U.S. Department of Agriculture
Forest Service
333 SW 1st Avenue, P.O. Box 3623
Portland, OR 97208

U.S. Department of the Interior
Bureau of Land Management
333 SW 1st Avenue, P.O. Box 2965
Portland, OR 97208

January 2004

Final Supplemental Environmental Impact Statement

MANAGEMENT OF PORT-ORFORD-CEDAR IN SOUTHWEST OREGON

Coos Bay, Medford, and Roseburg Bureau of Land Management Districts and the Siskiyou National Forest in Southwest Oregon

MANAGEMENT OF PORT-ORFORD-CEDAR IN SOUTHWEST OREGON

Final Supplemental Environmental Impact Statement

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Oregon State Office
333 S.W. First Avenue
P.O. Box 2965
Portland, Oregon 97208

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Lead Agencies: Bureau of Land Management – U.S. Department of the Interior
Siskiyou National Forest – U.S. Department of Agriculture

Cooperating Agency: Forest Service Region 5, U.S. Department of Agriculture

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We approve publication of this final supplemental environmental impact statement and the identification of Alternative 2 as the Bureau of Land Management proposed resource management plan amendment and Forest Service preferred alternative.

Elaine M. Brong
State Director
BLM Oregon/Washington

Scott Conroy
Forest Supervisor
Rogue River and Siskiyou National Forests

United States Department of Agriculture	Forest Service	R-6	OR/ WA	Bureau of Land Management	United States Department of Interior

Reply Refer To: 3400 (FS)/5820 (BLM) (OR-935) **Date: January 9, 2003**

Dear Interested Party:

In accordance with the "Federal Land Policy and Management Act," the "National Forest Management Act," and the "National Environmental Policy Act", the Bureau and Land management and the Forest Service (Siskiyou National Forest) have prepared the attached Final Supplemental Environmental Impact Statement (SEIS) for Management of Port-Orford-Cedar in Southwest Oregon. The final SEIS supplements the environmental impact statements for the resource management plans (Plans) of the Coos Bay, Medford, and Roseburg BLM Districts and the land and resource management plan (Plan) for the Siskiyou National Forest. Alternative 2, as modified from the draft SEIS and described in the final SEIS, is the Forest Service Preferred Alternative for amending the Siskiyou National Forest Plan, and the BLM Proposed Plan Amendment for the three BLM District Plans.

The draft SEIS was made available for 90-day public comment period June 13 through September 12, 2003. Four comments were received in the month and a half after September 12, for a total of 49 letters; all were included in the SEIS. The four letters from governments or agencies are shown in their entirety in Appendix 11. Over 600 substantive comments were identified in the 49 letters. These comments were often rephrased for clarity or combination of like comments, and are presented in Appendix 10 along with the Agencies' responses. The Interdisciplinary Team found the bulk of these comment letters to be informative and well thought-out, supplying additional information or pointing out deficiencies in the original analysis. The Team sincerely appreciates the many hours various members of the public obviously spent studying the draft in detail. A summary of major changes made between draft and final SEIS appears at the start of each chapter. The Agencies hope each commenter finds the SEIS appropriately improved as a result of their efforts.

Additional copies of the Final SEIS can be obtained from the Interdisciplinary Team at the "information contact" listed on the cover page, or on the web at http://www.or.blm.gov/planning/port-orford-cedar_seis/

Forest Service Appeal Procedures

Unlike the BLM, the Forest Service appeal procedures run for 30 days following issuance of the Forest Servce record of decision. A detailed description of those procedures will be included in the Forest Service record of decision when it is issued in early 2004.

Bureau of Land Management Proposed Resource Management Plan Amendment Protest Procedures

Alternative 2, without any of the additional mitigation measures presented on Table 2-6, is the BLM Proposed Resource Management Plan Amendment. Alternative 2 would establish standards and guidelines to be followed by the Districts on all projects (as applicable), and a methodology for clarifying environmental conditions that require implementation of site-specific practices. Project proposals in or directly affecting the currently uninfested 163 7th field (1,700 to 6,000 acre) watersheds would automatically be considered for application of the management practices, if the proposed activity would pose a significant risk of infecting Port-Orford-cedar in the watershed. The Alternative is completely described in Chapter 2 of the attached final SEIS.

