO Hab Acres	% NSO Habitat	Owls Singles	Owls Pairs	Total Activity Centers
Late-Successional Reserves								
Or	Klamath	258	90,579	58,515	65%	1	12	13
Or	Klamath	259	38,707	21,350	55%	1	17	18
Or	Klamath	223	63,259	33,804	53%	1	29	30
Or	Klamath	249	78,362	40,604	52%	1	26	27
Or	Klamath	255	237,458	107,343	45%	9	26	35
Or	Klamath	248	38,430	16,645	43%	1	16	17
Or	Klamath	253	59,503	23,050	39%	3	2	5
Or	Klamath	252	29,060	9,291	32%	4	2	6
Or	Klamath	250	97,577	23,683	24%	7	15	22
Or	Klamath	254	9,173	3,163	34%	1	2	3
Or	Klamath	352	8,698	3,202	37%	1	1	2
Or	Klamath	256	3,321	1,977	60%			0
Or	Klamath	257	2,649	1,226	46%	0	1	1
Or	Klamath	251	1,858	672	36%			0
Or	Klamath	260	1,147	988	86%	0	1	1
Or	Klamath	353	593	158	27%			0
			760,374	345,671	45%	30	150	180
Adaptive Management Areas								
Or	Klamath	908	249,833	72,392	29%	6	74	80
Or	Klamath	Total	1,010,207	418,063	41%	36	224	260
Late-Successional Reserves								
Or	Eastern Cascades	202	23,880	16,566	69%	1	10	11
Or	Eastern Cascades	201	21,350	12,929	61%	1	2	3
Or	Eastern Cascades	227	52,426	27,241	52%	9	12	21
Or	Eastern Cascades	204	32,460	16,092	50%	3	10	13
Or	Eastern Cascades	241	19,373	8,856	46%	0	4	4
Or	Eastern Cascades	238	47,681	15,498	33%	1	6	7
Or	Eastern Cascades	244	28,229	8,856	31%	2	8	10
Or	Eastern Cascades	245	73,776	22,299	30%	0	13	13
Or	Eastern Cascades	242	30,760	3,400	11%	1	0	1
Or	Eastern Cascades	229	8,935	4,151	46%	0	3	3
Or	Eastern Cascades	239	7,077	1,700	24%			0
Or	Eastern Cascades	232	5,733	1,858	32%			0
Or	Eastern Cascades	203	4,112	2,570	63%	1	0	1
Or	Eastern Cascades	235	3,123	1,147	37%	0	1	1
Or	Eastern Cascades	243	3,123	316	10%			0
Or	Eastern Cascades	233	3,084	119	4%			0
Or	Eastern Cascades	230	3,084	0	0%			0
Or	Eastern Cascades	231	2,926	1,858	63%	0	1	1
Or	Eastern Cascades	228	2,768	1,502	54%			0
Or	Eastern Cascades	247	1,661	158	10%			0
Or	Eastern Cascades	236	1,305	40	3%			0
Or	Eastern Cascades	237	1,107	435	39%			0
Or	Eastern Cascades	207	356	0	0%			0
Or	Eastern Cascades	240	356	119	33%			0
Or	Eastern Cascades	234	40	0	0%			0
			378,725	147,710	39%	19	70	89
Or	Eastern Cascades	Total	378,725	147,710	39%	19	70	89
Late-Successional Reserves								
Or	Western Cascades	210	16,131	12,336	76%	5	4	9

Table G-3. (continued)

State	Physiographic Province	LSR/AMA Number	Federal Acres	NSO Hab Acres	% NSO Habitat	Owls Singles	Owls Pairs	Total Activity Centers
Or	Western Cascades	215	26,687	20,164	76%	2	7	9
Or	Western Cascades	201	86,428	64,524	75%	4	7	11
Or	Western Cascades	218	27,162	19,057	70%	3	8	11
Or	Western Cascades	208	10,280	6,800	66%	0	3	3
Or	Western Cascades	213	83,700	53,217	64%	3	23	26
Or	Western Cascades	222	504,688	320,763	64%	39	177	216
Or	Western Cascades	221	16,724	10,121	61%	3	7	10
Or	Western Cascades	207	104,773	60,570	58%	9	30	39
Or	Western Cascades	209	60,570	34,990	58%	5	8	13
Or	Western Cascades	214	39,735	20,836	52%	3	18	21
Or	Western Cascades	225	39,774	19,848	50%	3	16	19
Or	Western Cascades	219	66,501	32,895	49%	9	20	29
Or	Western Cascades	220	51,793	25,145	49%	9	9	18
Or	Western Cascades	224	20,520	9,568	47%	1	16	17
Or	Western Cascades	226	50,093	22,852	46%	10	18	28
Or	Western Cascades	227	47,919	19,808	41%	0	12	12
Or	Western Cascades	247	30,918	9,647	31%	0	9	9
Or	Western Cascades	217	8,975	8,382	93%	0	1	1
Or	Western Cascades	205	5,377	4,033	75%	0	1	1
Or	Western Cascades	212	3,598	2,412	67%	0	2	2
Or	Western Cascades	246	2,095	1,344	64%	0	2	2
Or	Western Cascades	206	1,581	949	60%	0	1	1
Or	Western Cascades	248	1,265	870	69%			0
Or	Western Cascades	211	1,226	554	45%	0	1	1
Or	Western Cascades	204	1,107	593	54%			0
Or	Western Cascades	216	514	356	69%			0
Or	Western Cascades	235	119	0	0%			0
Or	Western Cascades	245	119	0	0%			0
			1,310,372	782,634	60%	108	400	508
Adaptive Management Areas								
Or	Western Cascades	905	154,075	91,646	59%	9	47	56
Or	Western Cascades	906	82,158	43,174	53%	5	25	30
			236,233	134,820	57%	14	72	86
Or	Western Cascades	Total	1,546,605	917,454	59%	122	472	594
Late-Successional Reserves								
Or	Coast Range	265	42,897	28,743	67%	3	10	13
Or	Coast Range	269	20,164	10,833	54%	1	2	3
Or	Coast Range	263	51,635	27,597	53%	1	28	29
Or	Coast Range	267	155,143	76,069	49%	6	48	54
Or	Coast Range	261	59,029	28,625	48%	0	26	26
Or	Coast Range	268	321,988	149,805	47%	24	44	68
Or	Coast Range	266	8,342	3,716	45%	0	3	3
Or	Coast Range	264	8,263	5,219	63%	0	3	3
Or	Coast Range	270	6,010	1,858	31%	1	0	1
Or	Coast Range	271	1,977	949	48%			0
Or	Coast Range	260	1,819	1,186	65%	0	1	1
			677,267	334,600	49%	36	165	201
Adaptive Management Areas								
Or	Coast Range	807	165,857	55,826	34%	9	7	16
Or	Coast Range	907	78,955	13,680	17%			0
			244,812	69,506	28%	9	7	16
Or	Coast Range	Total	922,079	404,106	44%	45	172	217

Table G-3. (continued)

State	Physiographic Province	LSR/AMA Number	Federal Acres	NSO Hab Acres	% NSO Habitat	Owls Singles	Owls Pairs	Total Activity Centers
Late-Successional Reserves								
Or	Willamette Valley	268	474	119	25%			0
Adaptive Management Areas								
Or	Willamette Valley	907	119	79	66%			0
Or	Willamette Valley	Total	593	198	33%	0	0	0
Or	Total for Oregon		3,858,209	1,887,531	49%	222	938	1,160



Table G-3. (continued)

State	Physiographic Province	LSR/AMA Number	Federal Acres	NSO Hab Acres	% NSO Habitat	Owls Singles	Owls Pairs	Total Activity Centers
Late-Successional Reserves								
Ca	Coast	322	38,746	4,900	13%	3	2	5
Ca	Coast	319	31,827	2,000	6%	1	6	7
Ca	Coast	318	11,189	200	2%	1	0	1
Ca	Coast	314	5,456	500	9%			0
Ca	Coast	250	4,863	2,095	43%	0	2	2
Ca	Coast	315	4,744	909	19%			0
Ca	Coast	316	3,637	300	8%			0
Ca	Coast	317	3,282	100	3%			0
Ca	Coast	326	3,005	900	30%	1	2	3
Ca	Coast	312	2,451	2,300	94%			0
Ca	Coast	324	2,412	0	0%	1	4	5
Ca	Coast	323	1,898	1,000	53%			0
Ca	Coast	310	1,740	0	0%			0
Ca	Coast	320	1,186	0	0%			0
Ca	Coast	303	1,067	40	4%			0
Ca	Coast	325	791	0	0%	0	1	1
Ca	Coast	321	751	0	0%			0
Ca	Coast	301	198	158	80%			0
Ca	Coast	307	0	0	0%			0
		119,243	15,402	13%	7	17	24	
Ca	Coast	Total	119,243	15,402	13%	7	17	24
Late-Successional Reserves								
Ca	Klamath	350	13,363	8,342	62%	0	1	1
Ca	Klamath	307	59,661	34,832	58%	6	14	20
Ca	Klamath	304	117,029	65,117	56%	6	22	28
Ca	Klamath	330	80,695	42,700	53%	9	18	27
Ca	Klamath	305	89,511	44,953	50%	9	15	24
Ca	Klamath	349	46,495	21,548	46%	4	10	14
Ca	Klamath	306	35,820	14,945	42%	0	26	26
Ca	Klamath	303	38,034	13,561	36%	1	3	4
Ca	Klamath	344	15,459	5,417	35%	1	4	5
Ca	Klamath	345	59,424	19,057	32%	3	15	18
Ca	Klamath	354	44,281	13,719	31%	1	15	16
Ca	Klamath	332	79,034	22,417	28%	5	12	17
Ca	Klamath	352	17,633	4,784	27%	0	2	2
Ca	Klamath	353	100,384	26,094	26%	11	14	25
Ca	Klamath	331	22,378	4,942	22%	0	5	5
Ca	Klamath	315	21,152	4,665	22%	1	5	6
Ca	Klamath	309	65,275	14,154	22%	8	12	20
Ca	Klamath	334	69,348	14,668	21%	5	8	13
Ca	Klamath	311	42,463	8,579	20%	2	2	4
Ca	Klamath	310	34,081	6,128	18%	4	5	9
Ca	Klamath	313	27,913	4,982	18%	0	2	2
Ca	Klamath	248	10,596	1,858	18%	0	2	2
Ca	Klamath	355	14,747	1,621	11%	3	8	11
Ca	Klamath	333	15,815	1,700	11%	1	1	2
Ca	Klamath	320	13,205	870	7%			0
Ca	Klamath	340	13,482	633	5%	1	1	2
Ca	Klamath	347	8,975	4,151	46%	0	3	3
Ca	Klamath	312	8,659	1,740	20%	1	3	4
Ca	Klamath	337	7,156	2,214	31%	0	2	2
Ca	Klamath	346	6,049	3,123	52%	1	1	2

Table G-3. (continued)

State	Physiographic Province	LSR/AMA Number	Federal Acres	NSO Hab Acres	% NSO Habitat	Owls Singles	Owls Pairs	Total Activity Centers
Ca	Klamath	338	3,756	554	15%	0	1	1
Ca	Klamath	302	3,282	2,056	63%	2	0	2
Ca	Klamath	351	2,649	1,226	46%	1	0	1
Ca	Klamath	339	2,491	198	8%	0	1	1
Ca	Klamath	343	2,372	514	22%	0	2	2
Ca	Klamath	348	2,135	870	41%	0	1	1
Ca	Klamath	356	1,898	633	33%	0	1	1
Ca	Klamath	328	1,700	791	47%	1	0	1
Ca	Klamath	329	1,107	988	89%			0
Ca	Klamath	326	593	0	0%			0
Ca	Klamath	308	435	395	91%			0
			1,200,535	421,739	35%	87	237	324
Adaptive Management Areas								
Ca	Klamath	810	10,714	5,733	54%	2	6	8
Ca	Klamath	908	16,289	3,321	20%	0	4	4
Ca	Klamath	910	385,484	52,624	14%	19	43	62
			412,487	61,678	15%	21	53	74
Ca	Klamath	Total	1,613,022	483,417	30%	108	290	398
Late-Successional Reserves								
Ca	Cascades	335	88,760	26,925	30%	4	8	12
Ca	Cascades	336	21,350	3,835	18%			0
Ca	Cascades	361	14,233	2,530	18%	0	1	1
Ca	Cascades	357	25,145	4,191	17%	1	4	5
Ca	Cascades	340	11,545	1,898	16%	1	0	1
Ca	Cascades	334	15,736	2,530	16%	0	1	1
Ca	Cascades	363	38,707	5,377	14%	0	6	6
Ca	Cascades	342	5,931	316	5%	0	1	1
Ca	Cascades	362	4,942	949	19%			0
Ca	Cascades	360	3,005	1,147	38%	0	1	1
Ca	Cascades	341	2,649	988	37%			0
Ca	Cascades	359	2,175	751	35%	0	1	1
Ca	Cascades	358	1,147	119	10%			0
			235,325	51,556	22%	6	23	29
Adaptive Management Areas								
Ca	Cascades	909	166,846	6,879	4%	1	2	3
Ca	Cascades	Total	402,171	58,435	15%	7	25	32
Ca	Total for California		2,134,436	557,254	26%	122	332	454
Three State Total			8,739,948	3,565,456	41%	383	1,605	1,988

## **Notes on Selected Individual Provinces**

### **WASHINGTON LOWLANDS PROVINCE**

While the FEMAT report identified an LSR in the Washington Lowlands province, the federal land in the province is not under the purview of this SEIS. Information is provided here for comparison purposes only. There is very little federal land in this province. The LSR delineated here by FEMAT occurs on the Fort Lewis Military Reservation, which currently does not support spotted owl habitat or owls. The proposed LSR is 90,580 acres. Past owl recovery planning efforts had identified this area as important to developing connectivity between the Olympic Peninsula and the Cascades owl populations. Much of the forested habitat on the Fort is designated as critical habitat at this time, and all activities which may adversely affect the habitat in this area will be subject to section 7 consultation. The Department of Defense intends to develop a management plan which will address the late-successional habitat issues here.

### **CALIFORNIA CASCADES AND WASHINGTON EASTERN CASCADES PROVINCES**

These provinces have repeatedly been identified as areas of concern in management of spotted owl populations. As with other east side provinces, this is due in part to the inherent ecological inability of the area to grow and maintain suitable spotted owl habitat. Current levels of habitat are believed to be at least partially the result fire suppression (which may have allowed habitat to develop where it would not naturally occur), versus harvest of other habitat. The known owl population here is sparse in relation to other parts of the owl's range and makes delineation of large clusters inefficient.

A compounding concern is the fact that the California Cascades province it is the connection between the two subspecies of spotted owl in California. Past management strategies have attempted to strengthen this connection whenever possible, to reduce the likelihood of the two subspecies being separated.

To respond to these concerns, management strategies designed specifically for spotted owls have had provisions to protect nearly all owls in the two provinces, even those owls which are discovered in the future. The Final Draft Recovery Plan also included language to actively manage some occupied habitat, to reduce the threat of fire and other habitat loss. The reserve network proposed in Alternative 9 was not specifically designed to protect known owl sites, nor did it focus on the population aspects of maintaining the subspecies connection. To improve this situation, Alternative 9 was modified to include Managed Late-Successional Areas at the location of known owl home ranges in these two provinces. This encompasses 10,200 acres in the California Cascades and in the Washington Eastern Cascades provinces.

### **WILLAMETTE VALLEY PROVINCE**

The Oregon Willamette Valley includes only 6,000 acres of NRF habitat, and overall has very little federal land. There is no opportunity to delineate large clusters in this province.

## **VI. Ability of Alternative 9 to Provide for Owl Dispersal**

While the assessment panel which rated the alternatives for the FEMAT were confident that all of the alternatives provided adequate large clusters of owl pairs, there were differences in how well they would meet the dispersal requirements (the final biological principle of the Final Draft Recovery Plan). The panel expressed some concern about the ability of the Alternatives 7, 8, 9 and 10 to

provide for owl dispersal (see discussion of ratings and Table 3&4-42 in the Final SEIS). This concern was reiterated for Alternative 9 in the October 1993 Biological Assessment and in the Draft Biological Opinion. Since those concerns were raised, Alternative 9 was modified, prompting the need for additional analysis. The following analysis is provided to better judge the ability of the modified Alternative 9 to meet the recovery plan objectives for owl dispersal.

Table G-4 illustrates acreage estimates of current forest landscape conditions in Alternative 9. It provides a view of the total landscape in terms of forest meeting the conditions necessary for owl dispersal, versus the lands not meeting those conditions. The righthand column shows the percentage of the federal forest landscape which is now in "11-40" condition, which will provide for owl dispersal.

## OWL ASSESSMENT TABLE

G-22 □ Final Supplemental Environmental Impact Statement

Owl dispersal requirements are believed to be met in Alternative 9 due to the cumulative benefits from a variety of land allocations and standards and guidelines which are not specifically earmarked as owl dispersal standards. The following are two the benefits which are expected to be the most important to assuring owl dispersal, when added to the discussion of "Spacing Between Owl Clusters". Additional measures which will provide incremental improvement of owl dispersal are addressed in the section titled "Other Considerations of Alternative 9 for Spotted Owl Management".

## Implementation of Riparian Reserve Scenario 1

Riparian Reserve Scenario 1 results in an increase in the total acreage and the amount of owl habitat and murrelet habitat which would be retained along intermittent streams. This will have a greater effect in the provinces which have higher stream densities, as illustrated in the calculations below and the Aquatic Conservation Strategy discussion in Chapter 3&4. The larger acreage of protected habitat will increase the amount of dispersal and nesting habitat which will be retained throughout the owl and murrelet range.

Riparian Reserve Scenario 1 will apply to Alternative 9 throughout the range of the northern spotted owl. This modification increases the acreage of Riparian Reserve along intermittent streams from one-half to the full height of a site potential tree. To provide an estimate of the effect of this change, Riparian Reserve widths were modeled in terms of the height of a "site-potential" tree. A site-potential tree height is the average maximum height of the tallest dominant tree (200 years or older) for a given site class. Riparian widths for intermittent streams will vary from about 220 feet (each side of the stream channel) on coastal lands to about 140 feet on lands in the eastern portion of the spotted owl's range. To provide a view of the effect of Riparian Reserve Scenario 1, the following correlation can be made between length of stream reach and number of acres in riparian reserve:

	Riparian Reserve width	Length of intermittent stream reach required to protect:	
		1 acre	10 acres
Coastal lands (avg. 220 ft each side riparian width)	440 ft.	99 feet	990 feet
Eastern Cascades (avg. 140 ft each side riparian width)	280 ft.	156 feet	1,560 feet

The decision to implement Riparian Reserve Scenario 1 results in 3,233,100 acres of Riparian Reserves, which is an additional 638,000 acres (25 percent increase) over the Draft SEIS Alternative 9. Total Riparian Reserves in Alternative 9 represent a 420 percent more Riparian Reserve acres than the Recovery Plan (Alternative 7; 622,300 acres), which relied on the 50-11-40 rule to provide dispersal habitat. These Riparian Reserves will improve travel and dispersal corridors for many terrestrial animals and plants, and serve as connectivity corridors between the Late-Successional Reserves.

The effect of Riparian Reserve Scenario 1 is increased protection of medium/large conifer (>21" dbh), and northern spotted owl NRF habitat in Alternative 9. It is estimated that an additional 1.15 million acres of medium and large conifer are protected from harvest in Alternative 9 as a result of Riparian Reserve Scenario 1. As a result, there are 44 percent fewer acres of medium/large conifer in the matrix in Alternative 9 than in Alternative 7.

The same comparison done for suitable spotted owl habitat shows, an additional 1.1 million acres of NRF habitat protected in the modified Alternative 9 due to wider Riparian Reserves. This leaves 45 percent fewer acres of NRF habitat in the matrix in Alternative 9 than in Alternative 7.

The standards and guidelines state that Riparian Reserve widths may be modified after completion of watershed analysis. That analysis will take into account northern spotted owl dispersal needs as well as other species that were intended to be benefited by this mitigation measure.

There are two specific values in the application of Riparian Reserve Scenario 1 for spotted owl dispersal. First is the fact that the acreage reserved will be fairly evenly arranged across the landscape. This is important because of the documentation of juvenile spotted owl dispersal occurring in random directions. An even distribution of dispersal habitat is important, and this was one factor which lead to the development of the 50-11-40 rule. The second important feature is that the acreage reserved will have the potential both in the short term and in the long term to provide higher quality habitat than "11-40" conditions. The Riparian Reserves will have more complex forest structure and more dead and down, which will provide better roosting and foraging conditions than a strictly 11 inch dbh and 40 percent canopy closure stand would provide. This will increase its effectiveness in providing for owl survival during dispersal.

## **Protection of Selected Owl Sites Outside of LSRs**

In parts of the range of the spotted owl, the owl population is relatively sparse due to natural habitat conditions. These same areas are especially susceptible to large wildfires. To mitigate this situation, which could have serious effects on the ability to maintain the species throughout its range (see biological principles), some relatively small areas are identified for special management.

Some Managed Pair Areas and Reserved Pair Areas, which were described in the Spotted Owl Recovery Plan, were specifically protected in the modifications to Alternative 9, though with different descriptors. In the Washington Eastern Cascades and California Cascades, these areas are now proposed for protection as Managed Late-Successional Areas in Alternative 9 (see discussion of large clusters).

The effect of this change to Alternative 9 is the restriction of timber harvest on 92,100 acres in the Washington Eastern Cascades and 10,100 acres in the California Cascades province. It provides protection for 17 owl activity centers in these areas of sparse populations. These areas will supplement the larger reserve system and provide insurance against catastrophic loss of owl habitat in the two areas at risk of large-scale disturbance.

On various BLM lands in Oregon, selected Reserved and Managed Pair Areas are identified for special management (see Appendix B9 of Final SEIS). Portions of the Connectivity Blocks are currently in late-successional forest conditions; they are providing and will continue to provide population support and dispersal habitat in several areas. Areas where dispersal concerns are likely to be addressed are the corridors which connect the Oregon Coast Range with the Western Oregon Cascades. In this area major portions of the BLM Districts located on the I-5 corridor have been proposed as Connectivity Blocks. An estimate is 270,000 acres of Connectivity Blocks are proposed here, accounting for 11 percent of all BLM lands in the planning area. Restrictions placed on the Connectivity blocks exceed that which would occur under application of the 50-11-40 standard.

These owl home ranges which are protected outside of Late-Successional Reserves will facilitate owl dispersal in two ways. First, they are expected to support reproductive pairs of owls, producing young which could move through the areas assure recolonization of habitat as it becomes available. Second, if managed as expected, it will provide islands of better quality habitat which could support dispersors, at least temporarily.

Some of the alternatives, including Alternative 9, have the provision to protect most spotted owl activity centers in the matrix and AMAs with 100 acre areas of suitable owl habitat. These areas, identified in the *Final Draft Recovery Plan for the Northern Spotted Owl* as residual habitat areas, are not considered adequate acreage to maintain these areas as home ranges for reproductive pairs. While not providing for the long-term needs of owl pairs, these areas provide acreage of high quality habitat which are valuable for other species (see Appendix B11 of Final SEIS). They also would retain future options for managing owls throughout the landscape, as described by the Recovery Plan as a long term goal for forest management. In the short term, in forest types which are managed through selective harvest (Klamath and eastside provinces), it is possible that these residual habitat areas in the matrix could be carefully managed to maintain the site as an owl home range, while allowing timber harvest.

The effect of residual habitat areas varies by province, due to the variation in density of owl activity centers (Figure G-2 and Table G-5). The acreage of these residual habitat areas will be a contribution to successful owl dispersal, especially where they are near Administratively Withdrawn lands and Riparian Reserves.



Figure G-2. Residual habitat areas (RHAs) in the matrix and in AMAs

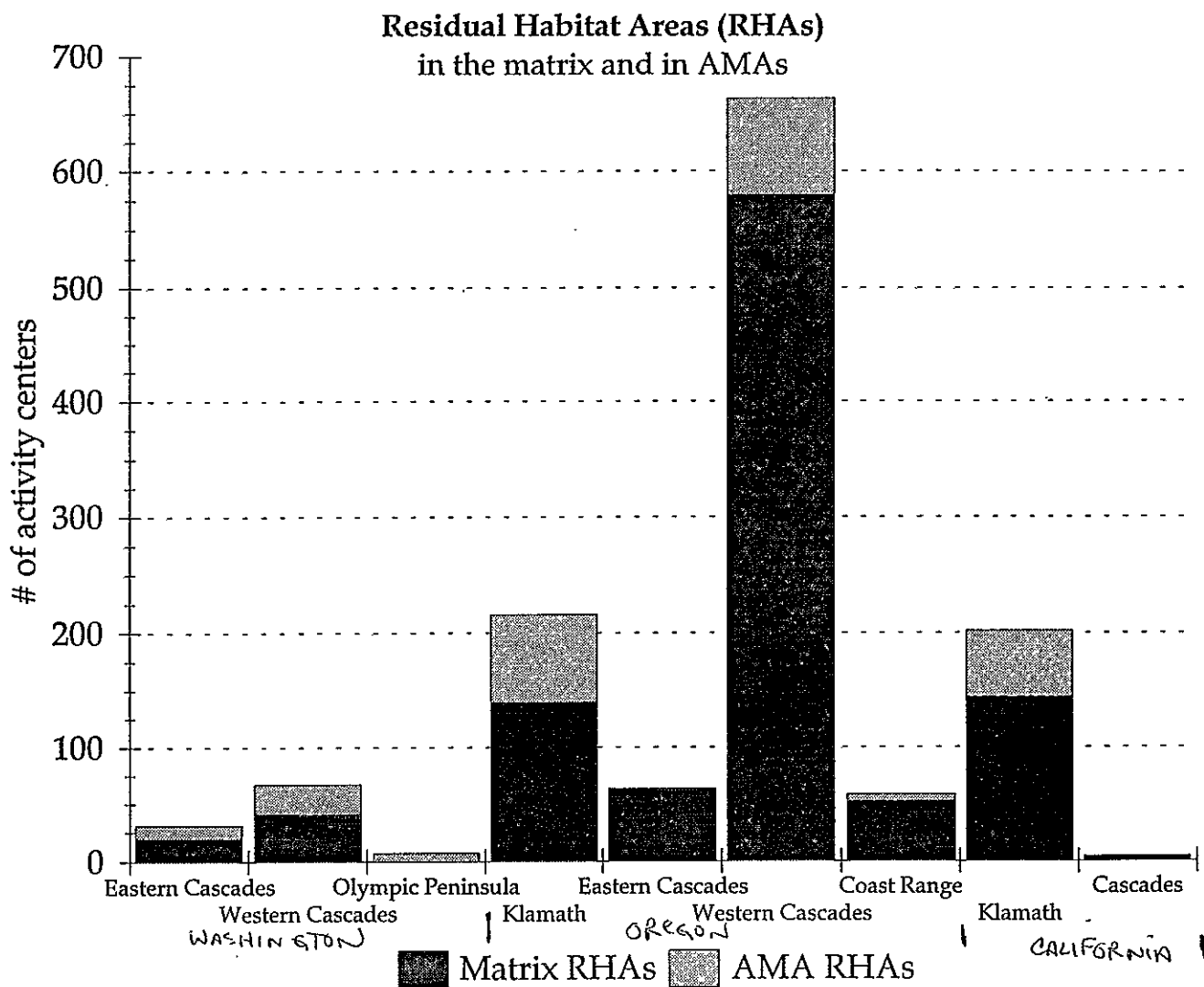


Table G-5. Residual habitat areas by Physiographic Province

## Residual Habitat Areas by Physiographic Province

State/ Physiographic province	RHAs in matrix	RHAs in AMAs
<b>Washington</b>		
Eastern Cascades	20	11
Western Cascades	41	26
Western Lowlands	0	0
Olympic Peninsula	0	7
<b>Total:</b>	<b>61</b>	<b>44</b>
<b>Oregon</b>		
Klamath	139	77
Eastern Cascades	63	0
Western Cascades	580	83
Coast Range	52	6
Willamette Valley	0	0
<b>Total:</b>	<b>834</b>	<b>166</b>
<b>California</b>		
Coast Range	0	0
Klamath	144	58
Cascades	4	0
<b>Total:</b>	<b>148</b>	<b>58</b>
<b>Three-State Total:</b>	<b>1043</b>	<b>268</b>

## Notes on Individual Provinces

### THE WESTERN OREGON CASCADES PROVINCE

The Oregon Western Cascades province has large areas of matrix in which owl dispersal will be necessary to maintain the clusters of owl pairs inside Late-Successional Reserves. The dispersal conditions in this province will improved by the large number of residual habitat areas. The Oregon Western Cascades province has 72 percent of all NRF habitat in reserve land designations. While this represents a 42 percent more reserved NRF habitat than Alternative 7, there are still large portions of the matrix in this province which may not provide adequate dispersal habitat. To help alleviate this concern, the Alternative 9 provision for the protection of 100 acres of each Residual Habitat Area located in the matrix and Adaptive Management Area will retain more suitable owl habitat evenly distributed. These RHAs consist entirely of NRF habitat. About one half of all RHAs are located in the Western Cascades province of Oregon. The matrix and AMA acreage protected in RHAs is shown by Administrative unit:

Table G-6. Approximate acreage of Forest and District RHAs located within the Oregon Western Cascades physiographic

Mount Hood NF - (2/3 of forest)	8,000 acres
Willamette NF	30,000 acres
Umpqua NF	14,000 acres
Medford BLM - (1/3 of district)	5,000 acres
Roseburg BLM - (1/2 of district)	4,000 acres
Eugene BLM - (1/2 of district)	1,500 acres
Salem BLM - (1/3 of district)	<u>500 acres</u>
	63,000 acres

The addition of 63,000 acres of NRF habitat in the Oregon Western Cascades province increases the amount of habitat in reserve status to 1,556,300 acres (75 percent of all NRF habitat).

## VII. Spacing Between Owl Clusters

The Late-Successional Reserves of Alternative 9 are intended to provide the large areas of suitable habitat to support clusters of reproductive spotted owl pairs. For these Reserves to function appropriately in the owl population maintenance, there must be genetic and demographic interchange between clusters. This is expected to be achieved by appropriate management of the matrix (see related discussion), but is also influenced by the linear distance between the clusters. The original owl population model presented by the ISC identified a distance of 12 miles between large clusters, and 7 miles where clusters were smaller and the need for successful interchange may be more acute.

To assess how well the Alternative 9 LSR network meets these distance goals, the following "nearest neighbor" analysis was done:

We drew habitat polygons using the boundary of Alternative 9 reserves, plus the owl habitat in the Congressionally Reserved Lands which was contiguous with an individual LSR/AMA. This is a hand-drawn layer to identify the "effective" owl clusters. The Congressionally Reserved habitat

contiguous to the reserves was derived from the owl recovery plan DCA boundaries. This was used because we have acreage figures for them.

A total of 103 "Effective Clusters" were identified. We measured the distance from one cluster to its three nearest neighbors and then averaged these distances (see Table G-7); the averages for each province area are shown in Table G-8.

Table G-7. "Nearest neighbor" measurements for protected areas in Alternative 9

STOC #	PROV	Three Closest Clusters (in cm)				Average Distance	
		Stoc#	Dist	Stoc#	Dist	AVG (CM)	AVG (MI)
<b>California Cascades</b>							
71 CCA		73	0.7	72	1	63	1.1
72 CCA		71	1	73	2.1	74	3.8
73 CCA		74	0.5	71	0.7	72	2.1
74 CCA		73	0.5	71	1.7	76	2.7
76 CCA		74	2.7	71	3.6	70	3.6
80 CCA	OR16	1.7	68	8.1	OR39	6.7	5.50
PROVINCE AVERAGE							7.88
<b>California Coast</b>							
17 CCR		16	3	3	4.4	21	5.1
32 CCR		39	6.3	40	8	28	8.4
39 CCR		40	0.3	32	6.3	25	7
40 CCR		39	0.3	46	4.3	25	7.2
46 CCR		49	1	44	2.9	40	4.3
PROVINCE AVERAGE							4.59
<b>California Klamath</b>							
3 CKM		16	0.4	4	0.5	OR38	1.5
4 CKM		3	0.5	5	1.5	OR38	0.5
5 CKM		7	0.5	OR39	4.8	OR18	5.3
7 CKM		5	0.5	18	5.3	68	6.7
13 CKM		16	0.4	14	0.4	3	0.7
14 CKM		13	0.4	18	1.1	5	1.4
16 CKM		13	0.4	3	0.4	14	1.3
18 CKM		19	0.2	16	1.1	21	1.7
19 CKM		18	0.2	68	3.6	64	3.7
21 CKM		24	0.3	63	0.5	18	1.7
23 CKM		24	0.8	21	2.1	25	3.7
24 CKM		21	0.3	23	0.8	29	3.3
25 CKM		43	0.9	28	0.9	29	1.7
28 CKM		25	0.9	23	3.9	32	8.4
29 CKM		25	1.7	24	3.3	63	5.7
43 CKM		25	0.9	44	0.9	50	3.9
44 CKM		43	0.9	50	1.2	49	1.3
49 CKM		51	0.5	50	1	46	1
50 CKM		49	1	44	1.2	51	2
51 CKM		49	0.5	52	1.7	50	2
63 CKM		21	0.5	64	1.1	71	1.1
64 CKM		63	1.1	68	3.4	19	3.7
68 CKM		64	3.4	18	4.4	63	5.2
PROVINCE AVERAGE							1.88

STOC #	PROV	Three Closest Clusters (in cm)				Average Distance	
		Stoc#	Dist	Stoc#	Dist	AVG (CM)	AVG (MI)
<b>Oregon Coast</b>							
31 OCR		32	7.4	A31	2.7	B31	0.3
32 OCR		35	0.4	34	1.1	12	5.9
33 OCR		34	2	35	2.6	36	3
34 OCR		35	1	32	1.1	33	1.7
35 OCR		32	0.4	A34	1	12	1.2
PROVINCE AVERAGE							2.12
<b>Oregon East Cascades</b>							
15 OEC		16	1	14	1.1	39	4.8
17 OEC		2	1.5	1	2.3	WA40	4.5
18 OEC		19	0.4	5	0.7	6	3.6
19 OEC		18	0.4	9	2.2	7	4.5
21 OEC		22	0.7	9	3.6	19	4.4
24 OEC		13	2.5	22	2.7	11	3.1
PROVINCE AVERAGE							2.44
<b>Oregon Klamath</b>							
36 OKM		37	0.4	40	2.4	38	3
37 OKM		36	0.4	CAL3	0	CAL4	3
38 OKM		36	3	CAL4	1.5	CAL5	0
39 OKM		16	1.3	15	4.8	CAL5	2
40 OKM		33	1.7	36	2.4	41	2.6
41 OKM		12	1.2	40	2.6	36	4.9
PROVINCE AVERAGE							2.07
<b>Oregon West Cascades</b>							
1 OWC		2	1.7	17	2.3	W44	0.5
2 OWC		3	0.3	17	1.5	1	1.7
3 OWC		2	0.3	4	1	5	5.6
4 OWC		3	1	5	1.3	6	2.5
5 OWC		18	0.7	4	1.3	6	1.8
6 OWC		5	1.8	7	1.9	4	2.5
7 OWC		6	1.9	9	3.7	19	4.5
9 OWC		10	1.7	11	2.5	19	2.2
10 OWC		9	1.7	11	1.8	12	3.1
11 OWC		13	0.8	10	1.8	12	2.3
12 OWC		41	1.2	13	2	11	2.3
13 OWC		11	0.8	12	2	24	2.5
14 OWC		15	1.1	12	2.6	16	8
16 OWC		15	1	39	1.3	CAL80	1.8
PROVINCE AVERAGE							2.01

Table G-7. (continued)

STOC#	PROV	Three Closest Clusters (in cm)				Average Distance			
		Stoc#	Dist	Stoc#	Dist.	Stoc#	Dist.	AVG (CM)	AVG (MI)
<b>Washington East Cascades</b>									
9 WEC		12	0.8	8	1	11	1.6	1.13	3.63
11 WEC		9	1.6	12	2.3	18	2.8	2.23	7.15
12 WEC		9	0.7	17	1.2	11	2.3	1.40	4.48
17 WEC		12	1.2	18	1.4	11	3	1.87	5.97
18 WEC		19	0.5	17	1.4	11	2.8	1.57	5.01
19 WEC		20	0.1	18	0.5	24	0.9	0.50	1.60
20 WEC		19	0.1	23	0.4	21	0.5	0.33	1.07
24 WEC		19	0.9	25	2	26	2.5	1.80	5.76
25 WEC		20	0.8	26	1.2	24	2	1.33	4.27
26 WEC		25	1.2	31	2.3	24	2.5	2.00	6.40
30 WEC		31	0.4	32	0.9	29	2	1.10	3.52
31 WEC		30	0.4	26	2.3	32	3.2	1.97	6.29
32 WEC		30	0.9	33	1.2	34	1.5	1.20	3.84
33 WEC		34	0.3	36	0.5	32	1.2	0.67	2.13
35 WEC		36	0.6	33	1.8	32	5.3	2.57	8.21
36 WEC		34	0.3	33	0.5	35	0.6	0.47	1.49
40 WEC		39	2.8	44	5.3	37	7.8	5.30	16.96
<b>PROVINCE AVERAGE</b>								1.61	5.16
<b>Olympic Peninsula</b>									
1 WOP		2	0.3	5	2.8			1.55	4.96
2 WOP		1	0.3	5	1.1	5	7.2	2.87	9.17
5 WOP		2	1.1	1	2.8			1.95	6.24
<b>PROVINCE AVERAGE</b>								2.12	6.79
<b>Washington West Cascades</b>									
6 WWC		7	1.5	10	1.5	14	2.2	1.73	5.55
7 WWC		8	0.9	6	1.5	10	6.8	3.07	9.81
8 WWC		7	0.9	9	1	10	2.7	1.53	4.91
10 WWC		13	0.8	15	1.5	6	1.5	1.27	4.05
13 WWC		15	0.7	10	0.8	14	1.4	0.97	3.09
14 WWC		16	1	13	1.4	6	2.2	1.53	4.91
15 WWC		13	0.7	16	1.1	10	1.5	1.10	3.52
16 WWC		21	0.4	20	0.7	14	1	0.70	2.24
21 WWC		16	0.4	20	0.5	23	2.3	1.07	3.41
23 WWC		20	0.4	28	1.2	21	2.3	1.30	4.16
28 WWC		29	1	23	1.2	20	1.8	1.33	4.27
29 WWC		28	1	30	2	32	2	1.67	5.33
34 WWC		36	0.3	33	0.3	32	1.5	0.70	2.24
37 WWC		38	0.5	39	2	34	2.3	1.60	5.12
38 WWC		37	0.5	38	1.1	46	3.9	1.83	5.87
39 WWC		44	1	38	1.1	37	2	1.37	4.37
44 WWC		39	1	OR17	4.5	OR1	0.5	2.00	6.40
46 WWC		38	3.9	34	4.1	37	5.3	4.43	14.19
<b>PROVINCE AVERAGE</b>								1.62	5.19

Table G-8. Average Nearest Neighbor for Owl Clusters in Alternative 9

Province	Number of clusters	Average Distance
California Cascades	6	7.88 miles
California Klamath	23	6.02 miles
California Coast Range	5	14.68 miles
Oregon Western Cascades	14	6.42 miles
Oregon Coast Range	5	6.78 miles
Oregon East Cascades	6	7.82 miles
Oregon Klamath	6	6.61 miles
Washington East Cascades	17	5.16 miles
Washington West Cascades	18	5.19 miles
Olympic Peninsula	3	6.79 miles
Washington Lowlands	NA	NA

NA - this measurement not applicable to this province as no LSRs are directed in this Final SEIS.

We did not use habitat clusters which were estimated to be less than 10,000 acres in size, since their role in population maintenance is believed to be less assured. Nor did we use the Managed Late-Successional Areas, since they are generally smaller than 10,000 acres and supporting few owl pairs. These smaller areas are scattered throughout the range, between the larger clusters. This is more significant in some provinces, such as the Oregon East Cascades, Washington East Cascades, California Cascades and California Coast, which have many of these smaller areas.

## Notes on Individual Provinces

### THE OLYMPIC PENINSULA PROVINCE

The Olympic Peninsula province requires special discussion of nearest neighbor distances since this province would essentially become an isolated population if nonfederal lands do not contribute to maintaining connectivity between this province and the Washington West Cascades province. The only other federal land which may contribute to this connectivity between provinces is the Fort Lewis Military Reservation, which is currently designated critical habitat for spotted owls.

### THE OREGON KLAMATH PROVINCE

In relation to the nearest neighbor distances, etc., the Oregon Klamath province deserves specific discussion because of the proposed "southern general forest management" on the BLM lands of the Medford district, which lies in the center of this province. This proposed management is intended to retain at least a minimum level of owl dispersal habitat and the area is expected to improve in dispersal conditions over time. This will somewhat mitigate the distance between clusters in this province.

### THE CALIFORNIA COAST PROVINCE

The average nearest neighbor distance shown in Table G-9 for the California Coast Range province is much greater than other provinces. This is due to the small acreage of federal land in this province; only 8 percent of the province is in federal ownership. The BLM land here generally occurs in very small parcels, which means that many of the Late-Successional Reserves of Alternative 9 were not

federal land in this province seriously limits the ability to delineate an effective network of owl clusters, and creates a reliance on the nonfederal lands in much of the province. There are hundreds of spotted owl activity centers on the nonfederal lands of this province.

## **VIII. Other Considerations of Alternative 9 for Spotted Owl Management**

There are other aspects of Alternative 9 which have value to spotted owl habitat management, but are not specifically identified as modifications since the Draft SEIS, or as designs in the Alternative for spotted owls.

### **Higher Percentage of Landscape and Owl Habitat in Reserves**

Alternative 9 would reserve a larger portion of the current suitable spotted owl habitat (NRF habitat) than the Recovery Plan (Alternative 7) would. There are three possible measures of gross acreage protection: NRF habitat, older seral habitat or total acreage. Table G-2 shows total acreage comparison. Tables G-9 and G-10 illustrate the effective difference for suitable habitat and medium/large conifer seral stages, respectively.

Generally there is a 20 to 22 percent increase in all three measures of habitat from Alternative 7 to Alternative 9 throughout the range. The correlation between percentages of medium/large conifer and NRF habitat is quite close, when compared at a physiographic province level.

Throughout the range of the spotted owl, Alternative 9 designates 82 percent of NRF habitat to reserve status. The amount of NRF habitat in reserve status varies by province, but is greater than 72 percent in all but one province (see Table G-9). The exception is the Oregon Willamette Valley physiographic province which has very little federal land.



Table G-9. Comparison of nesting, roosting, and foraging habitat between Alternative 7 and Alternative 9

Comparison of Nesting, Roosting, and Foraging habitat between Alternative 7 and Alternative 9.

State/ Physiographic province	Total Acres NRF Habitat Federal Land	ALTERNATIVE 7			ALTERNATIVE 9			% increase in reserved NRF habitat from Alt 7 to Alt 9***	% decrease in matrix NRF habitat from Alt 7 to Alt 9
		All Reserved Areas*		Matrix**	All Reserved Areas*		Matrix**		
		Acres	%		Acres	%			
Washington									
Eastern Cascades	712,400	610,900	86%	101,600	615,500	86%	96,800	1%	-5%
Western Cascades	1,114,000	939,200	84%	174,800	999,000	90%	114,900	6%	-34%
Western Lowlands	0	0	0%	0	0	0%	0	0%	0%
Olympic Peninsula	564,000	534,100	95%	29,900	559,700	99%	4,400	5%	-85%
Total:	2,390,400	2,084,200	87%	306,300	2,173,800	91%	216,400	4%	-29%
Oregon									
Klamath	799,000	396,000	50%	402,900	591,300	74%	207,600	49%	-48%
Eastern Cascades	443,200	275,200	62%	167,900	341,500	77%	101,600	24%	-39%
Western Cascades	2,072,800	1,054,900	51%	1,018,000	1,493,300	72%	579,600	42%	-43%
Coast Range	539,400	363,000	67%	176,400	484,400	90%	55,100	33%	-69%
Willamette Valley	6,000	800	13%	5,200	3,100	52%	2,900	288%	-44%
Total:	3,860,400	2,089,900	54%	1,770,400	2,913,100	75%	947,300	39%	-46%
California									
Coast Range	7,700	4,700	61%	2,900	6,000	78%	1,600	28%	-45%
Klamath	1,075,500	769,400	72%	306,200	941,200	88%	134,300	22%	-56%
Cascades	75,500	59,600	79%	15,900	66,100	88%	9,400	11%	-41%
Total:	1,158,700	833,700	72%	325,000	1,013,400	87%	145,200	22%	-55%
Three-State Total:									
	7,409,500	5,007,800	68%	2,401,700	6,098,300	82%	1,310,900	22%	-45%

\* All reserved areas include Congressionally Reserved Areas, Late-Successional Reserves, Managed Late-Successional Areas, Administrative Withdrawn Areas, and Riparian Reserves.

\*\* Matrix acres include portion of AMA outside of riparian reserves.

\*\*\* Alt 9 reserve acres minus Alt 7 reserve acres divided by Alt 7 reserve acres

Table G-10. Comparison of seral stages between Alternative 7 and 9

Comparison of seral stages between Alternative 7 and Alternative 9

Physiographic province	Total Federal				Alternative 7 Reserves*				Alternative 7 Matrix**				Alternative 9 Reserves*				Alternative 9 Matrix**				% increase in reserves from Alt 7 to Alt 9	% decrease in matrix from Alt 7 to Alt 9
	Small conifer	Medium/Large conifer	Small conifer	Medium/Large conifer	Small conifer	% of single story	Medium/Large conifer	% of total	Small conifer	% of single story	Medium/Large conifer	% of total	Small conifer	% of single story	Medium/Large conifer	% of total	Small conifer	% of single story	Medium/Large conifer	% of total		
Washington	Eastern Cascades	829,400	946,300	626,800	76%	789,900	83%	202,600	156,400	715,300	86%	834,400	88%	114,100	111,900	14%	6%	-44%	-28%			
	Western Cascades	1,008,700	1,190,400	789,000	78%	1,038,800	87%	219,700	151,600	862,000	85%	1,096,700	92%	146,700	93,700	9%	6%	-33%	-38%			
	Western Lowlands	0	0	0	0%	0	0%	0	0	0	0%	0	0%	0	0	0%	0%	0%	0%			
	Olympic Peninsula	488,300	497,300	415,300	85%	480,600	97%	73,000	16,700	453,000	93%	493,100	99%	35,400	4,200	9%	3%	-52%	-75%			
	Total:	2,326,400	2,634,000	1,831,100	79%	2,309,300	88%	495,300	324,700	2,022,300	87%	2,424,100	92%	304,100	209,900	10%	5%	-39%	-35%			
Oregon	Klamath	599,200	704,700	301,900	50%	364,300	52%	297,300	340,400	450,100	75%	520,900	74%	149,100	183,800	49%	43%	-50%	-46%			
	Eastern Cascades	976,700	291,800	576,300	59%	196,800	67%	400,400	95,000	720,900	74%	230,200	79%	255,800	61,600	25%	17%	-36%	-35%			
	Western Cascades	1,169,200	1,922,500	658,000	56%	1,082,700	56%	511,200	839,800	858,600	73%	1,429,200	74%	310,600	493,300	30%	32%	-39%	-41%			
	Coast Range	530,900	355,800	286,000	54%	246,100	69%	244,900	109,700	459,600	87%	318,300	89%	71,300	37,500	61%	29%	-71%	-66%			
	Willamette Valley	4,400	2,200	500	11%	400	18%	3,900	1,800	2,000	45%	1,300	59%	2,300	800	300%	225%	-41%	-56%			
Total:	3,280,400	3,277,000	1,822,700	56%	1,890,300	58%	1,457,700	1,386,700	2,483,000	76%	2,498,400	76%	797,400	778,600	36%	32%	-45%	-44%				
California	Coast	4,700	35,400	3,700	79%	27,700	78%	1,000	7,700	4,100	87%	31,100	88%	600	4,300	11%	12%	-40%	-44%			
	Klamath	140,800	2,265,700	84,200	60%	1,534,300	68%	56,600	731,400	113,700	81%	1,907,900	84%	27,100	357,800	35%	24%	-52%	-51%			
	Cascades	38,300	338,400	9,300	24%	163,700	48%	29,000	174,700	21,700	57%	230,500	68%	16,600	107,900	133%	41%	-43%	-38%			
	Total:	183,800	2,639,500	97,200	53%	1,725,700	65%	86,600	913,800	139,000	76%	2,167,300	82%	44,800	472,200	43%	26%	-48%	-48%			
	Three-State Total:	5,790,600	8,550,500	3,751,000	65%	5,925,300	69%	2,039,600	2,625,200	4,642,500	80%	7,081,700	83%	1,148,100	1,468,800	24%	20%	-44%	-44%			

\* All reserved areas include Congressionally Reserved Areas, Late-Successional Reserves, Managed Late-Successional Areas, Administrative Withdrawn Areas, and Riparian Reserves.

\*\* Matrix includes portion of AMA outside of riparian reserves.

## **Inoperable Lands**

Riparian Reserve Scenario 1 will create a pattern of reserves that will make some of the land inoperable for timber harvest due to inaccessibility. A portion of the timber production acreage will be in fairly small pieces and slivers between the Riparian Reserves. Johnson et al. estimated that an approximately 5 percent of matrix land would be inoperable due to this inaccessibility (the percentage varies by Forest and District), decreasing the matrix acreage by approximately 240,000 acres, ranged. All of these areas are likely to be adjacent to Riparian Reserves. The portion of these inoperable areas which is NRF habitat is approximately 50 percent (120,000 acres).

## **Reduction in PSQ Compared to Recovery Plan**

The PSQ for Alternative 9 will reflect a significant slowing in the removal of suitable spotted owl habitat versus that which was expected for the Recovery Plan. The PSQ for Alternative 9 is 958 MMBF, compared to 1643 MMBF for Alternative 7. Consequently, habitat conditions will be changed more slowly under Alternative 9 than under Alternative 7. Based on analysis which compares the rate of decline in NRF habitat between the Recovery Plan (Alternative 7) and Alternative 9, approximately 20,000 acres of suitable habitat will be harvested in Alternative 9 each year. Harvest over the next 3 decades is expected to reduce NRF habitat in the matrix and AMAs by about 600,000 acres. The primary concerns for spotted owls are dispersal habitat in the next 30 years (while current early-successional forests achieve dispersal conditions), and the expected need for a conservative approach, given the demographic data. After 3 decades (assuming no ingrowth) there would be over 700,000 acres of NRF habitat in the matrix and AMAs to contribute to spotted owl dispersal habitat and population support. This is a conservative estimate, since some forest stands in the matrix and AMAs will be achieving the conditions of NRF habitat.

Even with this slower harvest rate, areas in the matrix and AMAs which currently do not meet dispersal conditions will continue to experience reductions in NRF habitat for the next couple of decades until ingrowth creates satisfactory late-successional conditions throughout the landscape.