You now have the opportunity to protest the Proposed Resource Management Plan Amendment described here and in the Final SEIS. The BLM Planning Regulations, 43 CFR 1610.5-2, state that any person who participated in the planning process and has an interest which may be adversely affected may protest the proposed planning decision(s). A protest may raise only those issues that were submitted for the record during the planning process. Protests must be filed within 30 days of the date the Environmental Protection Agency publishes its Notice of Availability of the Final SEIS in the *Federal Register*. The Notice is expected to be published January 9, 2004, and the protest period to close February 8, 2004. If these dates change, the specific protest period closure date will be announced through the Port-Orford-cedar website (address above) and by postcards or letters sent through regular mail, or by e-mail as some people have indicated to us, to the 49 people and agencies who provided public comments and any others who may have only provided scoping comments. To be considered timely, your protest must be postmarked no later than the last day of the protest period. Though not a requirement, we suggest that you send your protest by certified mail, return receipt requested. Written protests must be submitted to the following address:

Director, Bureau of Land Management
Attention: Ms. Brenda Williams, Protests Coordinator
WO-210/LS-1075
Department of the Interior
Washington DC 20240

To expedite delivery in the Washington, DC area, you may wish to send your protest via one of the express air delivery services to:

Director, Bureau of Land Management
Attention: Ms. Brenda Williams, Protests Coordinator
WO-210
1620 L Street NW, Suite 1075
Washington DC 20236

You may wish to send a copy of the protest (in addition to the original sent via regular mail or express delivery) by FAX or e-mail to Ms. Brenda Williams at:

FAX: (202) 452-5112 or e-mail: bhudgens@wo.blm.gov

You are also encouraged (but not required) to forward a copy of your protest to the SEIS Team at the *information contact* address listed on the cover page of the Final SEIS. This may allow us to resolve the protest through clarification of intent or alternative dispute resolution methods. To be considered complete, your protest must contain the following information at a minimum:

1) Name, mailing address, phone number and the affected interest of the person filing the protest.
2) A statement of the issue(s) being protested.
3) A statement of the part(s) of the proposed plan being protested. To the extent possible, reference specific pages, paragraphs, and sections of the document.
4) A copy of all your documents addressing the issue or issues which were discussed with the BLM (IDT) for the record.
5) A concise statement explaining why the proposed decision is believed to be incorrect. This is a critical part of your protest. Document all relevant facts, as much as possible. A protest that merely expresses disagreement with the State Director's proposed decision, without providing any supporting data, will not be considered a valid protest.

For additional information or clarification regarding this document of the planning protest process, please contact Ken Denton at:

Port-Orford-cedar SEIS Team
P.O. Box 2965, Portland, OR 97208
or:
ORPOCEIS@or.blm.gov
or:
(503) 326-2368.

Comments and protests on the Proposed RMP Amendments, including names and street addresses, will be available for public review at the BLM State Office Reading Room, 333 SW 1st Street, Portland, Oregon 8:00 a.m. to 5:00 p.m. Monday through Friday except Federal holidays. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment/protest. Such request will be honored to the extent allowed by law. All submissions from organization and businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be available for public inspection in their entirety.

Sincerely,

KENNETH E. DENTON
SEIS Team Leader
Port-Orford-cedar SEIS Team

Abstract

The Coos Bay, Medford, and Roseburg Bureau of Land Management Districts and the Siskiyou National Forest are proposing to amend their respective land and resource management plans with standards and guidelines for the management of Port-Orford-cedar and the root disease, Phytophthora lateralis. *This final supplemental environmental impact statement considers six alternatives for maintenance of Port-Orford-cedar as an ecologically and economically significant species. Each alternative responds to the Purpose, to the degree such treatments are needed, practical, and cost-effective, of reducing disease introductions, slowing the spread of the disease where present, and/or mitigating the occurrence of the disease. Alternative 1 continues the current direction of implementing available disease-management practices based on site-specific analysis. Alternative 2 uses the same management practices, but places additional emphasis on 162 uninfested 7th field watersheds, and includes a risk key to clarify the environmental conditions that require implementation of site-specific practices. Alternative 3 includes all elements of Alternative 2, and adds additional protections for 31 currently uninfested 6th field watersheds. Alternative 4 removes existing disease management practices, but accelerates the resistant breeding program to provide resistant stock for all areas within 10 years. Alternative 5 removes existing disease management practices, and stops development of resistant seed for remaining undeveloped breeding zones. Alternative 6 includes all elements of Alternative 2, and adds additional protections for 162 currently uninfested 7th field watersheds.*

Major issues include the effectiveness of the proposed management techniques, the extent of negative effects from cedar mortality on other resource uses or values, and the degree of necessity of restricting other forest uses to reduce disease spread. In general, Alternatives 2, 3, and 6 improve conditions for water, fish, wildlife, rare plants, Tribal collections, and plant diversity, and adversely affect recreation access, special forest product collection, timber harvest, fire suppression and fuels management, and costs as compared to the present condition (Alternative 1). The less restrictive Alternatives 4 and 5 have the opposite effect. A major finding of the analysis is that Port-Orford-cedar is not in danger of extirpation under any of the alternatives.