## **Change of 180 Year Rotation in California**

The 180 year rotation for lands in California was expected to provide for owl dispersal. Since this rotation age was dropped from Alternative 9, the effects to owl dispersal should be discussed. Given that the California forest landscape is not appreciably different from the eastside forests and the Oregon Klamath province, it is appropriate to consider equal management guidance for all these lands. The provisions of Alternative 9 to provide owl dispersal in areas outside of California will also be adequate inside the state.

## **Key Watersheds**

Tables 3&4-13 and -14 of the Final SEIS show the acreage of federal land in Key Watershed in the range of the spotted owl. The direction for these areas will make some forested acres unavailable for timber harvest in the short term because of guidance against road construction in Riparian Reserves and the requirement to perform watershed analysis prior to timber harvest. The effect of this will be a slower timber entry in Key Watersheds, which will protect some spotted owls and their habitat in the short term. For example, the 229,000 acres of key watershed in the matrix of the California Klamath

province will likely have a slower timber entry, which will mitigate some short term concerns of providing owl dispersal habitat.

The Oregon Western Cascades province has 216,000 acres of key watershed in the matrix which will have the same effect there.

## **15 Percent Green-tree Retention**

The standard and guideline of 15percent green-tree retention in harvest units, and the retention of old-growth in watersheds which have little remaining (Appendix B11 of the Final SEIS), will provide some benefit to spotted owls in the long term. Over a period of 100 years or so, these provisions will provide additional structural diversity to forest stands, which would improve the stand's ability to serve as owl habitat, even after harvested.

## **Other Species Protection Buffers and "Survey and Manage"**

These measures, as described in Appendices B and B11 of the Final SEIS, are also expected to retain acreage of late-successional forest throughout the range of the owl. They will likely occur in small patches and have a long term effect similar to the green-tree and old-growth retention provisions.

## **Effects of the Proposed 4(d) Rule**

The proposed "Special Emphasis Areas" of the proposed 4(d) rule for spotted owl management on nonfederal lands generally correspond with the areas which had been identified by the Spotted Owl Recovery Team. These areas are locating where federal lands are inadequate to achieve recovery of the spotted owl, and where nonfederal lands contributions would be needed. Because the proposed special emphasis areas are generally located in the same areas identified by the Recovery Team, it is expected that the rulemaking will not affect the effectiveness of Alternative 9 to provide for management of owl populations. In Oregon, some of the special emphasis areas are in areas of intermixed ownership with the BLM. By retaining owls and habitat in these intermingled lands, the proposal will augment the federal lands and alleviate concerns about owl dispersal here. Because the 4(d) proposal will be addressed in an environmental impact statement and undergo public comment and Section 7 consultation, it cannot be predicted with certainty what the final outcome would be. However, given the intent of the 4(d) proposal, it is expected to result in a nonfederal lands contribution which will complement the federal plans for owl habitat management.

# **IX. Considerations of Alternative 9 for Marbled Murrelet Management**

Alternative 9, as modified, encompasses all of the standards and guidelines proposed to FEMAT by the Marbled Murrelet Working Group. Since the Draft SEIS, the Marbled Murrelet Recovery Team identified tentative recovery goals that would be applicable as the measure of effectiveness of Alternative 9. These goals were: (1) stop the decline and stabilize the population by increasing recruitment, decreasing habitat loss, maintaining the marine environment, and decreasing mortality; (2) increase the population by maintaining suitable habitat in the short term, developing recruitment

habitat, and increasing the quality of habitat; and (3) improve or maintain the distribution of populations and habitat.

Alternative 9 includes approximately 1.3 million acres of reported murrelet nesting habitat in Late-Successional Reserves 81,000 acres in Administratively Withdrawn areas and 149,000 acres in Riparian Reserves. This 1.5 million acres of murrelet habitat protected by Alternative 9 would be added to the estimated 739,900 acres of suitable murrelet nesting habitat in Congressionally Reserved Areas. The result is 89 percent of the reported murrelet habitat on federal lands occurring inside reserves of some sort.

There are 75,000 acres of murrelet habitat in Adaptive Management Areas. The modifications made to Alternative 9 have added protection of approximately 25,000 acres of Late-Successional Reserve in the Olympic Adaptive Management Area. Another change was made for the Finney and North Coast Adaptive Management Areas, which now have direction stating that this Late-Successional Reserve acreage may be reconsidered during development of the Adaptive Management Area plans, if the proposed actions are consistent with the Endangered Species Act requirements for the marbled murrelet.

Critical habitat was recently proposed by the Fish and Wildlife Service for the marbled murrelet. The proposal consisted of the federal lands within the Late-Successional Reserves of Alternative 9.

## **X. Relationship of Alternatives to Designated Spotted Owl Critical Habitat**

The planning area includes critical habitat for the northern spotted owl, which was designated in 1992. Spotted owl critical habitat occurs as 190 individual units (Chub) distributed across the range of the owl on Federal lands. A detailed description of spotted owl critical habitat, how it was determined, and how actions may affect it is contained in the final rule, and is hereby incorporated by reference into this addendum.

While designation of critical habitat did not set numerical population goals, some units were designed to function as large contiguous blocks of habitat to support multiple pairs or clusters of reproducing spotted owls or smaller clusters in connectivity areas. Based on the information provided in the ISC Strategy, population clusters containing 15 to 20 breeding pairs were expected to persist for at least 100 years. Therefore, the impact of habitat removal on individual spotted owl sites within critical habitat is one factor in the evaluation of impacts to critical habitat. This is of particular concern where populations in large blocks of critical habitat designed to provide clusters of spotted owls are currently limited by poor habitat condition or where maintenance of reproductive spotted owls is critical to the function of Chub designated to provide stepping stones in areas of concern. In evaluating the effects to critical habitat, it is the combination of habitat loss, baseline condition, and impacts on individual sites that causes concern.

The final rule designating critical habitat for the spotted owl recognized that the analysis of the impacts of timber harvest on individual units must also consider the effects on the provincial level and on the overall range of the species. Provinces, subprovinces, and individual Chub are all part of a habitat network important to maintaining a stable and well-distributed population over the range of the

spotted owl. As described in the Recovery Plan biological principles, the loss of one or more provinces, or even a major part of a province, could lead to genetic and demographic isolation of parts of the spotted owls' range.

To assess the relationship between Alternative 9's LSR network and the Chub, three measures of comparison were utilized: 1) the degree of overlap between the two designations, 2) the total acreage provided, and 3) the distribution of the reserve units to maintain a well distributed population on Federal lands.

### **Critical Habitat Overlap with Alternative 9 Allocations**

The overlap between Alternative 9 LSRs, MLSAs, AMAs and Chub was analyzed for each CHU (see Table G-11) and summarized for each physiographic province in Table G-12.

Table G-11. Overlap between individual critical habitat units and Alternative 9 allocations

CHU Name	Total CHU Acres	Federal CHU Acres	Federal NSO Habitat Acres	Federal LSR Acres	%CHU in LSR	Federal LSR NSO Habitat Acres	%NSO Habitat in LSR	Federal AMA Acres	Federal AMA NSO Habitat Acres	Federal Acres not in Reserves (Matrix, Rip, and Admin.)
<b>California Cascades</b>										
CA-1	41,586	36,289	5,337	36,211	1.00	5,337	1.00	0	0	78
CA-2	90,634	76,759	10,784	29,680	0.39	6,083	0.56	0	0	47,079
CA-3	33,515	21,338	3,829	21,062	0.99	3,829	1.00	0	0	276
CA-4	89,809	79,334	24,544	77,440	0.98	24,348	0.99	0	0	1,894
CA-6	4,619	4,580	790	3,634	0.79	790	1.00	0	0	946
CA-7	16,871	16,635	1,026	5,647	0.34	315	0.31	0	0	10,988
CA-8	19,317	18,093	3,239	12,407	0.69	2,924	0.90	0	0	5,686
CA-9	2,133	2,094	355	2,094	1.00	355	1.00	0	0	0
Total	298,484	255,122	49,904	188,175	0.74	43,981	0.88	0	0	66,947
<b>California Klamath</b>										
CA-10	12,126	9,637	1,064	6,281	0.65	433	0.41	0	0	3,356
CA-11	3,118	2,961	552	2,882	0.97	552	1.00	0	0	79
CA-12	5,525	3,511	1,578	3,472	0.99	1,539	0.98	0	0	39
CA-13	55,375	42,331	9,841	41,069	0.97	9,563	0.99	0	0	1,262
CA-14	6,441	6,362	474	5,058	0.80	474	1.00	0	0	1,304
CA-15	66,632	63,039	18,379	60,596	0.96	18,143	0.99	1143	39	1,300
CA-16	15,333	12,844	1,580	12,647	0.98	1,580	1.00	0	0	197
CA-17	46,489	46,450	11,860	44,515	0.96	11,663	0.98	0	0	1,935
CA-18	6,273	6,273	1,856	3,671	0.59	1,817	0.98	512	0	2,090
CA-19	54,612	54,100	25,730	22,607	0.42	10,554	0.41	2407	1303	29,086
CA-20	23,389	23,389	15,493	21,460	0.92	14,427	0.93	78	0	1,851
CA-21	48,621	48,503	22,218	39,058	0.81	18,660	0.84	0	0	9,445
CA-22	13,315	13,276	5,651	7,944	0.60	3,913	0.69	0	0	5,332
CA-23	1,816	1,816	593	1,777	0.98	593	1.00	0	0	39
CA-24	52,529	52,292	24,705	34,747	0.66	17,236	0.70	12411	4506	5,134
CA-25	60,757	57,834	19,094	52,422	0.91	17,237	0.90	0	0	5,412
CA-26	2,524	2,485	868	1,579	0.64	434	0.50	0	0	906
CA-27	2,884	2,805	1,186	2,805	1.00	1,186	1.00	0	0	0
CA-28	3,988	3,949	1,422	3,634	0.92	1,343	0.94	0	0	315
CA-29	37,898	37,148	15,019	34,864	0.94	14,547	0.97	1695	394	589
CA-38	60,821	55,763	31,657	47,946	0.86	28,658	0.91	0	0	7,817
CA-39	11,568	6,905	0	2,841	0.41	0	0.00	0	0	4,064
CA-40	113,046	108,937	20,828	95,187	0.87	19,920	0.96	0	0	13,750
CA-41	4,932	3,708	0	3,314	0.89	0	0.00	0	0	394
CA-42	29,638	25,527	5,294	24,584	0.96	5,216	0.99	0	0	943
CA-43	44,737	43,751	8,535	40,753	0.93	8,378	0.98	0	0	2,998
CA-44	8,881	8,447	1,695	8,173	0.97	1,695	1.00	0	0	274
CA-45	20,342	19,553	4,778	18,963	0.97	4,463	0.93	0	0	590
CA-46	1,460	1,223	0	750	0.61	0	0.00	0	0	473
Total	815,070	764,819	251,750	645,599	0.84	214,224	0.85	18246	6242	100,974
<b>California Coast Range</b>										
CA-47	8,060	3,830	0	3,633	0.95	0	0.00	0	0	197
CA-48	1,734	1,221	0	828	0.68	0	0.00	39	0	354
CA-49	2,250	2,093	0	2,093	1.00	0	0.00	0	0	0
CA-5	3,118	3,000	788	0	0.00	0	0.00	0	0	3,000
CA-50	24,896	23,513	0	22,764	0.97	0	0.00	0	0	749
CA-51	6,479	1,973	0	1,895	0.96	0	0.00	0	0	78
CA-52	1,260	1,064	0	1,064	1.00	0	0.00	0	0	0
CA-53	2,129	787	0	552	0.70	0	0.00	0	0	235
CA-54	23,631	14,302	0	13,198	0.92	0	0.00	0	0	1,104
CA-55	19,249	15,019	0	13,716	0.91	0	0.00	0	0	1,303
CA-56	5,370	3,514	0	3,199	0.91	0	0.00	0	0	315
CA-57	947	789	0	0	0.00	0	0.00	0	0	789
CA-58	14,939	10,276	0	9,605	0.93	0	0.00	0	0	671
CA-59	985	867	0	828	0.96	0	0.00	0	0	39
CA-60	1,183	749	0	749	1.00	0	0.00	0	0	0
CA-61	3,594	3,160	0	3,121	0.99	0	0.00	0	0	39
Total	119,824	86,167	788	77,245	0.90	0	0.00	39	0	8,873
<b>California Total</b>										
	1,233,378	1,106,098	302,442	911,019	0.82	258,205	0.85	18,285	6,242	176,794
<b>Oregon West Cascades</b>										
OR-9	121,858	116,249	83,684	98,154	0.84	71,553	0.86	0	0	18,095
OR-10	89,243	88,849	48,102	50,276	0.57	29,171	0.61	0	0	38,573
OR-11	49,480	49,480	34,070	11,496	0.23	7,823	0.23	0	0	37,984
OR-12	77,734	76,591	43,358	40,984	0.54	26,165	0.60	0	0	35,607
OR-13	93,117	86,794	40,037	46,125	0.53	22,806	0.57	0	0	40,669
OR-14	110,714	100,990	58,658	72,459	0.72	44,631	0.76	0	0	28,531
OR-15	42,674	38,644	20,981	1,812	0.05	1,458	0.07	0	0	36,832
OR-16	103,199	97,590	63,325	22,128	0.23	18,181	0.29	73489	43842	1,973
OR-17	41,367	40,658	26,871	25,333	0.62	17,667	0.66	2565	1777	12,760

Table G-11. (continued)

CHU Name	Total CHU Acres	Federal CHU Acres	Federal NSO Habitat Acres	Federal LSR Acres	%CHU in LSR	Federal LSR NSO Habitat Acres	%NSO Habitat in LSR	Federal AMA Acres	Federal NSO Habitat Acres	Federal Acres not in Reserves (Matrix, Rip, and Admin.)
OR-18	107,557	107,401	54,233	61,193	0.57	31,228	0.58	0	0	46,208
OR-19	113,079	113,000	60,277	60,950	0.54	31,978	0.53	0	0	52,050
OR-20	78,018	71,181	37,983	49,801	0.70	30,989	0.82	0	0	21,380
OR-21	3,755	2,055	869	0	0.00	0	0.00	0	0	2,055
OR-22	8,102	5,374	1,461	0	0.00	0	0.00	0	0	5,374
OR-23	18,418	9,009	1,500	0	0.00	0	0.00	0	0	9,009
OR-24	10,194	6,715	1,936	0	0.00	0	0.00	0	0	6,715
OR-25	102,935	58,658	36,327	48,780	0.83	30,874	0.85	0	0	9,878
OR-26	41,614	39,840	30,160	27,035	0.68	21,345	0.71	0	0	12,805
OR-27	19,759	14,226	8,102	0	0.00	0	0.00	0	0	14,226
OR-28	121,068	120,871	71,189	62,057	0.51	37,868	0.53	0	0	58,814
OR-29	97,196	95,935	61,785	27,946	0.29	21,425	0.35	44631	25459	23,358
OR-30	70,425	70,425	39,839	46,206	0.66	27,037	0.68	0	0	24,219
OR-34	66,637	46,239	23,281	34,387	0.74	18,934	0.81	0	0	11,852
OR-35	69,114	67,022	27,066	45,766	0.68	21,973	0.81	0	0	21,256
OR-36	10,350	6,559	3,992	0	0.00	0	0.00	0	0	6,559
OR-37	117,623	103,238	50,748	68,855	0.67	31,420	0.62	0	0	34,383
OR-38	59,882	40,944	13,950	19,998	0.49	6,639	0.48	0	0	20,946
Total	1,845,112	1,674,537	943,785	921,741	0.55	551,165	0.58	120,685	71,078	632,111
Oregon Coast Range										
OR-39	18,255	7,422	3,001	6,991	0.94	2,923	0.97	236	39	195
OR-40	8,489	7,503	2,646	5,095	0.68	2,449	0.93	2408	197	0
OR-41	102,381	84,633	28,382	78,946	0.93	27,751	0.98	5214	631	473
OR-42	3,037	2,762	0	2,211	0.80	0	0.00	551	0	0
OR-43	52,013	43,714	18,338	42,257	0.97	18,143	0.99	1064	156	393
OR-44	48,501	28,061	5,965	27,076	0.96	5,808	0.97	788	118	197
OR-45	17,152	6,873	2,685	6,599	0.96	2,568	0.96	235	117	39
OR-46	65,812	56,960	27,077	53,210	0.93	25,024	0.92	0	0	3,750
OR-47	73,599	43,278	20,394	41,740	0.96	19,922	0.98	0	0	1,538
OR-48	110,925	87,245	40,401	83,810	0.96	39,810	0.99	0	0	3,435
OR-49	68,149	59,847	28,857	57,875	0.97	28,187	0.98	315	118	1,657
OR-50	87,944	72,608	38,023	69,690	0.96	36,919	0.97	0	0	2,918
OR-51	4,580	3,790	1,185	1,263	0.33	474	0.40	0	0	2,527
OR-52	72,065	34,585	16,088	32,769	0.95	15,536	0.97	0	0	1,816
OR-53	98,986	50,593	21,385	41,148	0.81	19,568	0.92	0	0	9,445
OR-54	10,077	8,456	4,110	7,786	0.92	3,952	0.96	0	0	670
OR-55	52,284	40,981	28,417	39,838	0.97	27,707	0.98	0	0	1,143
OR-56	9,760	6,163	3,437	4,386	0.71	2,529	0.74	0	0	1,777
OR-57	15,215	10,392	5,967	8,536	0.82	5,454	0.91	0	0	1,856
OR-58	73,097	51,036	26,724	50,524	0.99	26,488	0.99	0	0	512
OR-59	6,954	4,780	2,647	4,702	0.98	2,608	0.99	0	0	78
OR-60	111,912	72,771	34,430	57,398	0.79	27,593	0.80	0	0	15,373
OR-61	3,753	2,607	1,620	2,489	0.95	1,541	0.95	0	0	118
Total	1,114,940	787,060	361,779	726,339	0.92	342,954	0.95	10,811	1,376	49,910
Oregon East Cascades										
OR-1	48,982	48,923	31,377	20,784	0.42	12,683	0.40	0	0	28,139
OR-2	31,532	31,257	16,994	6,082	0.19	4,149	0.24	0	0	25,175
OR-3	22,444	21,300	7,745	20,986	0.99	7,667	0.99	0	0	314
OR-4	18,726	18,570	7,390	14,701	0.79	7,193	0.97	0	0	3,869
OR-5	8,571	8,177	2,844	7,350	0.90	2,648	0.93	0	0	827
OR-6	14,816	14,816	6,637	14,777	1.00	6,637	1.00	0	0	39
OR-7	31,542	31,542	9,485	31,147	0.99	9,485	1.00	0	0	395
OR-8	37,893	37,735	18,453	24,659	0.65	13,555	0.73	0	0	13,076
Total	214,486	212,320	100,925	140,486	0.66	64,017	0.63	0	0	71,834
Oregon Klamath										
OR-31	2,369	1,737	1,185	0	0.00	0	0.00	0	0	1,737
OR-32	114,000	71,265	35,653	45,615	0.64	23,717	0.67	0	0	25,650
OR-33	5,765	5,529	3,674	5,293	0.96	3,477	0.95	0	0	236
OR-62	100,011	49,562	27,470	37,234	0.75	20,238	0.74	0	0	12,328
OR-63	10,945	8,534	4,900	0	0.00	0	0.00	0	0	8,534
OR-64	7,585	5,531	3,833	0	0.00	0	0.00	0	0	5,531
OR-65	91,497	86,322	55,578	56,211	0.65	33,523	0.60	236	118	29,875
OR-66	8,176	8,098	4,939	8,059	1.00	4,939	1.00	0	0	39
OR-67	102,443	97,189	50,316	74,354	0.77	37,040	0.74	551	355	22,284
OR-68	12,758	12,758	8,493	11,339	0.89	7,823	0.92	39	0	1,380
OR-69	26,785	26,785	12,447	23,668	0.88	11,263	0.90	39	0	3,078
OR-70	36,782	36,310	17,623	30,986	0.85	14,861	0.84	0	0	5,324
OR-71	53,872	53,519	16,994	52,138	0.97	16,323	0.96	0	0	1,381
OR-72	79,791	57,655	29,005	48,574	0.84	23,555	0.81	1498	907	7,583
OR-73	11,247	11,247	6,276	9,198	0.82	5,290	0.84	591	0	1,458
OR-74	31,773	30,509	13,553	2,999	0.10	2,724	0.20	27510	10829	0



Table G-11. (continued)

CHU Name	Total CHU Acres	Federal CHU Acres	Federal NSO Habitat Acres	Federal LSR Acres	%CHU In LSR	Federal LSR NSO Habitat Acres	%NSO Habitat in LSR	Federal AMA Acres	Federal AMA NSO Habitat Acres	Federal Acres not in Reserves (Matrix, Rip, and Admin.)
OR-75	22,130	19,326	5,809	0	0.00	0	0.00	18260	5454	1,066
OR-76	62,161	56,787	22,642	40,351	0.71	17,705	0.78	9046	4543	7,390
Total	780,090	638,663	320,390	446,019	0.70	222,478	0.69	57,770	22,206	134,874
<b>Oregon Total</b>										
	3,954,628	3,312,580	1,726,879	2,234,585	0.67	1,180,614	0.68	189,266	94,560	888,729
<b>Washington East Cascades</b>										
WA-1	19,589	19,589	9,479	12,719	0.65	5,885	0.62	0	0	6,870
WA-2	37,464	37,464	10,591	26,598	0.71	7,588	0.72	0	0	10,866
WA-3	9,992	9,992	1,538	9,638	0.96	1,499	0.97	0	0	354
WA-4	11,140	10,982	1,737	7,073	0.64	1,264	0.73	0	0	3,909
WA-5	19,836	19,836	4,424	17,112	0.86	3,675	0.83	0	0	2,724
WA-6	101,019	93,751	54,861	75,657	0.81	44,233	0.81	0	0	18,094
WA-7	36,376	36,102	22,003	28,606	0.79	17,584	0.80	0	0	7,496
WA-8	7,100	5,721	3,511	4,934	0.66	2,880	0.82	0	0	787
WA-9	23,973	17,218	4,500	10,664	0.62	3,515	0.78	0	0	6,554
WA-10	5,248	4,775	1,736	4,106	0.86	1,500	0.86	0	0	669
WA-11	11,920	8,684	2,248	5,725	0.66	1,223	0.54	0	0	2,959
WA-12	129,405	116,919	61,661	87,437	0.75	54,116	0.88	0	0	29,482
WA-13	85,560	55,008	30,865	9,160	0.17	4,343	0.14	45,219	26,128	629
WA-14	95,362	62,477	39,560	54,464	0.87	34,744	0.88	1,379	748	6,634
WA-15	15,681	14,377	8,650	13,117	0.91	7,665	0.89	0	0	1,260
WA-16	8,882	8,843	2,406	6,358	0.72	1,894	0.79	0	0	2,485
WA-17	19,593	19,593	6,435	12,326	0.63	4,858	0.75	0	0	7,267
WA-18	10,063	9,826	4,181	8,174	0.83	3,276	0.78	0	0	1,652
WA-42	37,067	35,645	26,084	12,803	0.36	11,263	0.43	0	0	22,842
Total	685,270	586,802	296,470	406,671	0.69	213,005	0.72	46,598	26,876	133,533
<b>Washington West Cascades</b>										
WA-19	42,787	42,432	14,653	38,730	0.91	13,790	0.94	197	79	3,505
WA-20	9,873	9,755	4,147	9,441	0.97	4,069	0.98	0	0	314
WA-21	85,720	84,221	39,124	78,266	0.93	36,838	0.94	78	0	5,877
WA-22	22,046	21,967	11,696	20,865	0.95	11,263	0.96	0	0	1,102
WA-23	18,725	18,725	8,495	17,820	0.95	8,377	0.99	0	0	905
WA-24	92,385	92,109	42,377	86,736	0.94	41,430	0.98	5,373	947	0
WA-25	13,748	13,630	4,542	13,158	0.97	4,227	0.93	0	0	472
WA-26	15,951	15,675	8,687	13,192	0.84	6,952	0.80	0	0	2,483
WA-27	42,515	42,319	16,276	39,283	0.93	15,411	0.95	236	78	2,800
WA-28	25,087	25,087	10,981	24,734	0.99	10,785	0.98	0	0	353
WA-29	34,520	33,533	15,996	23,033	0.69	10,706	0.67	5,292	3,278	5,208
WA-30	54,444	45,987	17,974	28,411	0.62	12,092	0.67	1,657	552	15,919
WA-31	5,959	5,920	3,631	5,528	0.93	3,514	0.97	0	0	392
WA-32	19,506	18,678	14,260	16,039	0.86	12,487	0.88	235	157	2,404
WA-33	33,539	18,481	10,900	14,339	0.78	8,493	0.78	3,867	2,368	275
WA-34	142,764	103,231	46,673	76,525	0.74	32,926	0.71	4,145	2,922	22,561
WA-35	51,418	33,197	15,373	31,739	0.96	15,098	0.98	0	0	1,458
WA-36	75,636	72,519	36,516	44,267	0.61	22,252	0.61	0	0	28,252
WA-37	69,346	68,874	37,382	37,863	0.55	22,964	0.61	20,588	8,851	10,423
WA-38	170,015	168,278	100,131	133,066	0.79	83,652	0.84	78	39	35,134
WA-39	9,634	8,689	3,909	0	0.00	0	0.00	0	0	8,689
WA-40	12,006	10,467	4,026	10,152	0.97	3,750	0.93	0	0	315
WA-41	173,847	169,421	88,426	88,073	0.52	47,951	0.54	0	0	81,348
Total	1,221,471	1,123,195	556,175	851,260	0.76	429,027	0.77	41,746	19,271	230,189
<b>Olympic Peninsula</b>										
WA-43	6,633	5,963	3,317	5,094	0.85	3,317	1.00	869	0	0
WA-44	4,615	3,710	2,645	3,671	0.99	2,606	0.99	0	0	39
WA-45	24,854	22,603	6,479	14,423	0.64	6,361	0.98	8180	118	0
WA-46	354	315	158	315	1.00	158	1.00	0	0	0
WA-47	52,486	52,250	29,366	49,489	0.95	29,210	0.99	2644	117	117
WA-48	9,279	8,253	5,924	7,701	0.93	5,924	1.00	0	0	552
WA-49	69,207	67,746	25,928	54,233	0.80	23,994	0.93	12213	1461	1,300
WA-50	38,810	38,652	19,287	38,061	0.98	19,129	0.99	394	0	197
WA-51	144,680	140,017	79,184	132,477	0.95	77,844	0.98	6675	907	865
WA-52	47,825	47,392	26,878	46,605	0.98	26,603	0.99	433	39	354
Total	398,743	386,901	199,166	352,069	0.91	195,146	0.98	31408	2642	3,424
<b>Washington Lowlands</b>										
WA-53	62,309	59,819	0	0	0.00	0	0.00	0	0	59,819
<b>Washington Total</b>										
	2,305,704	2,097,118	1,052,031	1,610,220	0.77	837,398	0.80	119,972	49,009	366,926
<b>Northern Spotted Owl Range Total</b>										
	7,493,710	6,515,796	3,081,352	4,755,824	0.73	2,276,217	0.74	327,523	149,911	1,432,449

Table G-12. Percent of CHU acreage in Allocations of Alternative 9.

Province	% in LSR	%in AMA	% in MLSA	% in Matrix
Washington East Cascades	69	8	2	11 (64,548 acres)
Washington West Cascades	76	4	NA	20 (23,407 acres)
Olympic Peninsula	91	9	NA	NA
Washington Lowlands	0	NA	NA	NA
Oregon Klamath	70	9	NA	11 (35,242 acres)
Oregon Eastern Cascades	66	NA	NA	34 (72,189 acres)
Oregon Western Cascades	55	7	NA	38 (636,324 acres)
Oregon Coast Range	92	1	NA	7 (49,910 acres)
California Cascades	74	0	0	26 (66,947 acres)
California Klamath	84	2	NA	14 (100,974 acres)
California Coast Range	90	0	NA	10 (8,912 acres)

NA - this allocation not applicable to this province

The acreage of CHU which would fall in matrix or AMA would be considered for timber management under the standards and guidelines of Alternative 9. There would be approximately 1.0 million acres of critical habitat in the matrix. For some AMAs, there is specific direction to maintain spotted owl home ranges as Reserved Pair Areas (Snoqualmie, North Coast, and Finney), and the acreage of these home ranges would be within the values shown for AMAs, but is expected to be retained.

Although the overlap of Chub and LSRs was not 100 percent, many areas adjacent to Chub were protected in LSRs. This would compensate for some of the disparity in overlap between individual Chub and LSRs.

### Total acreage comparison of critical habitat and Alternative 9

Approximately 6.5 million acres of Federal land are within the Chub, versus 7.5 million acres in the Alternative 9 LSR/MLSA network. There is 3.1 million acres of suitable spotted owl habitat in critical habitat, compared to 3.2 million acres in Alternative 9 LSRs. In addition to suitable habitat in LSRs, Alternative 9 includes 313,000 acres of suitable habitat in Administratively Withdrawn and approximately 740,600 acres in Riparian Reserves. In a net comparison, Alternative 9 would protect 1 million more acres of suitable spotted owl habitat than the critical habitat designation currently includes.

### Comparison of Distribution of Reserved Areas

A range-wide comparison of the LSR/MLSA network versus the CHU network shows the two to be providing a similar distribution of habitat. Alternative 9 would provide several larger LSRs than what is provided in the critical habitat designation and also would reserve acreage not known to contain spotted owl activity centers (thus, possibly allowing a broader distribution in the future). However, the CHU distribution appears to be somewhat more evenly spaced across the landscape than the LSR network under Alternative 9. There is also some difference in the distribution and location of habitat which would be reserved. This is noticeable in the Oregon Western Cascades province and the

Oregon Klamath province, where smaller Chub were identified to provide connectivity between large owl clusters. These Chub will be considered for possible designation as "Connectivity Blocks" in the revised BLM Resource Management Plans, which would allow these areas to be managed compatibly with their need for owl dispersal (see Appendix B9 of Final SEIS). Also, some CHU acreage falls within the area proposed by BLM to be managed as "southern general forest management area" which would retain at least a minimum level of dispersal habitat.

Based on these three comparisons, the LSR network of the preferred alternative would be a reasonable match with the spotted owl critical habitat units for many areas, but does result in CHU acreage in the Matrix and in AMAs. Activities in all critical habitat, whether within or outside of LSRs, would continue to be assessed as to their effect on the essential elements of the habitat and Section 7 consultation will occur, when appropriate. The U.S. Fish and Wildlife Service has indicated that the current designation of critical habitat will be reviewed after the Record of Decision for this SEIS.

## **XI. Ability of the Alternatives to Provide Monitoring, Research and Coordinated Management Direction**

All of the alternatives presented in the Final SEIS would be implemented with coordinated management, monitoring and research (Chapter 2 and Appendix E). The Regional Ecosystem Office will have lead responsibility to coordinate these efforts. As a member of the Regional Ecosystem Office, the Fish and Wildlife Service will participate in this coordinated effort and will assure that adequate monitoring and research of listed species is conducted.

The implementation structure also includes provisions for the adaptive management of federal forest ecosystems. This would address the Strategic Principle described in the Recovery Plan to implement a plan which can develop and respond to new information.

## **XII. Conclusion**

The clarifications and additional information presented in this addendum do not change the previous conclusion that Alternative 9 may affect northern spotted owls and marbled murrelets. For spotted owls this is due to the location of many owl home ranges in the matrix and AMA, where they may be considered for timber harvest. In the case of marbled murrelets, a recovery plan has not been developed and so the expected needs to achieve recovery are not known. All occupied murrelet sites on federal land are protected from timber harvest, but it is unknown how much of the unoccupied habitat may be desirable to speed the recovery of marbled murrelet.

Alternative 9 would not conflict with the proposed marbled murrelet critical habitat.

The outcome of the 4(d) proposal is intended to be complementary to the federal land allocations for spotted owl recovery and will be analyzed in that context.

# Appendix H

## SAT Report

# Appendix H

## Scientific Analysis Team Report

This appendix consists of the report *Viability Assessments and Management Considerations for Species Associated with Late-Successional and Old-Growth Forests of the Pacific Northwest*. It was prepared by the Scientific Analysis Team (SAT) to respond to questions and concerns regarding the 1992 *Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests* and was published in March 1993. It is frequently referred to in this SEIS as "the SAT Report."

Many members of the Scientific Analysis Team were later involved with the Forest Ecosystem Management Assessment Team (FEMAT or Assessment Team). The Assessment Team's work drew from a variety of previous efforts, including the SAT Report. The SAT Report is included here as an appendix because of its close association with the FEMAT Report, and because of its wide distribution in March 1993, it is an uncirculated appendix.

### Organization of the SAT Report

THE SCIENTIFIC ANALYSIS TEAM'S REPORT CONSISTS OF SIX CHAPTERS:

1. Introduction, Synthesis of the Scientific Analysis Team Report, and Observations
2. Effects of Exempting Thirteen Bureau of Land Management Timber Sales from Requirements of the Endangered Species Act on Viability Assessments in the Final Environmental Impact Statement
3. Effects of Bureau of Land Management Implementing Preferred Alternatives in Draft Resource Management Plans on the Viability Assessments in the Final Environmental Impact Statement
4. New Information on the Northern Spotted Owl
5. Risk Analysis of Species in Old-Growth Forests of the Pacific Northwest: Viability Assessment and Mitigation Measures in National Forests
6. Requirements for Successful Implementation

The report also contains a list of the scientists and analysts who prepared the report, and an Annotated Bibliography (Appendix 4-B), and is bound separately from the SEIS.

To receive a copy of *Viability Assessments and Management Considerations for Species Associated with Late-Successional and Old-Growth Forests of the Pacific Northwest* send a request in writing to:

SAT Report Request  
Interagency SEIS Team  
P. O. Box 3623  
Portland, OR 97208-3623



# Appendix I

## **Monitoring and Evaluation Plan**

# Appendix I

## Monitoring and Evaluation Plan

This appendix consists of the Monitoring and Evaluation Plan that will be used in conjunction with the selected alternative.

### Monitoring and Evaluation Plan

Monitoring is an important component in implementing ecosystem management and the selected alternative of this SEIS. Due to the broad scope of ecosystem management, the monitoring effort emphasizes coordination and cooperation between various federal, state, and local agencies; American Indian tribes; and other interests.

### Conceptual Framework

#### Scope

One of the challenges in designing a monitoring network is accommodating a variety of geographic scales (e.g., region, province, watershed, and site) and land ownerships in a manner that allows localized information to be compiled and placed in a broader, regional context.

Monitoring at any scale should:

- Detect changes in ecological systems from both individual and cumulative management actions and natural events
- Provide a basis for natural resource policy decisions.
- Provide standardized data
- Compile information systematically
- Link overall information management strategies for consistent implementation
- Ensure prompt analysis and application of data in the adaptive management process
- Distribute results in a timely manner

Relationship to Adaptive Management Process, Research, and Watershed Analysis

#### Adaptive Management

Adaptive management is based on monitoring that is sufficiently sensitive to detect relevant ecological changes. In addition, the success of adaptive management depends on the accuracy and credibility of information obtained through inventories and monitoring.

#### Research

Close coordination and interaction between monitoring and research also are essential for the adaptive management process to succeed. Data obtained through systematic and statistically valid monitoring can be used by scientists to develop research hypotheses related to priority issues. Conversely, the results obtained through research can be used to further refine the protocols and strategies used to monitor and evaluate the effectiveness of the selected alternative.



## **Watershed Analysis**

Watershed analysis is a technically rigorous procedure with the purpose of developing and documenting a scientifically-based understanding of the ecological structure, functions, processes, and interactions occurring within a watershed (see Appendix B6, Aquatic Conservation Strategy). Watershed analysis is one of the principal analyses on which decisions implementing the ecosystem management objectives of this SEIS will be made. Information from watershed analysis will be used in developing monitoring strategies and objectives.

Specific to monitoring and evaluation, the results and findings from watershed analysis are used to reveal the most useful indicators for monitoring environmental change, detect magnitude and duration of changes in conditions, formulate and test hypotheses about the causes of the changes, understand these causes and predict impacts, and manage the ecosystem for desired outcomes. Watershed analysis may result in additional monitoring questions. Watershed analysis will provide information about patterns and processes within a watershed and provide information for monitoring at that scale.

## **Components of the Monitoring and Evaluation Plan**

The following framework focuses on the purposes for monitoring and proposes units of measure for the monitoring process.

### **Types of Monitoring**

Three basic types of monitoring (implementation, effectiveness, and validation) will be applied to meet the objectives of the selected alternative and evaluate the efficacy of management practices. These three types of monitoring encompass a spectrum of monitoring, although some agencies use different terminology (e.g., trend, program evaluation).

### **Evaluation Questions**

Each basic monitoring question can be expressed in more definite terms that will lead to more specific and directed measurements, as explained in the following text.

#### **1. Implementation Monitoring**

Implementation monitoring determines if the standards and guidelines were followed.

Implementation monitoring asks: Does the project and/or activity follow the direction in its management plan? Generally, implementation monitoring answers this question by determining if the standards and guidelines were correctly applied and followed.

Implementation monitoring considers three strategies: aquatic, terrestrial, and social and economic. The components of these strategies include:

- Land allocations with specific boundaries
- Standards and guidelines for managing the land allocations, including Key Watersheds
- Watershed analysis

- Social and economic effects
- An adaptive management process, or learning framework

**Evaluation Question:** Are the aquatic, terrestrial, and social and economic resources being managed according to the standards and guidelines? To address this question, implementation monitoring is organized around land allocations, including types of activities allowed and projected conditions within each allocation. For the most part, this approach focuses on areas broader than specific project sites and restricts evaluation questions to the fundamental elements and components of the selected alternative. This broader scope is consistent with the ecosystem approach.

Key items which require specific monitoring include standards and guidelines of:

- Late-Successional Reserves
- Riparian Reserves
- Matrix
- Adaptive Management Areas
- Key Watersheds
- Watershed analysis

## **Late-Successional Reserves**

Key items to monitor include:

- Timber harvests consistent with standards and guidelines and with Regional Ecosystem Office review requirements.
- Other management activities in the Late-Successional Reserve consistent with the standards and guidelines (e.g., prescribed fire and resulting emissions)
- Late-Successional Reserve plan completed
- Management activities consistent with the Late-Successional Reserve plan?

## **Riparian Reserves**

Key items to monitor include:

- Width and integrity of Riparian Reserves (i.e., did the conditions that existed before management activities change in ways that are not in accordance with the standards and guidelines?)
- Completion of watershed analysis prior to management activities where required
- Management activities in Riparian Reserves consistent with standards and guidelines

## **Matrix**

Key items to be monitored include:

- Number and distribution of green trees left in harvested areas
- Snags; coarse woody debris
- Completion of watershed analysis prior to harvesting late-successional stands in watersheds with less than 15 percent late-successional forest remaining
- Prescribed burning and resulting emissions

## **Adaptive Management Areas**

In Adaptive Management Areas, implementation evaluations of the standards and guidelines are required, including the requirement that an Adaptive Management Area plan be developed that establishes future desired conditions.

Key items to monitor in Adaptive Management Areas include:

- Completion of an Adaptive Management Area plan
- Measurement of conditions that have been agreed to in the Adaptive Management Area plan

## Key Watersheds

Key items to monitor include:

- \* Watershed analysis prior to management activities
- \* Presence and timing of activities, including restoration projects
- \* No new roads in roadless areas
- \* No net increase in roads

In evaluating these questions, it is necessary to consider the roles Key Watersheds play in the Aquatic Conservation Strategy: refugia for at-risk stocks of anadromous salmonids and resident fish species, and sources of high quality water.

## Watershed Analysis

Key item to monitor:

- Presence and timing of watershed analysis

## PARTICIPATION

Key items to monitor include:

- Involvement of multiple agencies, the public, and others in planning, implementing, and monitoring watershed analysis
- Opportunities to share information (applicable to all parties such as agencies, publics, communities)
- Identification of clear expectations and responsibilities
- Active partnerships

## 2. Effectiveness Monitoring

Effectiveness monitoring takes a step further by evaluating if application of the management plan achieved the desired goals, and if the standards and guidelines met the objectives of the selected alternative. Success may be measured against the standard of desired future condition (sometimes referred to as reference condition). For example: Does the management of this resource maintain or restore the habitat for late-successional associated species?

Effectiveness monitoring will be undertaken at a variety of reference sites in geographically and ecologically similar areas. These sites will be located on a number of different scales, and will require the assistance of research statisticians to design an appropriate sampling regime.

## Aquatic Ecosystems

Evaluation Question: Is the ecological health of the aquatic ecosystems recovering or sufficiently maintained to support stable and well-distributed populations of fish species and stocks.

While many factors influence aquatic ecosystem integrity, the variables to be monitored will include critical habitat requirements identified by research and watershed analysis, and represent a range of values indicative of a healthy system. Variables may be surrogates representing other physical, biological,

and/or ecological processes. Variables must be quantifiable and measurable in a repeatable way. A range of values for the variables measured will often result from the spatial and temporal variability found in a particular geographic area. Variables must describe conditions for functional, healthy aquatic ecosystems.

A core set of inventory elements will be collected in all streams. Core inventory elements are the minimum set of variables to be collected at all scales. In all cases, standardized measurement and reporting protocols will be determined and are essential for consistency.

The health of aquatic and riparian ecosystems is dependent on water quality. Effectiveness monitoring that assesses the physical, chemical, and biological integrity of aquatic ecosystems is necessary to ensure conditions which will maintain water quality and support aquatic organisms. The Clean Water Act directs that states adopt water quality standards and criteria as necessary to protect designated beneficial uses. The standards and criteria of the Clean Water Act, which apply to both federal and nonfederal lands, will be used in effectiveness monitoring to determine if water quality and the health of aquatic systems are being maintained.

An emphasis of the monitoring of aquatic ecosystems will be to determine if actions are meeting the Aquatic Conservation Strategy objectives. The Aquatic Conservation Strategy emphasizes watershed health and maintenance of natural physical and biological integrity of aquatic and riparian habitats and watersheds. As such, monitoring will include aquatic, riparian, and watershed conditions and the processes in a watershed to determine if they achieve Aquatic Conservation Strategy Objectives. The wide range of natural variation and complex interaction of individual stream habitat components (e.g., numbers of pools, pieces of large wood, percent fine sediment, and water temperature) makes it difficult to establish relevant quantitative management directives for stream habitat components. Because of individual stream and watershed diversity and differences, it is also difficult to quantify direct linkages among processes and functions outside the stream channel to in-channel conditions and biological components. Watershed-specific objectives, based on watershed analysis, are necessary to accommodate the natural variation among individual streams and watersheds.

Key monitoring items include:

- Pool frequency and quality (width, depth, and cover)
- Percent fine sediment
- Coarse woody debris (size and quantity)
- Water temperature
- Width to depth ratio
- Bank stability and lower bank angle

## **Biological Diversity, Late-Successional and Old-Growth Forest Ecosystems**

The Purpose and Need of this SEIS includes, "... to take an ecosystem approach to forest management; maintain and restore biological diversity as it applies to late-successional and old-growth forest ecosystems." This purpose includes forest processes as well as forest species.

Evaluation questions:

- Is the forest ecosystem functioning as a productive and sustainable ecological unit?
- Is the use of prescribed fire or fire suppression maintaining the natural processes of the forest ecosystem?
- Are desired habitat conditions for the northern spotted owl and the marbled murrelet maintained where adequate, and restored where inadequate?
- Are habitat conditions for late-successional forest associated species maintained where adequate, and restored where inadequate?

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- Are desired habitat conditions for at-risk fish stocks maintained where adequate, and restored where inadequate?
- Is a functional interacting, late-successional ecosystem maintained where adequate, and restored where inadequate?
- Did silvicultural treatments benefit the creation and maintenance of late-successional conditions?
- Will the overall conditions of the watersheds and provinces continue to be productive over the long term?

To address these questions chemical, physical, and biological indicators may need to be evaluated. A variety of variables can be monitored within each of these categories, and those selected will address the objectives of specific monitoring plans. The Clean Air Act directs federal agencies to monitor air pollution emissions from prescribed burning on federal lands in order to manage prescribed fire operations, verify air quality models, and assess air quality impacts.

Indicators for assessing the condition and trends include:

- Land use data
- Seral development and shifts of forest plant communities
- Locations and concentrations of plant diseases and insect infestations
- Amount of fuels by category
- Air quality
- Riparian and stream habitat condition by stream class
- Water quality

Key monitoring items include:

- Size, location, spatial distribution, species composition, and development of late-successional and old-growth forests
- Retention of snags and coarse woody debris
- Abundance and diversity of species associated with late-successional forest communities
- Species presence (to calculate species richness i.e., numbers and diversity)
- Percent of land area affected by exotic species
- Structure and composition
- Ecological processes
- Ecosystem functions
- Air Quality

## Use Levels of Natural Resources

Evaluation Question: Are predictable levels of timber and nontimber resources available and being produced?

Key items to monitor include:

- Timber harvest levels
- Special forest products (e.g., mushrooms, boughs, and ferns)
- Livestock grazing
- Mineral extraction
- Recreation
- Scenic quality (including air quality)
- Commercial fishing

## Rural Economies and Communities

Evaluation Question: Are local communities and economies experiencing positive or negative changes that may be associated with federal forest management?

Key items to monitor include:

- Demographics
- Employment (timber, recreation, forest products, fishing, mining, and grazing)
- Government revenues (Forest Service and BLM receipts)
- Facilities and infrastructure
- Social service burden (welfare, poverty, aid to dependent children, and food stamps)
- Federal assistance programs (loans and grants to state, counties, and communities)
- Business trends (cycles, interest rates, and business openings and closings)
- Taxes (property, sales, and business)

Information for these items are collected by local, county, state, and federal agencies. This information will be used through the adaptive management process in future planning efforts. Because of the complexity of the relationships and the number of factors involved in these items, it is not possible to set specific or definite thresholds or values that would cause a reevaluation of the goals and overall strategy of the selected alternative.

## American Indians and Their Culture

Evaluation Questions:

- For those trust resources identified in treaties with American Indians, what are their conditions and trends?
- Are sites of religious and cultural heritage adequately protected?
- 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?

Key monitoring items include:

- Condition and trends of the American Indian trust resources
- Effectiveness of the coordination or liaison to assure protection of religious or cultural heritage sites
- Adequacy of access to resources and to the vicinity of religious or cultural sites

### 3. Validation Monitoring

Validation monitoring determines if a cause and effect relationship exists between management activities and the indicators or resource being managed. Validation monitoring asks: Are the underlying management assumptions correct? Do the maintained or restored habitat conditions support stable and well-distributed populations of late-successional associated species?

Among the key set of assumptions that need to be validated is the relationships between habitat and populations. This requires a strong mix of inventory, monitoring, and research. Where knowledge gaps exist, research and/or inventory may be needed. Hypotheses can be proposed and tested through a combination of research and monitoring.

There is one primary evaluation question with regard to the northern spotted owl, the marbled murrelet, and at-risk fish stocks: Is the population stable or increasing?

Key items to monitor include:

- Northern spotted owls by physiographic province
- Marbled murrelets within their known nesting range
- Populations of fish species and stocks that are listed under the Endangered Species Act or are considered sensitive or at risk by land management agencies
- Rare species

The relationship between levels of management intervention and the health and maintenance of late-successional and old-growth ecosystems

## Special Monitoring Issues and Situations

### Natural and Induced Environmental Stressors

A preliminary step in designing any monitoring scheme is development of a premonitoring assessment or baseline data to define the natural and management-induced environmental stressors which could act as outside influences on the outcome of monitoring. Examples of natural stressors are large-scale disease cycles, climatic cycles, and hot, expansive fires.

Management-induced stressors include habitat simplification; reduced habitat connectivity; high fire frequency resulting from fire suppression activities; forest diseases resulting from increased abundance of susceptible host species, loss of natural controls, and introduced pests; acid precipitation; introduced competitor species; and changes in predator-prey dynamics.

### Rare and Declining Species

Monitoring will address rare and declining species.

Rare species are plants or animals classified as:

- Federally threatened or endangered species
- Federally proposed threatened or endangered species
- Federal Candidate Species
- State listed species
- Forest Service sensitive species
- BLM assessment species
- Other infrequently encountered species not considered by any agency or group as endangered or threatened and classified in the FEMAT Report as rare

Monitoring for the type, number, size, and condition of special habitats over time will provide a good indication of the potential health of special habitat-dependent species. Although all special habitat areas do not support rare species, there is overwhelming evidence that special habitat types are closely related to the continued existence of certain rare species.

Since many rare species are associated with riparian habitats, the Riparian Reserve system offers potential protection. However, some rare species often are closely associated with or restricted to specific habitats that are outside Riparian Reserves.

It is also important to recognize that many species' habitat requirements vary considerably with age or size of the individual, and with the season. In some cases, more than one special habitat must be available for the species to successfully complete its life cycle.

While a stable special habitat type through time is not proof that a special habitat-dependent species population is stable, a decrease in a special habitat type does indicate increased risk to that species population.

Widely-dispersed species not associated with special habitats usually are associated with as yet undefined habitats within the general upland environment. Species with this type of distribution are difficult to

assess and monitor. Efforts will be made to identify key habitat components of existing species locations.

A monitoring program for rare and declining species will help to:

- Identify perceived present and future threats
- Increase future possibilities of discovering new locations
- Track their status and trends over time
- Ensure that, in times of limited agency resources, priority attention will be given to species most at risk

Inventoried locations and special habitats of rare species will be registered in the multiagency GIS data base. This information will be shared with the State Natural Heritage Program.

## **Steps to Develop an Interagency Monitoring Network**

An interagency monitoring network will be developed and implemented using a common design framework and common indicators (or environmental measurements). This effort will build on existing agency research and monitoring efforts, and will be accomplished through the Research and Monitoring Committee established by the Memorandum of Understanding for Forest Ecosystem Management.

Specific indicators will be identified within each monitoring component or activity, along with protocols and methodologies for their measurement and quality assurance. A required level of detectability, data quality objectives, and precision will be established.

Based on these details, a design framework will be established that permits resulting data to be integrated through statistical or modeling approaches to provide quantitative inputs to the adaptive management process. The design framework will accommodate multiple scales and provide a consistent process for establishing monitoring sites, frequency of sampling, scale of sampling, and specific techniques for analysis and reporting.

This approach will ensure that consistent collection, integration, and evaluation of data occur among projects, watersheds, provinces, agencies, and over long time periods.

The following four-step process will be used to establish such a monitoring network:

1. Identify information needs and develop them into quantitative monitoring objectives.
2. Survey and evaluate existing monitoring activities relevant to monitoring objectives, focusing on both the indicators and design components.
3. Develop a comprehensive monitoring strategy including statistical designs, indicators, quality assurance plan, and sampling protocols.
4. Conduct peer review and gather public and agency input and comment.



# Appendix J

## Technical Information

# Appendix J

## Technical Information

This appendix consists of a variety of documents and working papers that provide technical information and support to the analysis in this Final Supplemental Environmental Impact Statement.