Alternative 2 is the preferred alternative.

Table of Contents

Summary —
Introduction and Need S-1
Why Is the Action Being Proposed? S-2
What Would It Mean Not to Meet the Need? S-2
What Action is Proposed? S-2
Are There Other Alternatives that Would Meet the Need? S-3
What Are the Effects of the Alternatives? S-3
Can Any of the Adverse Effects be Mitigated? S-5
What Factors Will Be Used in Making the Decision Between Alternatives? S-6
What Monitoring is Necessary? S-7
Which Alternative is is the Preferred/Proposed RMP Amendment? S-7

Chapter 1 — Introduction, Purpose, and Need
Introduction 1-1
Changes Between Draft and Final 1-1
Background 1-1
The Need 1-5
The Purpose 1-5
Issues 1-6
Scoping 1-7

Chapter 2 — The Alternatives
Introduction 2-1
Changes Between Draft and Final 2-1
Background/Existing Port-Orford-Cedar Standards and Guidelines 2-2
The Sandy-Remote Lawsuit 2-5
The Supplemental Environmental Impact Statement 2-6
Endangered Species Consultation 2-7
The Planning Area 2-7
Relationship of Alternatives to Existing Management Plans 2-8
Bureau of Land Management 2-8
Forest Service 2-8
The Alternatives 2-9
Overview 2-9
Standards and Guidelines for Each Alternative 2-11
Alternative 1 — Continue Existing Direction 2-11
Alternative 2 — General Direction Plus Risk Key (Proposed Action) 2-14
Alternative 3 — Port-Orford-Cedar Cores and Buffers in 6th Field Watersheds 2-23
Alternative 4 — Passive Project Management with Accelerated Resistance Breeding 2-25
Alternative 5 — Passive Project Management with Reduced Resistance Breeding 2-27
Alternative 6 — Port-Orford-Cedar Cores and Buffers in 7th Field Watersheds 2-27

Alternatives Considered But Eliminated From Detailed Study 2-30
Comparison of the Effects of the Alternatives 2-40
Potential Mitigation Measures 2-46

Chapter 3&4 — Affected Environment and Environmental Consequences
Introduction ..... 3&4-1
Changes Between Draft and Final ..... 3&4-2
Incomplete and Unavailable Information ..... 3&4-2
Cumulative Effects ..... 3&4-5
California Portion of the Range ..... 3&4-7
Siuslaw National Forest, Oregon Caves National Monument ..... 3&4-8
Port-Orford-Cedar Management on Non-Federal Lands in Oregon ..... 3&4-8
Timber Harvest on Private Lands Within the Range of Port-Orford-Cedar ..... 3&4-9
Temporal Effects ..... 3&4-11
Past Harvest and Mortality of Port-Orford-Cedar, All Lands ..... 3&4-12
Relationship of this Supplemental Environmental Impact Statement to the Northwest Forest Plan ..... 3&4-12
Encumbered Forest Roads ..... 3&4-15
Assumptions and Clarifications ..... 3&4-16
Planting Assumption ..... 3&4-18
Port-Orford-Cedar Background ..... 3&4-19
Species Range ..... 3&4-19
Autecology ..... 3&4-19
Geomorphic Position ..... 3&4-20
Moisture Regime ..... 3&4-20
Summary of Limitations on Distribution ..... 3&4-20
Life History ..... 3&4-21
Historical Setting ..... 3&4-21
Distribution Across the Range ..... 3&4-22
North Coast Risk Region ..... 3&4-22
Inland Siskiyou Risk Region ..... 3&4-25
Siskiyou Risk Region ..... 3&4-26
Disjunct California Risk Region ..... 3&4-29
Port-Orford-Cedar Acreage Data ..... 3&4-29
Geographic Information System ..... 3&4-29
Current Vegetation Survey ..... 3&4-32
Aerial Mortality and Defoliation Surveys — Oregon ..... 3&4-33
Resource Elements That Address Issues ..... 3&4-34
Introduction ..... 3&4-34
Pathology ..... 3&4-34
Ultramafic Soils ..... 3&4-52
Ecology and Plant Associations ..... 3&4-54
Botany ..... 3&4-71
Water and Fisheries ..... 3&4-76
Wildlife ..... 3&4-98
Pacific Yew ..... 3&4-105
Genetics and Resistance ..... 3&4-106
Fire and Fuels ..... 3&4-125