### Organization of This Appendix

This appendix consists of the following documents and working papers:

1. *Estimation of Vital Rates of the Northern Spotted Owl* by K.P. Burnham, D.R. Anderson and G.C. White. This 44 page paper consists of an analysis of spotted owl demographic data collected at study areas throughout the owl's range. The results include the rate of population change for the individual study areas, as well as for the population as a whole.
2. *Results of Additional Species Analysis*. A presentation of the results of an analysis, of more than 427 species, that was conducted by the Species Analysis Team. This paper includes:
  - a discussion of the process used for this analysis,
  - a list of all species that were reviewed (with rationale for analysis),
  - a summary report on the effects of mitigations for all species, and
  - a species-by-species write-up of the basis for the FEMAT rating and possible mitigations considered.
3. *Additional analysis and discussion*. Additional analysis and discussion of spotted owl and marbled murrelet issues, including preliminary information on modeling.

Because of the substantial volume of this material (over 700 pages), Parts 2 and 3 are an uncirculated portion of this appendix and are available on request. To receive a copy of Parts 2 and 3 of Appendix J, send a request in writing to:

Appendix J Request  
Interagency SEIS Team  
P. O. Box 3623  
Portland, OR 97208-3623



# Estimation of Vital Rates of the Northern Spotted Owl

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National Biological Survey  
Colorado Cooperative Fish & Wildlife Research Unit  
Fort Collins, CO 80523

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Department of Fishery & Wildlife Biology  
Colorado State University  
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January 12, 1994

**Abstract:** The Northern Spotted Owl is a Threatened subspecies (under the Endangered Species Act) and important decisions about management of its habitat are pending; therefore, we used all available data to estimate vital rates of this population to assess the current status of the subspecies. We used likelihood and information-theoretic methods to analyze "demographic" data from 1985–93 on the Northern Spotted Owl from 11 large study areas. The analyses (i.e., model selection, assessment of model fit, parameter estimation, estimates of precision or uncertainty, and hypothesis tests) were completed largely during a 12-day session in Fort Collins, Colorado in December, 1993, involved approximately 50 professional people and dealt with 103 capture-recapture data sets. This interim document reports on the demography of this Threatened subspecies; a much more detailed report will be prepared for formal publication by the various biologists who have collected the data.

No survey techniques exist to estimate the size of the owl population each year; thus, methods were used to estimate the rate of population change, based on estimates of the average vital rates (i.e., average age-specific survival probabilities  $\bar{\phi}_x$ ; and average age-specific fecundity rates  $\bar{b}_x$ , where  $x$  is age). In addition to direct examination of estimated annual survival probabilities, we used these estimated average rates to estimate a parameter  $\lambda$ , the finite rate of population change. Estimation and proper interpretation of  $\lambda$  can be used to answer the question, "Have the resident, territorial population of females replaced themselves?" Stated another way, the question can be phrased, "Given a population with estimated vital rates (the age-specific  $\bar{\phi}_x$  and  $\bar{b}_x$ , where  $x$  denotes age), what is the rate of population change if these rates remained constant over an appropriately long time period?"

The first important result is that annual survival probabilities for adult female owls have declined significantly in recent years for both the 6 long-term (defined as more than 6 years of banding data) and the 5 short-term study areas. This is an important finding and must be weighed heavily in decisions concerning forest management policy in the future.

The second important result is that the population of resident, territorial females is declining at a significant rate (*significant* both biologically and statistically). Using data from the 11 study areas and making an empirical adjustment to the estimated juvenile survival probability from the capture-recapture data, required due to undetected surviving emigrants, we get the estimate  $\hat{\lambda} = 0.9548$  ( $se = 0.017$ ). The 95% confidence interval on  $\lambda$  was (0.916 to 0.993). Finally, a  $t$ -test of the null hypothesis that  $\lambda \geq 1$  vs. the one-sided alternative hypothesis that  $\lambda < 1$  was significant ( $t_{10} = 2.61$ ,  $P = 0.017$ ). We restrict our interpretation of  $\hat{\lambda}$  to the specific years of study; we do not intend that  $\hat{\lambda}$  be used to project the size, or rate of change, of the population into the distant future (say, 10–100 years). The inference concerning declining populations of resident, territorial female owls applies to the entire population, not just the banded birds on the 11 study areas.

The third important result is that the population loss rate is accelerating. This conclusion stems from the fact that  $\lambda$  is estimated from time-averages of the vital rates (the time-average survival probabilities  $\bar{\phi}_x$  and time-average fecundity rates  $\bar{b}_x$ , where  $x$  is age). However, it is clear that adult females have a significant, negative time trend in annual survival rate. Therefore, we conclude that the rate of population decline is accelerating. This accelerating decline was not anticipated by the Interagency Scientific Committee in 1990 or other groups trying to deal with forest planning and management. If the next 100 years are thought to be "highly risky" for the owl, then these findings concerning accelerated declines offer no comfort for the long-term viability for this subspecies.

The Northern Spotted Owl has been listed as Threatened for 3.5 years, but the decline of resident, territorial females is accelerating throughout the range of the owl.

## INTRODUCTION

Controversy over forestry practices in the Pacific Northwest dates back to the mid-1930s and led President Roosevelt to commission several cabinet level officials to prepare a special report on the issue (National Resources Committee 1938). Controversy over forest management practices continued after WW II and the effect of overharvest of old-growth forest resources on the Northern Spotted Owl was highlighted in 1972-73 by the U. S. Fish and Wildlife Service (Meslow 1993). Since that time, the situation has grown steadily worse, management options have narrowed, litigation has increased and dozens of special committees, task forces, teams and committees have been commissioned (see Meslow 1993 for a review). The subspecies was listed as Threatened by the Fish and Wildlife Service in 1990 (Anderson et al. 1990), just as the Interagency Scientific Committee (ISC) (Thomas et al. 1990) completed a *Conservation Plan* for forest management and protection of the owl.

Since the mid-1980s a number of "demographic" study areas were established within the range of the owl. Capture-recapture methods were employed on each study area to estimate age- and sex-specific annual survival probabilities ( $\phi$ ) and field methods were developed to estimate age-specific fecundity (the number of female young fledged per territorial female of age  $x$ ,  $b_x$ ). Anderson and Burnham (1992) presented an analysis of data from 5 of these large study areas. By the fall of 1993, 14 such demographic study areas had at least 4 years of capture-recapture and fecundity data.

This summary of scientific information was produced as the result of a letter from 14 scientists, concerned over the viability of the Northern Spotted Owl and forest management policy, to the Secretaries of the U. S. Departments of Agriculture and Interior (Appendix A). In response to this letter, we were directed to coordinate a major analysis of these data (i.e., 103 capture-recapture data sets, plus over 5,000 fecundity records) within a very short time frame.

The material presented here is the result of an intensive series of educational and data analysis sessions held in Fort Collins, CO during December 10-21, 1993 (detailed schedule is provided in Appendix B). Intensive efforts were made by biologists prior to December 10 to check and verify the basic data for each study area (i.e., the capture history and fecundity data). This was the first of several quality control steps made to insure the integrity of the analysis and inference procedures to be employed. Approximately 23 biologists working on the demographic study areas spent the first 2 days working with several analysts (see Appendix C for lists of people involved) to summarize the fecundity data, agree on consistent definitions, and prepare the data for statistical analysis.

An intensive educational "short course" (agenda appears in Appendix B) was offered the following 2.5 days to the 23 biologists and 17 scientists and managers concerned in some way with the issues (see Appendix C). These training sessions introduced the theory and application of the analysis methods. This was a hands-on

session with computer intensive methods for the analysis of capture-recapture data; however, no spotted owl data were used in these training sessions. The training short course on analysis theory and philosophy was presented to increase the number of professional people that are fluent in these technical areas.

This group of about 40 people were joined mid-day Wednesday, December 15 by a total of 7 analysts (excluding ourselves, see Appendix C) for a half-day session to discuss and agree on a protocol for the objective analysis of these data. Several leaders in the field of capture-recapture methods were invited to assist in the data analyses (none were selected from the Pacific Northwest). Thus, the stage was set for an afternoon debate on the analysis philosophy, theory and methods, prior to starting the analysis of the actual data. Areas of disagreement were formalized as hypotheses and decisions were to be based on the analysis of the empirical data. The paradigm followed was to encourage argument and debate about statistical methods, likelihood models, assumptions, hypothesis tests, and other technical issues. Once these technical points were decided *a priori*, debate regarding the value of a particular estimate or test result was ruled "unfair." The 3 hour session on the protocol for the data analyses was videotaped, allowing participants to recheck the details of the analyses protocol if necessary.

Field biologists briefed the analysts on data gathering aspects and on the validity of the assumptions required during a 3 hour session on the evening of December 15 (Appendix B). The invited scientists and managers left by the morning of December 16 and the field biologists and analysts were left to conduct the analysis of the data *according to the protocol developed the previous day*. Biologists were closely involved in the data analysis. A special 4 hour session on the estimation of the finite rate of population change ( $\lambda$ ) was held the evening of December 16 (see Appendix B) and this included still additional specialists. Data analyses were essentially complete by the afternoon of December 21.

The various field biologists are currently working on a formal manuscript presenting the full details on methodology, estimation of parameters and inference from these data. This manuscript will be submitted for publication in a peer-reviewed journal and will represent an important document. Here, we provide a summary of the key results from the 12-day session involving some 50 people and the analyses of the extensive set of demographic data. Time limitations necessitate only a brief review of the general analysis methods used and we will mainly restrict this report to the statistical inferences justified by the data.

Generally, we provide results for only 11 of the 14 demographic data sets available; the two study areas in northern California conducted by the timber industry were not made available and the industry sponsored study on the Wenatchee NF was withdrawn on the final day of the 12-day session. Thus, none of the 3 study areas sponsored by the timber industry were available for use in this report. The 11 study areas where data were available are shown in Fig. 1; these are large study areas (Table 1), several are contiguous with others, and have as few as 4 years to as many as 9 years of demographic data (Table 2). The sample size for adults (i.e., non-juvenile birds) was over 6,500 releases (Table 2).

## OBJECTIVES

Our objective was to conduct a rigorous and objective analysis of the empirical data available and provide the statistical inferences that were justified. We emphasized a science-based, data analysis agenda during the 12-day session in December, 1993 (see Appendix D). Many quality controls were established, data were formally certified prior to analysis, *a priori* analysis protocols were determined and followed. Several people with special expertise in capture-recapture and population dynamics theory were invited to supervise the analyses, and every effort was made to assure the integrity of the data analyses and inferences. Considerable published, formal theory and computer software

## DEMOGRAPHIC STUDY AREAS

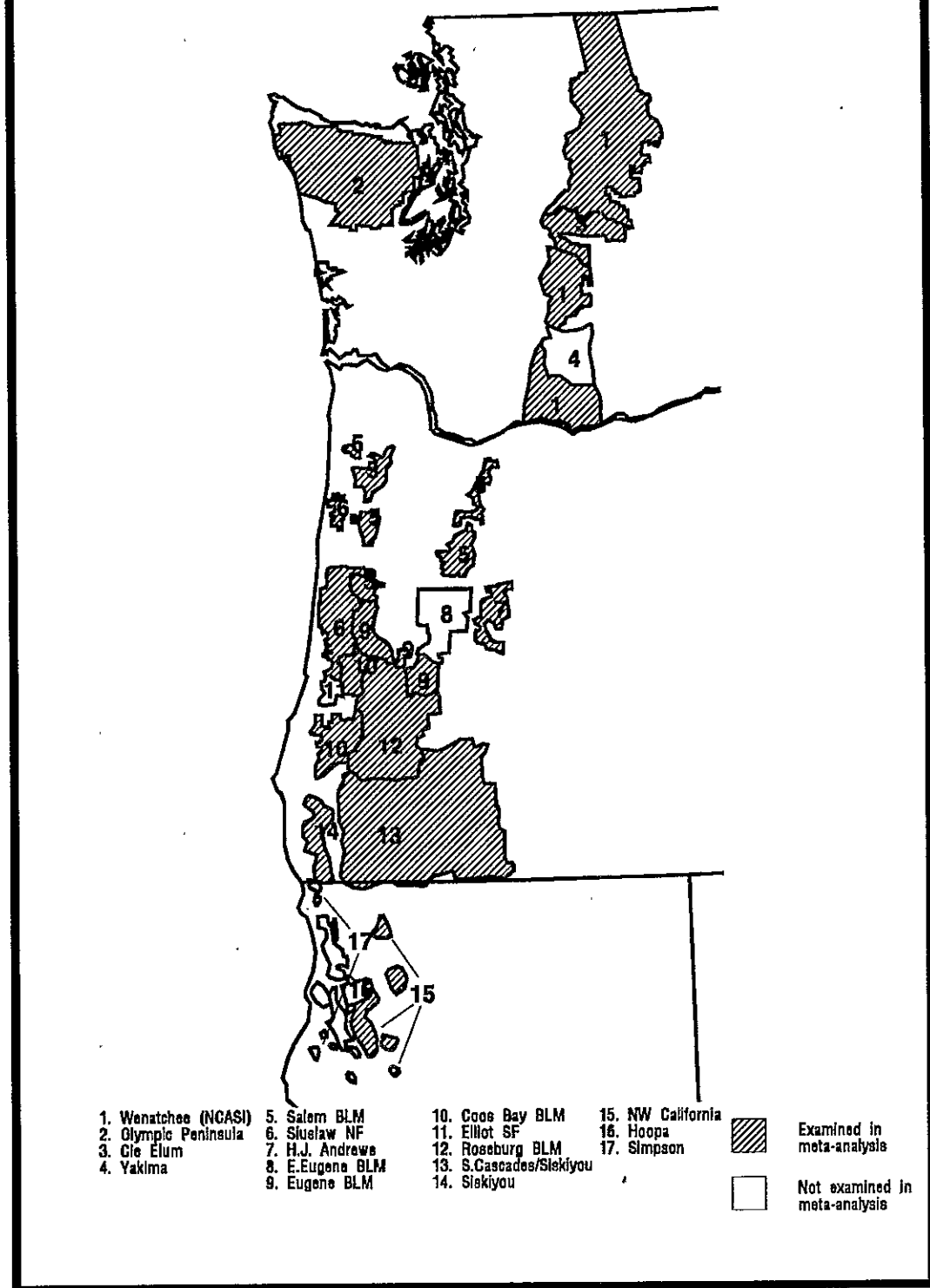


Fig. 1. Map showing the range of the Northern Spotted Owl and the location of the 11 demographic study areas where data were made available for analysis. The study areas tend to be quite large and several are contiguous. (Appendix E gives additional maps).

exist to guide the sophisticated analysis of these data. Direct inferences were limited to the years where data were available. Because of the number, large size, and wide distribution of the study areas, we assume the statistical inferences extend beyond these specific study areas to the range of this subspecies.

We were asked repeatedly to provide insights to managers and policy people as to "*What do these results and inferences mean to managers? or Is Option 9 viable, given the results from these 11 studies?*" While we were initially willing to attempt these insights and generalizations, we have decided these subjects lie beyond our expertise. Thus, this report remains as a "science only" document with few of our interpretations expressed. We feel that the 40 people that attended the 2.5 day short course will be able to understand and interpret these results and that the total decision process is best served if people remain well within their areas of expertise.

Table 1. Summary information on the 11 demographic study areas for the Northern Spotted Owl.

Study area and location	Acronym	Approximate size (sq. mi)	Years of banding
Northwest California (Willow Creek)	CAL	4,000	1985 – 1993
Roseburg (Oregon)	RSB	1,700	1985 – 1993
Southern Cascades and Siskiyou Mountains (Oregon)	SCS	4,050	1985 – 1993
Salem BLM (Oregon)	SAL	1,484	1986 – 1993
H.J. Andrews (Oregon)	HJA	655	1987 – 1993
Olympic NF and Olympic National Park (Washington)	OLY	625	1987 – 1993
Cle Elum (Wenatchee NF, Washington)	CLE	696	1989 – 1993
Eugene BLM (Oregon)	EUG	550	1989 – 1993
Coos Bay (Oregon)	COO	735	1990 – 1993
Siuslaw NF (Oregon)	SIU	1,026	1990 – 1993
Siskiyou NF (Oregon)	SIS	625	1990 – 1993

## METHODS

### Capture – Recapture Data

Most of the data analysis effort focused on the spotted owl capture-recapture (CR) data sets from 11 studies (see Tables 1 and 2). The basis for these statistical analyses is firmly rooted in standard likelihood theory and methods, and in current philosophy of parametric statistical analysis of large data sets based on explicit scientific-statistical models for the data. There is a very large literature on the relevant general statistical and CR theory; to thoroughly understand the analyses underlying the results given herein a person would have to be familiar with this literature. Good introductions to the relevant general statistical theory are McCullagh and Nelder (1989) and Mood, Graybill and Boes (1974). For basic background on CR see Lebreton et al. (1992), and also Burnham et al. (1987) and Pollock et al. (1990).

Capture-recapture of spotted owls allows estimation of annual survival probabilities. The basic data are the set of capture histories for each individual owl caught and banded. These data are partitioned by age and sex of the owls, and of course by study area. Given sufficient sample sizes, one can estimate (in principle)



Table 2. Summary information on sampling effort for the 11 demographic study areas of the Northern Spotted Owl; number banded is the number of distinct birds caught and banded, whereas sample size =  $R_1 + R_2 + \dots + R_{k-1}$  in the capture-recapture  $m$ -array (Lebreton et al. 1992).

Study area	First year	Number of years	Adults male	Adults female	Juveniles banded	Subadults banded	Adult sample size male	Adult sample size female
CAL	1985	9	99	91	274	84	369	257
RSB	1985	9	262	214	429	117	692	520
SCS	1985	9	560	491	680	189	1032	823
SAL	1986	8	74	68	101	17	151	129
HJA	1987	7	123	109	226	57	294	286
OLY	1987	7	127	129	249	43	295	278
CLE	1989	5	60	56	186	30	131	96
EUG	1989	5	49	52	59	16	117	98
COO	1990	4	99	93	136	49	178	157
SIU	1990	4	82	72	72	25	135	112
SIS	1990	4	38	31	31	10	75	55
totals:			1573	1406	2443	637	3469	2811

yearly survival probabilities (roughly from 15 June one year to the next 15 June) for males and females, for juvenile, subadult and adult age classes. Estimation is based on well-developed sampling models for use with the CR data (Cormack 1964, Jolly 1965, Seber 1965, and much subsequent literature on the CJS model). Analysis followed the strategy of Lebreton et al. (1992) (see also Burnham and Anderson 1992) of starting with a general "global" model that allowed survival and capture probability parameters to vary by all these factors (i.e., time, sex, and age) and then seeking a parsimonious model that included only those structural parameters supported by the data. The first issue addressed, prior to model fitting, was the adequacy of the fit of these spotted owl data to the general assumptions of CR.

As adapted to owls, from Burnham et al. (1987), requisite assumptions are listed here. Assumptions 1–7 relate to study planning, field procedures, data collection, and generality of the desired inferences:

1. Study areas are representative of the habitat of interest.
2. Within a study area, banded owls are representative of that area.
3. Capture, handling, banding and release do not affect survival.
4. The number released on occasion  $i$  is known exactly.
5. There is no band loss, and no bands are misread on capture or resighting.
6. All releases and captures of owls occur in relatively brief time intervals, and recaptured birds are released immediately.
7. Any unknown emigration out of a study area is permanent.

Assumptions 8–9 relate to the stochastic component of the CR models:

8. The fate of each individual owl, after any known release, is independent of the fate of any other owl.
9. Data sets for the various ages, sexes and areas are statistically independent.

Assumptions 10 – 11 relate to model structure:

10. Statistical analyses of the sample data are based on an appropriate model.
11. All owls of an identifiable class (e.g., age, sex) have the same survival and capture probabilities, by study area (parameter homogeneity).

These assumptions were discussed extensively during the 12-day session in December. Regarding #1, a substantial part of the spotted owl habitat in Oregon, Washington and Northern California is part of some study area. Study areas tend to either be representative or perhaps tend to be better habitat. The group as a whole felt assumptions #2–5 were met. As is typical in CR studies, #6 is violated in that a capture occasion actually occurs over a period of time. In these studies an occasion takes about 2 months; this does not bias survival estimates provided the occasion length is always the same and the temporal distribution of effort is the same on all occasions. This was felt to be met.

Most CR studies are on unconfined populations, hence marked individuals can leave the area where capture effort is expended. The classical Cormack-Jolly-Seber (CJS) model allows such emigration if it is permanent. Temporary emigration means a banded bird is alive but off the study area during one or more capture occasions. For these studies, emigration means the banded owl is not in anyone's study area, hence is not at risk of capture. All CR methods only estimate apparent survival probability,  $\phi = S \cdot (1 - E)$ ;  $E$  = probability of emigrating = probability that the owl is alive at the end of the year (to which the true survival probability,  $S$ , applies) but has left the study area, and hence is no longer at risk of capture.

Adults are only banded when territorial; emigration of territorial adults seems to be relatively rare, hence it is not considered a problem and therefore we take  $\phi \equiv S$  for adults. Some banded juveniles no doubt emigrated (such movements are only emigration for CR purposes if the banded juvenile is outside all study areas, not just the study area where it was banded). Juvenile emigration is a problem, but does not violate CR analysis assumptions (if emigration is permanent).

Assumption #8 may be violated for mated pairs or siblings. Such violation does not bias parameter estimates, rather it biases estimated sampling variances based on assumed independence of individual fates. As noted by Lebreton et al. (1992), and further studied by Anderson, et al. (in press), methods exist to correctly estimate sampling variances if assumption #8 fails. Assumption #9 is reasonable for the owl data.

The focus of the data analysis and model selection is to find the most parsimonious model (as a special case of the global model) that is an acceptable fit to the data. Hence assumption #10 is not an issue. Parameter heterogeneity surely occurs to some extent, which violates assumption #11. This issue has been much studied for CR data, and when average capture probabilities and survival probabilities are high, violation of assumption #11 causes little or no bias in estimated survival probabilities. Finally, classical statistical goodness-of-fit tests exist to test whether the CR data meet some of the assumptions (#3, 7, 8, 10, 11) for the CJS model.

### Model Notation

The basic model for open-populations CR is the CJS model (Lebreton et al. 1992) which has only time specific survival ( $\phi$ ) and capture probabilities ( $p$ ). For  $k$  capture occasions, the parameters in the CJS model are the survival probabilities between occasion  $i$  and  $i+1$ , denoted  $\phi_i$ ,  $i=1, 2, \dots, k-1$ , and the capture probabilities at occasions  $i$ , denoted  $p_i$ ,  $i=2, 3, \dots, k$  ( $p_1$  cannot be estimated). This model is

denoted as  $\{\phi_t, p_t\}$  to show that the survival and capture parameters in the model are allowed to vary arbitrarily over time (occasions), and do not depend on any other possible explanatory variables nor are they in any way restricted. A similar notation for other models exists (Lebreton et al. 1992) when age, study area, or sex is a possible factor in the appropriate model for the CR data sets; that notation was used to identify models examined during data analysis. (Note that CR uses the designation "capture" probability to mean any of physical capture, recapture or visual resighting of tagged animals when tags can be read at a distance).

The general (global) model for adult only data sets with both sexes is denoted as  $\{\phi_{s*t}, p_{s*t}\}$  (or equivalently as  $\{\phi_{t*s}, p_{t*s}\}$ ). This model would be fit jointly to the male and female data from one study area. It allows unrestricted variation in survival and capture probabilities over time for males and females. For analysis of the CR data from just one sex but jointly for multiple study areas (hence multiple groups ( $g$ ) of adult-class CR data), the general model is denoted  $\{\phi_{g*t}, p_{g*t}\}$ . The general (global) model for adult data, both sexes and multiple groups, is denoted  $\{\phi_{s*g*t}, p_{s*g*t}\}$ . The resulting model is equivalent to a separate CJS model for each combination of sex and study area, i.e., separate  $\{\phi_t, p_t\}$  models for each sex in each group.

Finally, age as a factor can be added to the CR model. The pure age model is denoted  $\{\phi_a, p_a\}$ : parameters vary by age only. This model only makes sense to use with data from releases of banded birds of known age. For  $k$  capture occasions, this model has survival probabilities for ages 1, 2, ...,  $k-1$  ( $\phi_1, \phi_2, \dots, \phi_{k-1}$ ). The model for the capture data from the releases of banded known-aged birds at only occasion  $i$  is a CJS model because then age and time are confounded in subsequent capture data. Given releases of juveniles of one sex in one area at each of occasions 1, 2, ...,  $k-1$  the subsequent capture data correspond to a general age-and time effects model denoted  $\{\phi_{a*t}, p_{a*t}\}$ ; this notation denotes a model with full age and time variation in the survival and capture probabilities. This model is developed from a series of independent CJS models, one for each annual cohort of new, known-age releases of just banded birds. The most general model considered for a study area is  $\{\phi_{s*a*t}, p_{s*a*t}\}$ , i.e., separate  $\{\phi_{a*t}, p_{a*t}\}$  models for males and females.

### Goodness-of-Fit Tests

A chi-squared goodness-of-fit test was computed for model  $\{\phi_{a*t}, p_{a*t}\}$  for each sex and each area. This test is composed of two major parts: TESTS 2 and 3 (Burnham et al. 1987, see also Lebreton 1992). These tests are constructed as the sum of independent contingency table  $\chi^2$  statistics, based mostly on a series of  $2 \times 2$  tables. Each such table tests somewhat different aspects of fit (Burnham et al. 1987). With sparse data in a table, Fisher's exact test was used. If the goodness-of-fit test rejects, then some assumption is violated. In this case the many components of these tests were scrutinized to understand why rejection occurred and what, if anything, can and should be done about the matter, such as use of a quasi-likelihood variance inflation (Burnham et al. 1987, Lebreton et al. 1992, Anderson, et al. in press).

Once a suitable global model is established, further data analysis involves fitting many candidate models (using maximum likelihood theory) and model selection based on Akaike's Information Criterion (AIC) (Akaike 1973). Corresponding to every possible probability sampling model for the data is a "likelihood" function, given the data, of the parameters in the model, denoted  $\mathcal{L}(\phi, p)$ . Optimal parameter estimation was done using maximum likelihood estimation (MLE). Also, from the likelihood functions, the

estimated sampling variances and covariances of the MLEs can be computed. When a simpler model is a special case of a more complex model, a likelihood ratio test (LRT) can be used to test if the simpler model is adequate, or if the more complex model is needed to fit the data. For example, model  $\{\phi_t, p_t\}$  is a special case of model  $\{\phi_{s+t}, p_{s+t}\}$ . Comparing these two models with a LRT, tests the null hypothesis of no sex effects for any of the survival or capture parameters, i.e., the time specific survival and capture probabilities are equal for both sexes. Likelihood inference is the foundation of statistical theory and the foundation of our CR data analysis methods.

Hypothesis testing is one approach to model selection, but it is too limited. We used AIC for model selection (Akaike 1973 and 1985, Sakamoto et al. 1986, Lebreton et al. 1992, Burnham and Anderson 1992). AIC is an extension of likelihood theory:

$$\text{AIC} = -2 \cdot \log_e(\mathcal{L}(\hat{\phi}, \hat{p})) + 2 \cdot K,$$

where the log-likelihood is evaluated at the MLEs under a given model and  $K$  is the number of unique parameters estimated under that model. The AIC is computed for each of the candidate models that might describe the structural information in the data and the best model to use is the one that produces the minimum AIC value. This is an objective model selection procedure. The selected model (and its associated parameter MLEs) constitute the best inference from the data, although any model within about 2 AIC units of the best is also informative about the data. As with likelihood inference, AIC has a deep, sound theory. Recent studies support the use of AIC in CR data analysis (Burnham et al. in press, Burnham et al. in review, Anderson et al. in press).

### More Model Nomenclature

The full range of models that need to be considered with large numbers of CR data sets is far more extensive than those models denoted above. Numerous special cases need to be considered, all of which are restrictions on the global model (e.g., models  $\{\phi_{s+t}, p_{a+t}\}$ ,  $\{\phi_s, p_{a+t}\}$ ,  $\{\phi_{a2+s}, p_{g+T}\}$ ). This notation is introduced in Lebreton et al. (1992) for CR, and is based on standard ideas of model designation in general linear models (McCullagh and Nelder 1989), which includes ANOVA. All model fitting was done with program SURGE (Lebreton et al. 1992) which by default re-parameterizes the likelihood function via the logit-link (McCullagh and Nelder 1989) for all  $\phi$  and  $p$  parameters:  $\text{logit}(\phi) = \log_e(\phi/(1-\phi))$ . This transforms the fitting problem from a bounded one (parameters all between 0 and 1) to an unbounded problem. This allows full application of standard linear model theory in the CR context, and upon back transformation, the MLEs are always between 0 and 1.

In this context,  $\phi_{s+t}$  denotes the model

$$\text{logit}(\phi) = \beta_0 + \text{sex effect} + \text{time effects},$$

whereas  $\phi_{s*t}$  denotes the model

$$\text{logit}(\phi) = \beta_0 + \text{sex effect} + \text{time effects} + \text{all sex-by-time interactions}.$$

Thus  $\{\phi_{s+t}, p_{s+t}\}$  is just model  $\{\phi_{s*t}, p_{s*t}\}$  restricted to have no interactions between sex and time effects (on a logit scale). Model  $\{\phi_s, p_{a+t}\}$  denotes only sex effects on survival, and additive age and time effects on capture probabilities.

We often want to test for linear trends in survival probabilities. This is a restriction on the “ $t$ ” models:  $T$ , rather than  $t$ . Thus  $\phi_T$  denotes that

$$\text{logit}(\phi_i) = \beta_0 + \beta_1 \cdot i,$$

hence a model for a linear time trend on survival (on a logit scale). The model  $\{\phi_{s+T}, p_{s+T}\}$  is one of linear time trends in survival with a common slope, different intercepts (as per classical analysis of covariance), and capture probabilities show linear time trends with both different intercepts and different slopes.

The notation “ $a$ ” for age models denotes no restrictions on the number of age classes. Restricted models are denoted as  $a2$ ,  $a3$ ,  $a4$ , and so forth, to denote only 2, 3, or 4 age classes, respectively. The case of survival probabilities being different only for juveniles vs. an adult age class, and constant capture probabilities, is denoted  $\{\phi_{a2}, p\}$ ; if there is one year of subadult effects on survival and capture probabilities, the model is denoted as  $\{\phi_{a3}, p_{a2}\}$ . In several of the age models, the capture probabilities were age-specific only for birds initially banded as juveniles, this model aspect was denoted as, for example,  $a3'$ ,  $a4'$ . Consider model  $\{\phi_{a2+s+T}, p_{s+t}\}$  applied to all the data from one area. This model has survival probabilities for two age classes (juvenile and adults) plus an additive sex effect on survival and an additive linear time trend effect. Capture probabilities have additive sex and general time effects. Such a model is easily fit with program SURGE.

The CR data from each individual study were thoroughly analyzed as described above, independent of any other areas. Also several “meta” analyses were done, as the data sets were partitioned into short-and long-term studies. The global model for a meta-analysis is  $\{\phi_{a*s*g*t}, p_{a*s*g*t}\}$ . This model can have hundreds of parameters. No new ideas are introduced in doing a meta-analysis, but meta-analysis models are much more difficult because so much data are being dealt with. The advantage of such overall analyses is that we learn of common effects and trends in all the data sets. A meta-analysis is more powerful than the separate analyses. (The meta-analysis on the short term studies includes the Wenatchee Demographic Study [N.E. Washington] data because those analyses were done, and could not be re-done, when the investigators withdrew their WDS data. They did, however, agree that the WDS data could remain in the meta-analysis).

To summarize, the methodology underlying the CR data analyses is based on standard statistical likelihood theory and current ideas of general linear models methods. Moreover, the models for the CR data are all founded on the CJS model as further developed in the last 30 years (e.g., Lebreton et al. 1992). All the analyses were rigorously done, with much attention paid to necessary assumptions, possible biases, and concern for uncertainty in the results as measured through estimated standard errors, and AIC values of selected best models vs. models not selected. The model selection procedure (AIC) is objective; selection is based on function minimization (in particular, selection never involves looking at the parameter estimates from the fitted models). Given a model, maximum likelihood methods provide asymptotically optimal ways to make point estimates and measure precision (sampling variances, covariances, confidence intervals and coefficients of variation). Maximum likelihood methods are asymptotically normal, fully efficient and unbiased. Likelihood theory provides a rigorous basis for performing tests of hypotheses.

## Fecundity Data

The field studies involved finding and monitoring territorial females to determine their breeding success (young fledged). The basic data are, for each territorial female (hence for potential breeders), the number of offspring that were fledged. This is one of the numbers 0, 1, or 2, rarely 3. A 50:50 sex ratio is assumed at fledging. The parameter of interest, recruitment rate  $b$ , is just a mean (number of young fledged per territorial female), hence statistical analysis is quite straightforward. Despite the integer nature of the data, sample sizes are sufficient to justify ANOVA inference methods. Hence, data analysis was done using SAS PROC MEANS, GLM and VARCOMP (SAS Institute 1985). PROC MEANS was used to produce means and standard errors by various categories (e.g., female age, year, study area, age and study, etc.). PROC GLM, with area and time effects random, was used to test for significance of effects and interactions. PROC VARCOMP using option MIVQUE was used to estimate variance components from the fecundity rates,  $b$ , over years, areas and for interactions.

## Radio-Tracking Data

In recent years some juveniles have had radios attached so that their movements and fate could be determined. The goal was to better estimate the survival probability of juveniles. The only such data available at this workshop were from the RSB and OLY areas, from birds radioed in the summers of 1991 and 1992. Each bird must be monitored until the next spring to obtain information on survival probability. Unfortunately radios are attached not at fledging but 3 to 6 weeks later, so estimated survival probabilities that can be computed are not for the same year's period of time that corresponds to the probabilities computable from CR data. There were also lots of censored records (presumable radio failure, or quick, long movements of birds that prevented tracking). The available data were analyzed by standard methods (White and Garrot 1990), such as the Kaplan-Meier method and PROC LIFETEST in SAS (SAS Institute 1985).

It became evident during the workshop that these radio-tracking data could also be used to directly estimate juvenile emigration, based on counts of surviving juveniles in the next spring. Emigration is defined here as: the bird moves out of its original study area, where it would be at risk of capture, is not captured by any other researchers, and survives its first year. The radio-tracking data includes counts of survivors in and out of the specific study areas, and includes information on whether the emigrated birds were captured in other areas.

Let  $n$  be total number of survivors in spring, year  $i+1$ , of birds radioed in summer, year  $i$ . Then  $n = n_s + n_{ed} + n_{en}$ , where  $n_s$  = number that stayed in their natal study area and survived the year,  $n_{ed}$  = number that emigrated off the natal area, survived the year, and were detected by the routine CR study methods (with no aid from telemetry), and  $n_{en}$  = number that emigrated off the natal area, survived the year, and were not detected by the routine CR study methods. Then the emigration estimate is

$$\hat{E} = \frac{n_{en}}{n}, \quad \text{with} \quad \text{se}(\hat{E}) = \sqrt{\frac{\hat{E}(1 - \hat{E})}{n}}.$$

This estimator is robust to some problems that would bias an estimator of annual juvenile survival probability based on the radio-tracking data. Birds are radioed (on average) about a month after fledging and their survival is not always monitored until mid-June. Thus, a survival estimate covers a shorter time period than the requisite 1 year needed to match with adult survival probability in population dynamics

evaluation. This emigration estimate is based only on survivors to spring; assuming all emigration has occurred by then, and that by spring, subsequent mortality of birds is the same for emigrants and non-emigrants, then it is not required that the survivors be monitored clear to mid-June.

Let  $S_s$  and  $S_e$  represent the annual survival probability of juveniles that stay and those that emigrate, respectively. Then true juvenile survival probability is

$$S_J = S_s(1 - E) + S_e E = \phi_J + S_e E.$$

Without reliable, large samples of radio-tracking data on annual survival probability of juveniles (residents vs. emigrants), to estimate  $E$  from these data it is necessary to assume  $S_s = S_e \equiv S_J$ . Then

$$S_J = \phi_J + S_J E, \quad \text{hence we get } \hat{S}_J = \frac{\hat{\phi}_J}{1 - \hat{E}}.$$

To compute  $se(\hat{\lambda})$  we need the variances and covariance below (derived by the delta-method):

$$[\text{var}(\hat{S}_J)]^2 = (S_J)^2 [\text{cv}(\hat{\phi}_J)]^2 + [\text{cv}(1 - \hat{E})]^2,$$

$$\text{cov}(\hat{S}_J, \hat{\phi}_A) = \frac{\text{cov}(\hat{\phi}_J, \hat{\phi}_A)}{1 - \hat{E}}.$$

#### Population Rate of Change, $\lambda$

There is a large literature on population dynamics that is relevant to interpreting survival and fecundity rates as regards whether populations would be (generally) increasing, stationary, or decreasing at any set of rates. The Leslie and Lefkovich projection matrices theory are relevant here (see Lande 1988, Noon and Biles 1990, Noon and Sauer 1992). A certain complicated function of the vital rates for females (age-specific survival and fecundity), usually denoted as  $\lambda$ , measures finite population rate of change over the time period to which the vital rates apply. These rates may be averages that apply to that time period. This  $\lambda$  may be solved for from well known functions (Caswell 1989). From Noon and Biles (1990)  $\lambda$  is found as the solution to the equation

$$1 = b_1 \left[ \frac{S_J}{\lambda} \right] + b_2 \left[ \frac{S_J S_1}{\lambda^2} \right] + b_A \left[ \frac{S_J S_1 S_2}{\lambda^3} \right] \left[ \frac{1}{1 - S_A/\lambda} \right].$$

This model is for the case of survival probabilities being different for juveniles, subadults 1 and 2 years old, and adults; and recruitment rates being different for subadults 1 and 2 and adults. From earlier analyses (and in these analyses) of spotted owl data we found at most statistically different survival probabilities for juveniles, 1 year olds, and adults, hence the equation was used as

$$1 = \hat{b}_1 \left[ \frac{\hat{S}_J}{\lambda} \right] + \hat{b}_2 \left[ \frac{\hat{S}_J \hat{S}_{SA}}{\lambda^2} \right] + \hat{b}_A \left[ \frac{\hat{S}_J \hat{S}_{SA} \hat{S}_A}{\lambda^3} \right] \left[ \frac{1}{1 - \hat{S}_A/\lambda} \right].$$

The solution for  $\lambda$  gives  $\hat{\lambda}$ , which being an estimate has a sampling standard error. If subadult and adult survival probabilities are the same, one uses in the above  $\hat{S}_{SA} = \hat{S}_A$ . Similarly, one uses  $\hat{b}_1 = \hat{b}_2$  if only a common subadult estimated recruitment rate is available.

SAS code (SAS Institute 1985) was written to find  $\hat{\lambda}$  and to compute the  $se(\hat{\lambda})$  given the inputs of point estimates of vital rates and their estimated sampling standard errors and correlations. The  $se(\hat{\lambda})$  must be computed numerically on a case-by-case basis, based on a standard delta-method approach, such as is described by Alvarez-Buylla and Slatkin (1994). Our own previous investigations of the adequacy of this approximate variance are confirmed by the findings of Alvarez-Buylla and Slatkin (1994).

For one study area, we can test  $H_0: \lambda \geq 1$  vs.  $H_a: \lambda < 1$  with a one-sided  $z$ -test,

$$z = \frac{1 - \hat{\lambda}}{se(\hat{\lambda})},$$

wherein  $z$  is approximately a standard normal variate under  $H_0$ . With multiple studies a broader scope of inference is possible with an empirical  $t$ -test if one has independent estimates of  $\lambda$  for each site.

A problem arises in that the CR data provides only  $\hat{\phi}_J$  and this is biased low if taken as an estimate of juvenile survival probability,  $S_J$ . Thus, the computed  $\hat{\lambda}$  are biased low when  $\hat{\phi}_J$  are used. We therefore used all the other parameter estimates (which have little or no bias), set  $\lambda$  to 1 and computed the juvenile survival probability that would be needed to obtain  $\lambda = 1$  (denoted  $S_{J|\lambda=1}$ ). This allows a judgment as to whether it is unreasonable to think these populations have  $\lambda \geq 1$ , or it is more likely that  $\lambda < 1$ . An alternative, but equivalent assessment is to assume true  $\lambda = 1$  and compute the emigration rate,  $E_{|\lambda=1}$ , needed to have the estimated juvenile survival probability  $\hat{\phi}_J$ , and hence the estimated  $\hat{\lambda}$ :

$$E_{|\lambda=1} = 1 - \frac{\hat{\phi}_J}{S_{J|\lambda=1}}.$$

We were able to estimate emigration ( $\hat{E}$ ) from the small (relative to sample sizes for CR and fecundity data) sample of radioed birds in 1991 and 1992. Therefore, we used  $\hat{E}$  and the estimated average vital rates from the CR data to compute a single emigration bias-adjusted  $\hat{\lambda}$  and a standard error for this  $\hat{\lambda}$ . For the 11 study areas, we averaged (unweighted) the 11 rates for each of  $\hat{\phi}_J$ ,  $\hat{\phi}_A$ ,  $\hat{b}_1$ ,  $\hat{b}_2$  and  $\hat{b}_A$ . Then as explained above, juvenile survival was adjusted for emigration bias. The variances and covariance of juvenile and adult survival estimates were computed empirically. Then the above described method was used to get  $\hat{\lambda}$  and  $se(\hat{\lambda})$ . This single finite rate of change is our best estimate of the average rate of change for the Northern Spotted Owl population size during 1985 to 1993.

## RESULTS

### Goodness-of-fit tests for Capture-Recapture Data

Table 3 gives the summarized results of the goodness-of-fit (GOF) tests to the global model ( $\{\phi_{a*t}, p_{a*t}\}$  separately for males and females and each study area) for the adult data. The CR data on releases of juveniles and subadults were also tested for goodness-of-fit. Those tests are additive to the tests for the adult data. These latter



Table 3. Goodness-of-fit (GOF) tests for Northern Spotted Owl adult capture-recapture data sets.

Study area	Sex	TEST 2 + 3			TEST 2	TEST 3
		$\chi^2$	df	P	P	P
CAL	Males	11.22	14	0.6688	0.2399	0.8382
	Females	4.75	14	0.9890	1.0000	0.9428
RSB <sup>1</sup>	Males	29.02	19	0.0656	0.0087	0.5393
	Females	26.93	20	0.1374	0.0831	0.3288
SCS <sup>1</sup>	Males	31.69	15	0.0071	0.0001	0.5714
	Females	40.54	17	0.0011	0.0000	0.5300
SAL	Males	12.89	14	0.5354	0.1420	0.8152
	Females	14.86	16	0.5350	0.9040	0.2753
HJA <sup>1</sup>	Males	16.23	12	0.1810	0.1239	0.3138
	Females	19.87	13	0.0984	0.5854	0.0482
OLY <sup>1</sup>	Males	19.89	12	0.0691	0.3937	0.0499
	Females	34.36	13	0.0011	0.2021	0.0008
CLE	Males	5.11	7	0.6466	0.3280	0.7185
	Females	6.03	7	0.5368	0.0612	0.9942
EUG	Males	0.85	4	0.9323	1.0000	0.9323
	Females	3.30	7	0.8559	1.0000	0.6539
COO	Males	2.98	4	0.5605	1.0000	0.3941
	Females	6.47	3	0.0910	0.0128	0.8787
SIU	Males	3.83	4	0.4295	1.0000	0.2804
	Females	1.15	4	0.8858	1.0000	0.7644
SIS	Males	0.50	3	0.9199	1.0000	0.9199
	Females	0.23	3	0.9734	1.0000	0.9734
Total $\chi^2$ GOF		292.70	225	0.0016		
$\chi^2$ GOF w/o SCS		220.47	193	0.0853		

<sup>1</sup>Examined in detail for lack of fit in the component tests (Burnham et al. 1987, Lebreton et al. 1992).

data were so sparse in terms of captures that they contributed relatively little to the overall GOF test (a total of  $\chi^2_{(36)} = 28.49$ ,  $P = 0.8095$  for those test components with enough data to be reliable).

From Table 3, the overall GOF test result was  $\chi^2_{(225)} = 292.47$ ,  $P = 0.0016$ . Given the sample size (about 3,000 banded as adults) this is really a very decent fit for data of this magnitude and complexity. Lack of fit comes from mostly the SCS and

OLY areas. GOF test components for these areas, and HJA and RSB, were carefully scrutinized. It was found that the significant test components were associated with only a few birds and failure to fit was not due to any systematic patterns that could be modeled with CR models more general than CJS. Much of the lack of fit for area SCS is due to about 5 birds that show temporary emigration (one adult female was not seen for 6 years after initial banding; this one bird “caused” much of the GOF failure of the female data for SCS). In the case of OLY, there was one released cohort of about 18 newly banded birds in 1992 that was captured in 1993 at a very different rate from previously banded birds. Basically, most of the lack of fit indicated in Table 3 can be related to about 30 to 40 birds out of 3,000. Therefore, we maintained that the global model was satisfactory and analysis could proceed (and without any need for quasi-likelihood variance inflation—even with a variance inflation factor of  $292.47/225 = 1.3$  the increase in sampling variances of estimators would be minor).

#### Models of the Capture-Recapture Data

The model with the minimum AIC value for each study area is summarized in Table 4 for data from adult (i.e., non-juvenile) and juvenile + adult birds. Five of the 11 minimum AIC models contain a negative time trend in survival (i.e.,  $\phi_T$ ) for the adult data, while 3 of the 11 show this negative trend for the juvenile + adult data. Other study areas had negative time trends in survival for models within 1 or 2 AIC units. Thus, even for individual data sets, where sample size is small and statistical power could be expected to be low, there are indications of significant negative time trends in survival probabilities.

Table 4. Summary of the model with the minimum AIC value by study area, for the Northern Spotted Owl; “adults only” use only CR data on birds initially banded as an adult, “age models” use all the data.

Study area	Best model, adults only	Best model, age models
CAL <sup>1</sup>	$\phi_{s \neq T}, p_{tech}$	$\phi_{J, A\{t\}}, p_{aA', A\{tech\}}$
RSB	$\phi_T, p_{s+T}$	$\phi_{a2}, p_{aA'+s}$
SCS	$\phi_T, p_s$	$\phi_{a2}, p_{aA'+s}$
SAL	$\phi_T, p$	$\phi_{a2+T}, p_{aA'+s}$
HJA	$\phi, p_{s+T}$	$\phi_{a2+t}, p_{a3'+s}$
OLY	$\phi_s, p_T$	$\phi_{a2}, p_{a5'+T}$
CLE	$\phi_T, p_s$	$\phi_{a2+T}, p_{s+T}$
EUG <sup>2</sup>	$\phi_{t_1=t_2, t_3, t_4}, p_{t+s}$	$\phi_{a2+T}, p_{a2+s \neq T}$
COO	$\phi_t, p_s$	$\phi_{a2+t}, p_{a2+s}$
SIU	$\phi, p_{s+t}$	$\phi_{a2}, p_{a2}$
SIS	$\phi, p_T$	$\phi, p_T$

<sup>1</sup> Technique (*tech*): a binary variable to index physical recapture vs. resighting.

<sup>2</sup> Here  $\phi_{t_1=t_2, t_3, t_4}$  denotes model  $\{\phi_t\}$  with the constraint that survival probabilities are equal in periods one and two.

## Estimates of Age-Specific Survival Under the Minimum AIC Models

Estimated apparent juvenile survival ( $\hat{\phi}_J$ ) varied from 0.140 (CLE) to 0.418 (RSB), excluding SIS which had little data for the estimation of this parameter (Table 5). An unweighted average across study areas yielded an estimate of apparent juvenile survival of 0.258 (empirical se = 0.036). These estimates include the rate at which juvenile birds left the area, survived a year, and were not captured by other investigators (i.e.,  $\phi = S(1 - E)$ ). Adult birds (including first and second year subadults) had estimated survival probabilities varying over a small range from 0.821 (HJA) to 0.868 (CAL). The unweighted average survival of adults was estimated to be 0.844 (empirical se = 0.0052) (Table 5). Emigration is a minor issue in adult birds. The effect of emigration and senescence produce negative and positive bias, respectively, thus we assumed  $\phi = S$ . The average survival of adults is very precisely estimated, cv = 0.6%.

Table 5. Estimates of juvenile and adult survival probabilities, from the best model, for the Northern Spotted Owl data.

Study area	Best model, age models	Juvenile survival		Adult survival	
		$\hat{\phi}_J$	se( $\hat{\phi}_J$ )	$\hat{\phi}_A$	se( $\hat{\phi}_A$ )
CAL	$\phi_{J,A\{t\}}, p_{aA',A\{tech\}}$	0.330	0.043	0.868	0.012 <sup>1</sup>
RSB	$\phi_{a2}, p_{aA'+s}$	0.418	0.042	0.843	0.010
SCS	$\phi_{a2}, p_{aA'+s}$	0.320	0.038	0.824	0.009
SAL	$\phi_{a2+T}, p_{aA'+s}$	0.402	0.105 <sup>1</sup>	0.851	0.022 <sup>1</sup>
HJA	$\phi_{a2+t}, p_{a3'+s}$	0.288	0.052 <sup>1</sup>	0.821	0.016 <sup>1</sup>
OLY	$\phi_{a2}, p_{a5'+T}$	0.245	0.064 <sup>1</sup>	0.862	0.017 <sup>1</sup>
CLE	$\phi_{a2+T}, p_{s+T}$	0.140	0.026 <sup>1</sup>	0.850	0.031 <sup>1</sup>
EUG	$\phi_{a2+T}, p_{a2+s*T}$	0.232	0.078 <sup>1</sup>	0.853	0.026 <sup>1</sup>
COO	$\phi_{a2+t}, p_{a2+s}$	0.218	0.045 <sup>1</sup>	0.862	0.019 <sup>1</sup>
SIU	$\phi_{a2}, p_{a2}$	0.243	0.092	0.822	0.027
SIS	$\phi, p_T$	0.000	--	0.830	0.045
Mean, and empirical se on 10 df		0.258	0.036	0.844	0.005

<sup>1</sup> Standard error is an approximation based on the nearest (in AIC) model with no time effects on survival probability.

## Meta-Analysis of Survival

Anderson and Burnham (1992) conducted a comprehensive "meta-analysis" of the data from adult females on the 5 study areas available at that time. Because more data are used in the estimation of parameters, there is greater power to detect various "effects" and reveal more structure in the data. Here, we partitioned the study areas

into 6 short-term data sets (< 6 years; the WDS data were included in this analysis, with the investigators consent) and 6 long-term data sets (> 6 years) to test the null hypothesis that there were no time trends in survival against the one-sided alternative that survival was decreasing. Thus, interest was focused on 3 models for survival  $\{\phi, \phi_T, \text{ and } \phi_t\}$ , while allowing the minimum AIC parameterization of the capture probabilities (e.g.,  $p_{g*T}$ ). Note, the data are in no way "pooled" during this analysis; rather, the data from several study areas are often used to estimate the same parameter set.

Long-Term Study Areas. We tested for a time trend in survival of adult females using a likelihood ratio test of model  $\{\phi, p_{g*T}\}$  vs. model  $\{\phi_T, p_{g*T}\}$  and found a significant time trend ( $\chi^2_{(1)} = 4.889$ ,  $P = 0.027$ ). A further test of model  $\{\phi_T, p_{g*T}\}$  vs. model  $\{\phi_t, p_{g*T}\}$  was also significant ( $\chi^2_{(6)} = 15.015$ ,  $P = 0.020$ ). Some of this additional scatter is related to study area effects. This general finding is shown in Fig. 2 where a nearly linear negative trend in adult female survival is seen (it is linear on  $\text{logit}(\phi)$ ) corresponding to model  $\{\phi_T, p_{g*T}\}$  and the year-specific estimates are also plotted; corresponding to model  $\{\phi_t, p_{g*T}\}$ . The average standard error for points along the line was 0.014,  $\text{cv} \doteq 1.7\%$ .

A similar finding was made for a joint analysis of adult males + females. That is, a significant negative time trend in survival was shown ( $\chi^2_{(1)} = 15.307$ ,  $P = 0.0001$ ), given a  $p_{g*T+s}$  structure on the capture probabilities. Less evidence was found for a similar negative time trend in the survival of just adult males ( $\chi^2_{(1)} = 2.053$ ,  $P = 0.152$ ), given a  $p_{g*t}$  model structure on the capture probabilities.

Short-Term Study Areas. Power to detect time trends from the short-term study areas was low because so few years were available and sample sizes tended to be low (Table 2.) A significant negative time trend in survival was shown only for the adult females ( $\chi^2_{(1)} = 3.476$ ,  $P = 0.062$ ), given a  $p_{g+t}$  model structure on the capture probabilities. The result for the joint analysis of adult males + females was inconclusive ( $\chi^2_{(1)} = 1.707$ ,  $P = 0.191$ ) as was that for adult males ( $\chi^2_{(1)} = 0.754$ ,  $P = 0.385$ ). Two points are of interest here, first a significant negative trend was shown for adult females and second, the sign of the non-significant relationships for males + females and males alone was negative in both cases.

### Fecundity Data

The key statistical analysis results for the fecundity data are given in Table 6, along with the overall means for each year. These means are numbers of female young fledged per territorial (hence potentially breeding) female; these yearly means use all data (known and unknown aged females). Table 7 gives the estimates of fecundity ( $b$ ) by study area and age of parent female; these means use only data from known-aged female parents. The variance components in Table 6 are for females fledged per parent female.

From the ANOVA results in Table 6, age of the (female) parent and year are significant factors in variation among true fecundities ( $b$ ). There may be small, but real, differences in fecundity by study area ( $P = 0.0534$ ). With year and study area effects and interactions with these effects, treated as random, the estimated variance components are given in Table 6. Because of the big year effects, Table 6 also gives the mean fecundity by year. The most striking features of these means are the high fecundity in 1992 and low fecundity in 1993. We believe no meaningful linear trend in

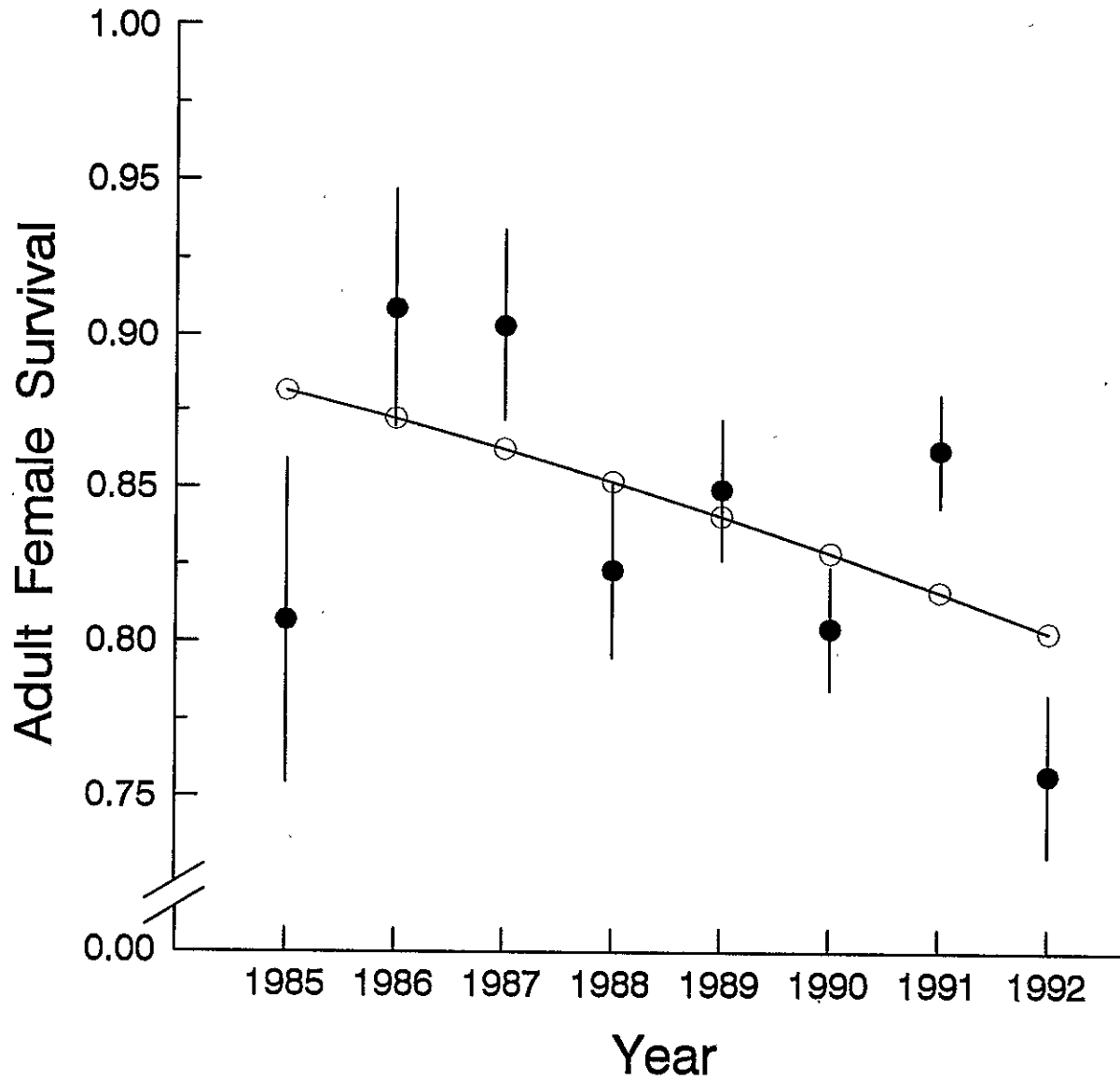


Fig. 2. Estimated survival probability of adult female Northern Spotted Owls as a function of years, 1985-92. A significant negative time trend is indicated by the nearly linear line (estimated under model  $\{\phi_T, p_{g^*T}\}$ ). The points (in black) are estimates under model  $\{\phi_t, p_{g^*T}\}$  with one standard error plotted. The standard error for points along the line averaged 0.014.

Table 6. Analysis of variance results, and yearly means, for number of young fledged per breeding female; the exact F-tests use expected mean squares to construct a denominator mean square; variance components estimated by the MIVQUE method in SAS PROC VARCOMP.

Source	df	SS	Mean Square	F-Value	P
AGE	2	9.4096	4.7048	8.18	0.0003
(exact F-test based on expected mean squares)				8.14	0.0004)
YEAR	8	39.5056	4.9382	8.58	0.0001
(exact F-test based on expected mean squares)				5.07	0.0001)
AGE*YEAR	16	14.5085	0.9068	1.58	0.0665
STUDY	11	12.4231	1.1294	1.96	0.0280
(exact F-test based on expected mean squares)				1.84	0.0534)
AGE*STUDY	21	5.7360	0.2731	0.47	0.9791
YEAR*STUDY	57	129.9290	2.2795	3.96	0.0001
ERROR	4406	2534.4290	0.5752		

Variance components estimates:

Var(YEAR)	0.02087
Var(STUDY)	0.00256
Var(YEAR*STUDY)	0.00000
Var(YEAR*AGE)	0.02682
Var(STUDY*AGE)	0.00000
Var(ERROR)	0.13932

Average yearly fecundity

Year	Mean	n
1985	0.2630	116
1986	0.4160	125
1987	0.2466	217
1988	0.3544	285
1989	0.2969	421
1990	0.3576	839
1991	0.2707	1003
1992	0.5237	1246
1993	0.0725	1125

fecundity is observed over these 9 years, although formal statistical tests seem unduly influenced by the results in 1993 and tend to therefore have a negative trend.

As Table 7 shows, fecundity of subadults is much less than for adults (birds 3+ years old). Within subadults, two year old females are more productive than 1-year old birds. These age differences in fecundity are highly significant ( $P < 0.0004$ ).

Juvenile Emigration (Radio-tracking data)

The radio-tracking data available for these analyses were from post-fledging juveniles in the OLY and RSB areas in 1991 and 1992 (Forsman, unpublished data, Reid, unpublished data). These data were analyzed to see if useful estimates of juvenile survival could be obtained. "Useful" here means that the estimates would validly apply to the same annual time period as the CR data. Because the radios were put on 3-6 weeks after fledging and there was a lot of censoring (radio failure and birds that were lost), we did not get an estimate of  $S_j$  from the radio-tracking data. However, it became apparent during the workshop that these data did allow estimation of the parameter  $E$  needed to adjust the CR estimator,  $\phi_j$ , for emigration.

Table 7. Estimates of age-specific fecundity ( $b_x$ ) for female Northern Spotted Owls ( $b_x$  = the number of juvenile females fledged/female of age  $x$ ).

Study area	Subadult 1 (12 mos.)		Subadult 2 (24 mos.)		Adult ( $\geq 36$ mos.)	
	$\hat{b}_1$	$se(\hat{b}_1)$	$\hat{b}_2$	$se(\hat{b}_2)$	$\hat{b}_A$	$se(\hat{b}_A)$
CAL	0.094	0.067	0.205	0.077	0.333	0.029
RSB	0.080	0.056	0.144	0.062	0.321	0.022
SCS	0.013	0.019	0.145	0.056	0.313	0.016
SAL <sup>1</sup>	0.500	0.408	0.500	0.408	0.381	0.051
HJA <sup>1</sup>	0.154	0.102	0.154	0.102	0.348	0.034
OLY <sup>1</sup>	0.206	0.106	0.206	0.106	0.380	0.036
CLE <sup>1</sup>	0.360	0.126	0.360	0.126	0.565	0.061
EUG <sup>1</sup>	0.167	0.236	0.167	0.236	0.272	0.049
COO	0.156	0.124	0.167	0.113	0.323	0.044
SIU <sup>1</sup>	0.071	0.101	0.071	0.101	0.231	0.043
SIS <sup>1</sup>	0.000	0.000	0.000	0.000	0.282	0.072
Average <sup>2</sup>	0.068	0.027	0.205	0.034	0.339	0.010

<sup>1</sup>Data for subadults 1 and 2 were pooled, to estimate a common fecundity, because of small sample size ( $n_1 + n_2 < 30$  for total sample size of subadults).

<sup>2</sup>These averages are based directly on all the data pooled over ages, not on averaging the column means.

To estimate  $E$  we need only counts of juveniles surviving until after emigration occurs (plus the unavoidable assumption that the annual survival probability is the same for emigrating and not emigrating juveniles). The relevant data are given below:

Area	Year	$n_{en}$	$n$
OLY	1991	8	11
OLY	1992	3	8
RSB	1991	2	26
RSB	1992	11	31
Totals:		24	76

Based on these data,  $\hat{E} = 24/76 = 0.3158$ , with  $se(\hat{E}) = 0.05332$  and a 95% confidence interval of 0.2113 to 0.4203.

#### Population Rate of Change, $\lambda$

Table 8 gives the estimates of  $\lambda$  based on  $\hat{\phi}_J$ , hence these estimates are biased low. Still, it is worth testing them against 1 because if these  $\hat{\lambda}$  are not less than 1, then we may conclude we do not have statistical evidence from the data that  $\lambda$  is less than 1. Given that the results in Table 8 suggest true  $\lambda$  might be less than 1, we computed Table 9 results. Table 9 allows a subjective assessment of whether it is reasonable, or not, to believe  $\lambda < 1$ . Overall, to believe  $\lambda$  is not less than 1, one must believe average

Table 8. Estimates of the finite rate of annual population change,  $\lambda$ , for female Northern Spotted Owls in 11 independent study areas throughout their range. Also shown are test statistics and P-values for the test of the null hypothesis that  $\lambda \geq 1$  vs. the alternative that  $\lambda < 1$ .

Study area	$\hat{\lambda}$	$se(\hat{\lambda})$	$t$ or $z$	P
CAL	0.9656	0.0165	2.08	0.0188
RSB	0.9570	0.0146	2.94	0.0016
SCS	0.9105	0.0121	7.39	0.0000
SAL	1.0191	0.0729	-0.26	0.6064
HJA	0.9106	0.0212	4.22	0.0000
OLY	0.9472	0.0255	2.07	0.0192
CLE	0.9240	0.0323	2.35	0.0094
EUG	0.9134	0.0314	2.76	0.0029
COO	0.9274	0.0223	3.25	0.0006
SIU	0.8738	0.0312	4.04	0.0000
SIS	0.8302	--	--	--
Simple average and $t$ -test, 10 $df$	0.9253	0.0148	5.04	0.0003
Simple average and $z$ -test <sup>1</sup>	0.9349	0.0103	6.32	0.0000

<sup>1</sup>Excludes SIS area because no theoretical  $se(\hat{\lambda})$  could be obtained for that area.

juvenile survival probability ( $S_J$ ) is near 0.565, or (equivalently) that emigration probability is near 0.51. In the previous section we derived  $\hat{E} = 0.3158$  with a 95% confidence interval of 0.2113 to 0.4203. This is indirect, but strong, evidence that on average during the years of these studies,  $\lambda < 1$ .

Given this data-based estimate of  $E$ , we can adjust  $\hat{\phi}_J$  for emigration to obtain  $\hat{S}_J$  and compute a less biased  $\hat{\lambda}$ . We will not do this for each area (because we do not have area-specific  $\hat{E}$ ), but rather based only on the overall averages of the vital rates, the resultant  $\hat{\lambda}$  applies in general, as an average over the years 1985 to 1993, to Northern Spotted Owls. From Table 7 the fecundities are (standard errors in parentheses),

$$\hat{b}_1 = 0.068 (0.027),$$

$$\hat{b}_2 = 0.205 (0.034),$$

$$\hat{b}_A = 0.339 (0.010).$$

Sampling correlations among these estimates are 0. From Table 5,

$$\hat{\phi}_J = 0.2579 (0.03563),$$

$$\hat{S}_A = \hat{\phi}_A = 0.8441 (0.00519),$$



with empirical correlation between these estimates of 0.130 (note, we are using empirical not theoretical variances for the above point estimates). From above, and the *Methods* section, we get

$$\hat{E} = 0.3158 (0.05332),$$

hence

$$\hat{S}_J = 0.3769 (0.05979),$$

and the estimated correlation between adult and juvenile survival estimates ( $\hat{S}_A, \hat{S}_J$ ) is 0.13. Using these parameter estimates (and variances and covariances) we find that

$$\hat{\lambda} = 0.9548, \quad \text{se}(\hat{\lambda}) = 0.01731.$$

Because we used empirical variances we will consider that the standard error of  $\hat{\lambda}$  is based on 10 *df* and do a one sided *t*-test, and construct a 95% confidence interval on this basis. This is conservative in the sense of producing a less powerful test and a wider interval than might be justified by a more exact evaluation of degrees of freedom to associate with the standard error of  $\hat{\lambda}$ .

The *t*-test ( $H_0: \lambda \geq 1$  vs.  $H_a: \lambda < 1$ ) is  $t_{10} = 2.61$ ,  $P = 0.01731$ . The 95% confidence interval (2-sided,  $t_{10, \alpha = 0.025} = 2.228$ ) is 0.9162 to 0.9934.

Table 9. For the estimates of adult survival (Table 5) and fecundity (Table 7) used to compute  $\hat{\lambda}$  in Table 8 (and repeated below), the value of juvenile survival probability need to produce  $\lambda = 1$  is tabulated here ( $S_{J|\lambda=1}$ ) as is the corresponding juvenile emigration probability ( $E_{|\lambda=1}$ ) that would then result in the observed  $\hat{\phi}_J$  estimates given in Table 5; this information is useful in assessing the degree of bias (relative to the question of could  $\lambda = 1$  be true) in the  $\hat{\lambda}$  values.

Study Area	$\hat{\lambda}$	$S_{J \lambda=1}$	$E_{ \lambda=1}$
CAL	0.9656	0.461	0.29
RSB	0.9570	0.607	0.31
SCS	0.9105	0.746	0.75
SAL	1.0191	0.360	-0.12
HJA	0.9106	0.630	0.54
OLY	0.9472	0.413	0.41
CLE	0.9240	0.297	0.53
EUG	0.9134	0.603	0.61
C00	0.9274	0.492	0.56
SIU	0.8738	0.995	0.77
SIS	0.8302	0.607	1.00
Means:	0.9253	0.565	0.51

## DISCUSSION

The first important result was that annual adult female survival probabilities have declined at a significant, negative rate. Several individual data sets revealed this negative time trend, as did the meta-analyses for both the short-term and long-term data sets. This is an important finding and must be weighed heavily in decisions concerning land management policy in the future and in view of the fact that this is a Threatened subspecies under the Endangered Species Act. The results for adult male survival were less convincing, but the pattern of declining survival was still there. The meta-analysis of males + females showed a highly significant negative time trend for both males and females. The adult female population component is the most important, and it is this component where the evidence is very strong for a negative time trend (Fig. 2) (we again note that  $\lambda$  applies only to the female owls).

We were unable to detect a negative trend in juvenile survival probabilities; these data are somewhat sparse and the power to detect such a trend was perhaps quite low. Several areas did seem to show a negative time trend in  $\phi_J$  (Table 4), but we will not pursue this further here. We found no time trends that we felt were significant in fecundity, but note that 1993 was a year of very poor production.

The second important result is that  $\lambda$ , corrected for juvenile emigration, is significantly  $< 1$ . We will restrict our inference to the specific years of study; we do not intend that  $\hat{\lambda}$  be used to project the size or rate of change of the population into the distant future (say, 10–100 years). We use  $\lambda$  to answer the following question, “*given a population with estimated average vital rates for females (the  $\hat{S}_x$  and  $\hat{b}_x$ , where  $x = \text{age}$ ), what is the rate of population change if these rates remained constant over an appropriately long time period?*” Thus, these estimates of  $\lambda$  answer a hypothetical question that remains of prime interest. No assumptions concerning a stationary age distribution are required under this interpretation. Finally,  $\hat{\lambda}$  relates to the population of resident, territorial female birds. In this sense,  $\lambda$  answers the question, “*Have the resident, territorial female birds replaced themselves?*” This is an inference to the entire population of owls, not just the banded birds.

The ability to make definitive statements concerning  $\lambda$  is hampered by the emigration of some juvenile birds to areas outside the study areas. To the degree that juvenile owls emigrate from the study area, survive the year, and are not captured, a negative bias exists if one takes  $\hat{\phi}_J$  as an estimator of the parameter  $S_J$ . In fact, there is the relationship  $\phi_J = S_J(1 - E)$ . To evaluate the bias in  $\hat{\phi}_J$ , we have given the value of  $S_J$  required for  $\lambda = 1$  (as in Table 9). In addition, during 1991 and 1992 there were birds fitted with radios, which allowed an estimate of emigration probability ( $E$ ). This, also, leads to insights concerning the degree to which  $\lambda < 1$ . Generally, we conclude from Table 8 that the population of resident females is declining on most of the 11 areas (perhaps SAL is an exception; but note the large estimated standard error for SAL).

Past studies (e.g., Anderson and Burnham 1992) have shown significant rates of immigration and this seems likely to be the case here; time constraints did not permit the estimation of these rates during the December, 1993 sessions. Thus, if a census could be done over several years to completely enumerate all the birds within some study area boundary, it is entirely likely that these numbers might be fairly stationary (i.e.,  $N_1 \doteq N_2 \doteq N_3 \doteq \dots \doteq N_k$ ). This hypothetical result is not inconsistent with our findings that  $\lambda < 1$  and that populations of resident, territorial birds are declining. In this latter case, the population within a particular bounded study area is being temporarily augmented by immigration into the territorial population.

The third important result is that the rate of population decline is accelerating. This stems from the fact that  $\lambda$  is estimated using time-averages of the vital rates (the  $\bar{\phi}_x$  and  $\bar{b}_x$ , where  $x = \text{age}$ ); however, it is clear that adult female survival probability has a significant, negative time trend (Fig. 2). Thus, we conclude that the rate of population decline is accelerating. This acceleration was not "expected" by, for example, the Interagency Scientific Committee (Thomas et al. 1990) or other groups examining this general issue since that time. If the next 100 years are thought to be "highly risky" for the owl, then the findings concerning accelerating declines offer no comfort for the long-term viability for this subspecies.

A final remark relates to the critical need to continue to monitor these populations. We are aware that several of these demographic study areas are to be terminated in 1994. Given the results provided here, termination of these large study areas seems like a very serious and needless error. No other survey or monitoring program provides the critical information that these demographic studies offer. It seems indefensible to us that several of these important monitoring sites will be terminated. In fact, the first 3-4 years of such demographic studies provide relatively little information because a population of banded birds must be built up for sampling in future years. These methods just begin to be useful in about year 4-5. If these studies are terminated in 1994, the money spent over the past several years will be largely wasted. We strongly urge that these demographic studies be continued and fully funded, at least until such a time that the population is not in serious jeopardy.

## ACKNOWLEDGMENTS

Our sincere appreciation is extended to many people that participated in this fascinating project (see Appendix C). Ms. Beverly Klein and Ms. Brigitte Williams (Colorado State University) and Ms. Beverly Connor (USFS) provided excellent administrative support. The funds for the 12 day session came from the Interagency EIS Team. In particular, we thank the many biologists that brought their data for analysis and weathered the entire 12-day session. Special thanks to those that helped in coordination in various ways, including Robert Anthony (NBS), Stephen DeStephano (Oregon Cooperative Wildlife Research Unit), Eric Forsman (USFS), Alan Franklin, Charles Meslow (NBS), and Martin Raphael (USFS). So many helped in this effort it is hard to stop in acknowledging valued assistance, but we must include Russell Lande (University of Oregon), Barry Noon (USFS), Eric Rexstad (University of Alaska), and Tanya Shenk and Ken Wilson (Colorado State University). Dr. Jean Clobert traveled from Paris, France to join the analysis team. Roger Pradel, also from France, attended some of the sessions on his move from Maryland to Vancouver, B. C. Jon Bart (NBS) and Lloyd Goldwasser (University of California at Santa Barbara) attended the evening session on the estimation and interpretation of  $\lambda$ .

## APPENDICES

- A. Letter to USDI and USDA Secretaries
- B. Workshop and Short Course Agendas, Objectives
- C. Lists of Participants for December 10-22 Sessions
- D. Components of Data Analysis and Statistical Inference
- E. Additional Maps of the various Northern Spotted Owl demographic study areas

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# APPENDIX A

## AN OPEN LETTER FROM SCIENTISTS TO THE SECRETARIES OF AGRICULTURE AND INTERIOR

September 29, 1993

The Honorable Bruce Babbitt  
Department of the Interior  
1849 C St., NW  
Washington, DC 20240

The Honorable Mike Espy  
Department of Agriculture  
14th St. & Independence, SW  
Washington, DC 20250

Dear Secretaries Babbitt and Espy:

As scientists concerned that public policymakers have access to the best available data and analysis for making natural resource decisions, we write to express our deep concern that agencies under your authorities are not analyzing or utilizing critically important demographic data collected on the northern spotted owl during the last two years. These data, collected at the cost of millions of taxpayer dollars, are of little use to anyone unless properly analyzed. In our opinion, analysis of these data is essential to making a rational choice among forest management policies for the Pacific Northwest's old-growth forests -- a choice you must make by year's end.

Since the early 1980s, the Forest Service, in cooperation with state and other federal agencies, has instituted a number of demographic studies on areas spread throughout the northern spotted owl's range. All spotted owls are uniquely tagged within each study area. Annually the study area is intensively surveyed for owls, with new owls tagged and previously tagged owls observed and recorded. These "mark-recapture" data are the underlying basis for determining the owl population's vital statistics and, thus, the species' population trend and risk of extinction. However, until fully analyzed these mark-recapture data cannot be used to make management decisions.

In the Fall of 1991, Fish and Wildlife Service (FWS) scientists, in cooperation with key spotted owl field biologists, analyzed the extant mark-recapture data. Their analysis, published as Appendix C to the Draft Recovery Plan for the Northern Spotted Owl, revealed two critical risks facing the owl. First, the analysis indicated that the population of censused owls was declining at an average annual rate of 7.5 percent during the study period. Second, the annual adult female survival rate had steadily declined during the study period. The authors concluded not only that the owl populations were declining, but also "the rate of population decline has probably accelerated." Draft Recovery Plan at 328. These results, if accurate, are alarming.

Scientists have debated the accuracy and relevance of the 1991 results. The recently released Forest Ecosystem Management Assessment Team (FEMAT) report briefly summarizes this debate. See FEMAT Report at IV-183. This report concludes that the "issue appears unresolved."

The government has available to it the means to shed substantial light on these critical unresolved issues. Two additional years of demographic data are now available and five additional demographic study areas have data spanning sufficient time periods to add to the analysis.

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Open Letter to Secretaries Babbitt and Espy

The federal agencies now have twice the owl demographic data that were available in 1991.

It is inexplicable to us that the federal agencies have not analyzed these data or used them as a basis for developing management alternatives. If the data were worth collecting, at considerable expense to American taxpayers, then they should be worth analyzing (at relatively little cost). This analysis should have been performed as an integral and essential part of the FEMAT report; it was not.

In fact, the FEMAT report suggests that only long-term data gathering and modelling can hope to yield much improvement over current estimates of the owl's viability. We believe that the quantity of already gathered, but as yet unanalyzed, data are likely to be very informative and that the analysis should be completed before any rational decision selecting a final plan can be made. We believe such an analysis should repeat the work performed in 1991, which would require approximately one week's commitment by the field scientists who collected the data together with statisticians expert in the analysis of mark-recapture data.

We call on you to instruct the federal agencies under your authority to do the job that needs to be done.

Sincerely,

John Baldwin, Director  
Institute for Sustainable Environment  
University of Oregon

Barbara Bentley, Professor  
Department of Ecology and Evolution  
State University of New York - Stony Brook

Daniel Doak, Assistant Professor  
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Open Letter to Secretaries Babbitt and Espy

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John A. Wiens, Professor of Ecology  
Department of Biology  
Colorado State University

cc: James Lyons, Assistant Secretary of Agriculture  
Tom Collier, Chief of Staff to the Secretary of Interior  
Robert T. Jacobs, Interagency SEIS Team Leader

Institutional affiliations listed for identification purposes only



## APPENDIX B

### Northern Spotted Owl Data Analysis Sessions

#### Schedule

Friday, Dec. 10	Install computing hardware & software, etc., etc. Biologists arrive in Fort Collins. Their capture-recapture data must be checked and rechecked and in the proper format for final analysis (although we will do further checking).
Sat-Sun, 11-12	22-25 biologists and 1-3 analysts organize fecundity data for analysis.  Interested scientists (about 15; by invitation only) arrive in Fort Collins.
Mon-Wed., 13-15	Training workshop--focus on principles of capture-recapture modeling, analysis, inference, estimation of fecundity, estimation of finite rates of population change ( $\lambda$ ). Computer intensive, using real data (but not the NSO data).
Mon., 13 PM	Biologists certify that their data are ready for final analysis.
Wed., 15 PM	The entire group (biologists, both those with data and observers, and analysts) will discuss and agree on a protocol for the analysis to begin the next day. A "strategy of analysis" will be developed and agreed upon.
Wed., 15 Evening	Evening session, given by owl biologists, for the analysts in an effort to inform them concerning field aspects of the studies and the validity of the assumptions.
Thu., 16 AM	Invited scientists leave Fort Collins Thursday AM.
Thu., 16 Evening	Evening discussion concerning $\hat{\lambda}$ (select group)
Thr-Sat., 16-18	Data analysis--single data sets, estimation, testing, model selection.  Analysis of radio-telemetry data on juvenile survival.
Sun. 19	Break. Catch-up, review, final approach, check to see that the protocol is being followed, etc.  Biologists discuss plans to publish the results of the demographic studies ?
Mon-Tue, 20-21	Estimates of $\lambda$ , meta-analysis, discussion of inference, wrap-up. Preparation of preliminary tables and other summaries.
Wed., 22 AM	Participants leave for home.

# OWL WORKSHOP -- Tentative Schedule

MONDAY, DEC 13

Introduction

Workshop Objectives

History of C-R

- Long history, 500 ± papers in scientific literature
- Mainstream statistical theory
- Sophisticated theory and software
- Methods are objective and repeatable
- Comments on *ad hoc* approaches

Sampling Populations / Inductive Inference

- Inference
- Uncertainty

Data, Notation, Constants, Parameters

- Capture History Matrix → RELEASE
- $m_{ij}$  array → RELEASE
- $b_j$ ,  $a_{ij}$ ,  $c_{ij}$ , and  $d_{ij}$  → SURGE
- Conditional nature of parameters

Modeling Capture-Recapture Data

- Cormack-Jolly-Seber type models (CJS models)
- Emphasis on Survival  $\phi_j$
- Restrictions on the CJS model
- Generalization of the CJS model
- Estimability & Identifiability

Computer Session (SURGE and CR)

- Dipper Data
- Models  $[\phi_t, p_t]$ ,  $[\phi, p_t]$ ,  $[\phi_t, p]$ , and  $[\phi, p]$   
by sex and then pooled over sex

Review of SURGE output/questions

Assumptions

- Biological and operational
- Stochastic components
- Model Structure

Testing Assumptions

- Testing between models
- TEST1
- Goodness-of-fit tests
- TEST2
- TEST3
- Reduced models

Computer Session (RELEASE)

Dipper Data

Testing hypotheses

GOF TESTS2 and 3

CJS  $\hat{\phi}_j$  and  $\hat{p}_j$  and compare with SURGE

GOF for reduced models

Review of RELEASE output/questions

More on RELEASE

PROC SIMULATE

PROC CHISQ

PROC SURVIV

Review of Material: theory and application

Evening Assignment

TUESDAY, DEC 14

Likelihood Function  $\ell(\theta | X)$

Link between the model, assumptions, data and unknown parameters.

This is a critical tool.

This is the basis for estimation, testing and inference.

Likelihood Theory (asymptotically optimal):

1. Point estimation
2. Estimates of Precision
3. Testing: LRTs, GOF tests, TESTS 1, 2, & 3.
4. Estimation equations often lack a closed form solution,  
must use numerical methods to obtain MLEs

Variances and covariances

Estimation

Interpretation

Components of Variation:

Age, sex, year, area

Sampling vs. population

Quasi-likelihood methods

More Sophisticated Modeling of Parameters

$\text{logit}(\hat{\theta}) = \beta_0 + \sum \beta_i(X_i)$ .

log(-log) models

Multiple data sets

Dummy variables

Principle of Parsimony

Bias / variance tradeoff

Truth is illusive, true models,

“Significant sources of variability”

Structure

Information Theory (Extension of Likelihood Theory)

1. Model selection
2. Some N.Z. results; AIC vs. LRT

Meta-analysis -- The Use of Data from Several Areas

Background and theory

No “pooling” of data

“Modeling” vs. statistical models and estimation and inference

Interpreting interactions and additive models

Extensions of Models of Survival

$\text{Logit}(\hat{\theta}) = \beta_0 + \beta_1(T)$

Adult Males

Adult Females

Review

WEDNESDAY, DEC 15

Fecundity

State-of-the-art modeling to assess:

Age-specific variation

Time-specific variation

Area-specific variation

Linear trends;  $f_i = \beta_0 + \beta_1(T)$

Estimation of Juvenile Survival Using Telemetry

Methods--modeling

Examples

Estimation of  $\lambda$ , the Rate of Population Change

Leslie-type matrix

$\hat{\lambda}$  and  $\hat{se}(\hat{\lambda})$

Tests of  $\lambda=1$

No predication, only "snapshots"

Review of Science Philosophy

Objectivity vs. subjectivity and Repeatability of Methods (i.e., those above)

Open discussion, honest appraisal of information

Inductive and Statistical Inference

Links between sample and population sampled -- basis for inference.

2:00 - 5:00 PM Discussion, Derivation and Agreement on Analysis Protocol

6:30-9:30PM Biologists lead a discussion concerning data collection and general field techniques. Site selection and representativeness, data collection, quality control, band loss, banding periods, C-R effort, etc. A focus on assumptions. Open-ended session to provide field information to the analysts.

## WORKSHOP OBJECTIVES

December 13–15

The workshop is to provide participants with a basic knowledge and understanding of capture-recapture sampling and analysis theory that will be useful in the subsequent analysis of the data on the northern spotted owl and understanding of that analysis. Analysis methods for fecundity data will be reviewed as will methods for estimation of juvenile survival from radio telemetry data. The estimation of finite rates of population change will be introduced.

The workshop will focus on the analysis of multiple data sets as well as the critical analysis of individual data sets. Likelihood theory will provide the backbone of the workshop and subsequent analysis of the owl data. A more detailed outline of the topics to be covered follows.

1. Introduction to Capture-Recapture Theory
  - Data summaries & formats
  - Estimable parameters
  - Cormack-Jolly-Seber model
  - Restrictions
  - Generalizations
2. Introduction to Likelihood Theory
  - Point estimation
  - Estimates of precision
  - Hypothesis testing -- LR and GOF tests
  - Properties of MLEs
3. Model Selection in Data Analysis
  - Principle of Parsimony
  - Akaike's Information Criterion
  - Likelihood ratio tests
4. Analysis Theory
  - Emphasis on multiple data sets
  - Emphasis on model building
  - Practical statistical inference
5. Additional Material on Variances and Covariances
  - Estimation & interpretation
  - Quasi-likelihood
  - Components of variance
6. Advanced Capture-Recapture Models
  - Analysis of multiple data sets
  - Logit modeling of parameters
  - Dummy variables
  - Meta-analyses methods
  - Further extensions

7. Estimation of fecundity
  - Age- sex- year-specific
  - Time trends
  - Estimates of precision
8. Estimation of juvenile survival from radio telemetry
9. Estimation of the rate of population change
  - Leslie-type matrix methods
  - Estimation and testing
10. Importance of Assumptions
  - Between model tests
  - Goodness-of-fit tests
  - Bias (sign and magnitude)
11. Limited Hands-on Experience With Computer Software, Model Building, and Data Analysis

## **APPENDIX C**

### **Northern Spotted Owl Demography Workshop**

#### **Owl Biologists & Study Area December 10-22, 1993**

Olympic NF and Olympic National Park, WA

Eric Forsman  
Erran Seaman

H. J. Andrews, OR

Gary Miller  
Steve DeStefano  
Keith Swindle

Cle Elum, Wenatchee NF, WA

Stan Sovern  
Eric Forsman

Eugene BLM, OR

Jim Thraillkill

Wenatchee NF, WA

Larry Irwin  
Tracy Fleming

Coos Bay BLM, OR

Mark Brown  
Terry Hines  
Cindy Zabel

Siuslaw NF, OR

Eric Forsman

Siskiyou NF, OR

Sue Salmons  
Cindy Zabel

Roseburg, OR

Janice Reid  
Eric Forsman

Willow Creek, CA

Alan Franklin  
Rocky Guttierrez  
Christine Moen

Salem BLM, OR

Scott Hopkins  
Eric Forsman

Simpson Timber Lands, CA

Lowell Diller

Medford BLM, OR

Frank Wagner

#### **Data Analysts**

David Anderson  
Kenneth Burnham  
Jean Clobert  
James E. Hines  
James D. Nichols

Roger Pradel  
Eric Rexstad  
Tanya Shenk  
Gary C. White  
Kenneth R. Wilson



**Invitees for Workshop  
December 13-15, 1993**

Robert G. Anthony  
Bill Block  
Mike Collopy  
Lloyd Goldwasser  
Loren Hicks  
Richard Holthausen  
Russell Lande  
Joe Lint  
Kevin McKelvey

Charles Meslow  
Barry Mulder  
Barry Noon  
Cay Ogden  
Dave Pyke  
Martin Raphael  
Ed Starkey  
Bob Taylor

**Special Session on the Rate of Population Change  
December 16, 1993**

David Anderson  
Jon Bart  
Ken Burnham  
Jean Clobert  
Alan Franklin  
Eric Forsman  
Lloyd Goldwasser

Russ Lande  
Gary Miller  
Jim Nichols  
Barry Noon  
Janice Reid  
Gary White (Facilitator)

## APPENDIX D

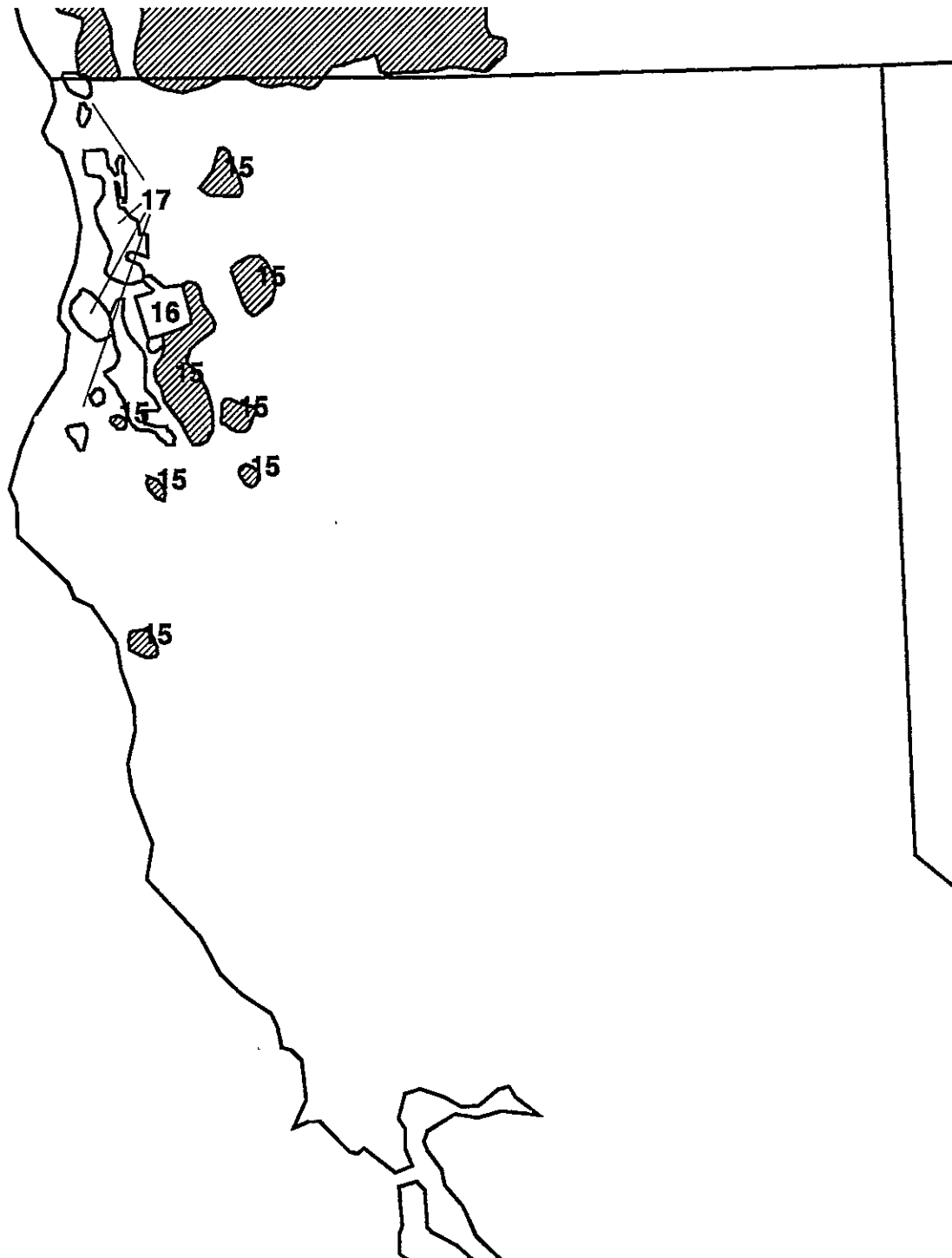
### COMPONENTS OF DATA ANALYSIS AND STATISTICAL INFERENCE

- 1. Review of Sample Data and Protocol for Data Collection**
  - Selection of Study Areas
  - Sampling Issues
  - Integrity of Data Collection and Record-Keeping
- 2. Building a Set of Candidate Models for Data Analysis**
  - Assumptions
  - Product Multinomial Models
  - Parameterization
  - Model Structure
  - Variance Structure
- 3. Estimation of Parameters and Effects**
  - Likelihood Theory
    - Point Estimation
    - Interval Estimation
    - Hypothesis Testing (e.g., LRT, GOF tests)
  - Information Theory (Model Selection)
- 4. Estimation of Uncertainty**
  - Likelihood Theory
    - $\hat{\text{var}}(\hat{\theta})$ ,  $\hat{\text{se}}(\hat{\theta})$ , cv
    - Confidence Intervals (several procedures)
  - Quasi-likelihood Theory
- 5. Statement of and Tests of Assumptions**
  - Review of Various Assumptions
  - Goodness-of-Fit Tests (e.g., TESTS 1, 2 and 3)
  - Likelihood Ratio Tests
  - Wald Tests
- 6. Critical Review of Supporting Data and Models**
  - Review of Analysis, Check and Recheck
  - Discussions with Peers
- 7. Critical Review of Conflicting Data and Models**
  - Effect of Partial Failure of Assumptions
    - Bias?
    - Precision?
  - Modeling and/or Monte Carlo Simulation
  - Theory/Scientific Literature
  - Discussion with Peers
- 8. Weighing of all of the Information to Reach a Final Statistical Inference (this, too, contains some uncertainty)**


## APPENDIX E


We arranged to get Fig. 1 from the USFS (courtesy of E. Forsman) ; that figure arrived 3 hours before we produced and mailed copies of this report. Unexpectedly we also got the following figures. Hence we include them here.

## CALIFORNIA DEMOGRAPHIC STUDY AREAS

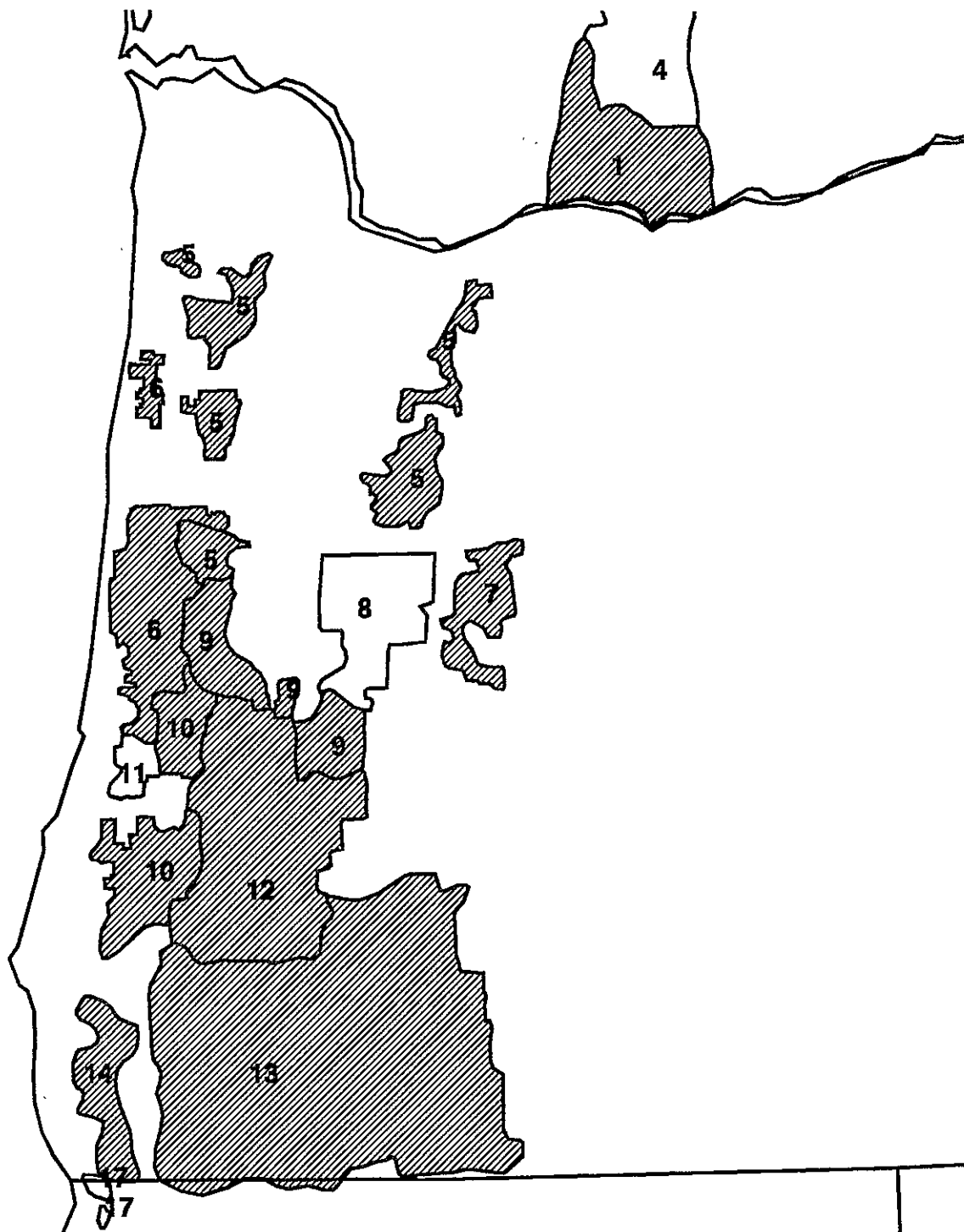


15. NW California  
16. Hoopa  
17. Simpson



 Examined in  
meta-analysis

 Not examined in  
meta-analysis

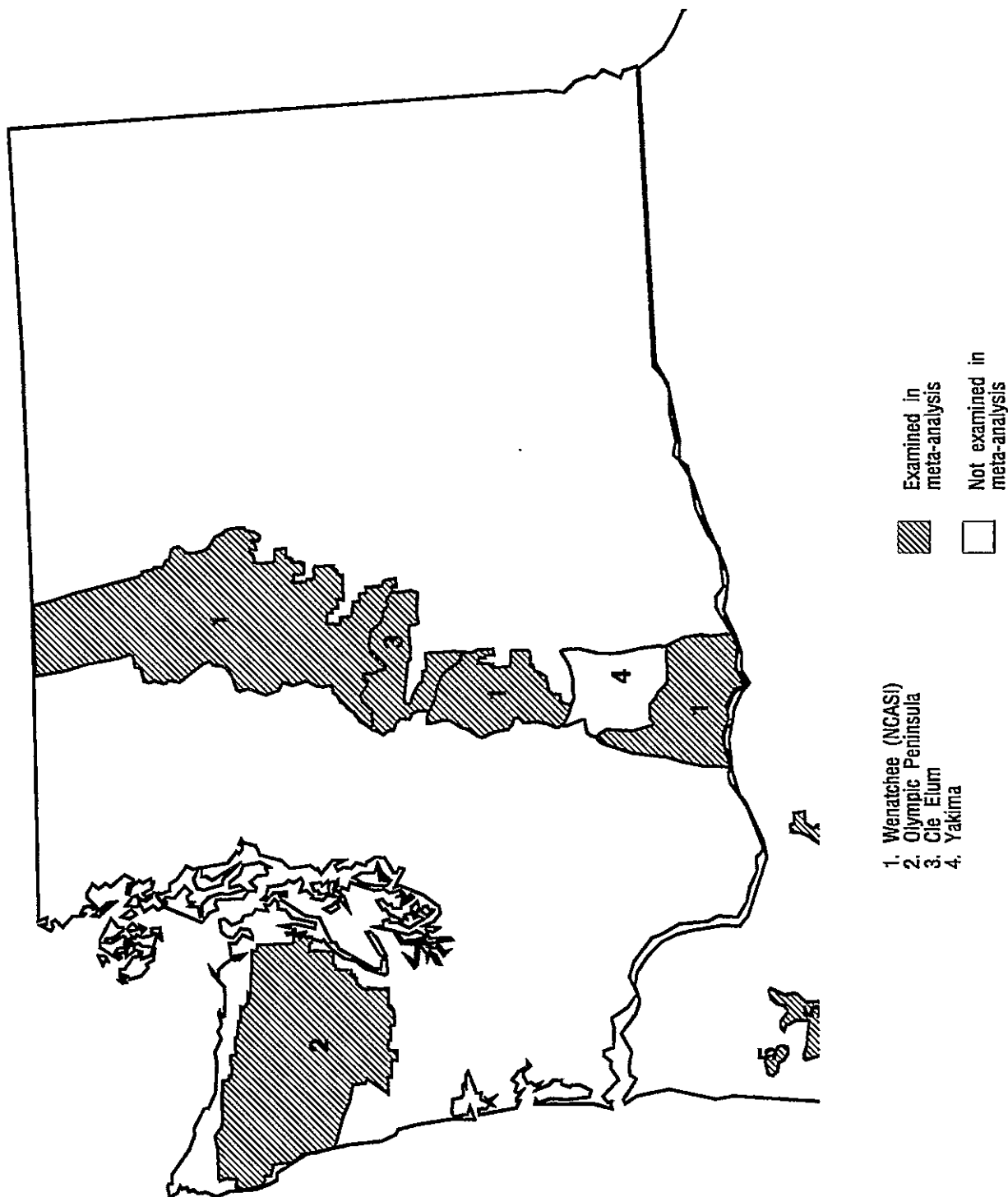
# OREGON DEMOGRAPHIC STUDY AREAS



- |                 |                         |
|-----------------|-------------------------|
| 5. Salem BLM    | 10. Coos Bay BLM        |
| 6. Siuslaw NF   | 11. Elliot SF           |
| 7. H.J. Andrews | 12. Roseburg BLM        |
| 8. E.Eugene BLM | 13. S.Cascades/Siskiyou |
| 9. Eugene BLM   | 14. Siskiyou            |

- |   |                               |
|---|-------------------------------|
|  | Examined in meta-analysis     |
|  | Not examined in meta-analysis |

# WASHINGTON DEMOGRAPHIC STUDY AREAS



# WASHINGTON DEMOGRAPHIC STUDY AREAS