Air Quality ..... 3&4-136
Recreation, Visual, Wilderness, and Wild and Scenic Rivers ..... 3&4-136
Areas of Critical Environmental Concern and
Research Natural Areas ..... 3&4-140
Culturally Significant Products for American Indian Tribes ..... 3&4-142
Special Forest Products ..... 3&4-144
Timber Harvest ..... 3&4-147
Livestock Grazing ..... 3&4-153
Mining ..... 3&4-154
Costs ..... 3&4-156
Environmental Justice ..... 3&4-160
Civil Rights Impact Assessment ..... 3&4-162
Critical Elements of the Human Environment ..... 3&4-164
Other Environmental Consequences ..... 3&4-164

Chapter 5 — Preparers, References, Glossary, Distribution List, and Index
Changes Between Draft and Final 5-1
Preparers 5-1
Port-Orford-Cedar-SEIS Core Team 5-1
Technical Specialists 5-2
Technical Consultant 5-5
Administrative and Technical Support 5-5
References 5-7
Glossary 5-29
Distribution List 5-45
Index 5-49

Appendices
Changes Between Draft and Final A-1
Appendix 1: Port-Orford-Cedar Management Guidelines A-1
I. Introduction A-4
II. *Phytophthora lateralis* and Port-Orford-Cedar A-4
III. *Phytophthora lateralis* and Pacific Yew A-5
IV. Management Objectives for Port-Orford-Cedar A-5
V. Implementation Strategy to Achieve Port-Orford-Cedar
Management Objectives A-6
VI. Mitigation Measures for Timber Sale and Service Contracts A-12

Appendix 2: Summary of Agency Actions for Fiscal Years 2001 and 2002
Under the Existing Direction for Port-Orford-Cedar A-24
Overview of Current Port-Orford-Cedar Program Implementation A-24
Existing Programmatic Actions A-27

Appendix 3: Port-Orford-Cedar Standards and Guidelines
in the Land and Resource Management Plans in Region 5
(SEIS Cooperating Agencies) and the Siuslaw National Forest A-31
Existing Direction — Six Rivers National Forest A-31
Existing Direction — Klamath National Forest A-37
Existing Direction — Shasta-Trinity National Forest A-38

Existing Direction — Siuslaw National Forest A-39

Appendix 4: Clorox Use, Toxicity, Potential Environmental Effects, and Label Information A-40
Introduction and Use A-40
Toxicity and Potential Environmental Effects A-40
Clorox Label Information A-42

Appendix 5: Monitoring Plans for Each Alternative A-44
Alternative 1 ..... A-44
Alternatives 2–6 ..... A-44

Appendix 6: Resistant Port-Orford-Cedar Planting and Growth Assumptions A-46

Appendix 7: Biological Evaluations A-50
Wildlife A-50
Botany A-62
Fisheries A-69

Appendix 8: Areas of Critical Environmental Concern and Research Natural Areas and Requirements for Designation A-75
Areas of Critical Environmental Concern A-75
Research Natural Areas A-77

Appendix 9: Summary of Modeled Potential Stream Temperature Increases Resulting from Port-Orford-Cedar Mortality A-80

Appendix 10: Response to Public Comments A-81
Introduction A-81
Organization A-81
Public Comments and Agency Responses A-83
Summary A-83
Chapter 1 ..... A-83
Chapter 2 ..... A-92
Chapter 3&4 ..... A-119
Chapter 5 ..... A-170
Appendices A-171

Appendix 11: Reprinted Comment Letters from Governmental Entities A-177

Appendix 12: Port-Orford-Cedar Disease-Free Watersheds A-186

Appendix 13: Equipment Cleaning Checklist A-191

Tables

Table S-1.—*Summary of alternatives considered in detail* S-1
Table S-2.—*Summary and comparison of the environmental consequences [effects] of the alternatives* S-4

Table 2-1.—*Port-Orford-Cedar Risk Key: Site-specific analysis to help determine where risk reduction management practices would be applied* 2-18
Table 2-2.—*Alternative 3, summary of 6th field watershed cores and buffers* 2-24
Table 2-3.—*Alternative 6, summary of 7th field watershed cores and buffers* 2-28
Table 2-4.—*100-year infestation prediction for Oregon by alternative* 2-42
Table 2-5.—*Summary and comparison of the environmental consequences [effects] of the alternatives* 2-45
Table 2-6.—*Identified adverse environmental effects and possible mitigation measures* 2-48

Table 3&4-1.—*Average yearly private harvest levels for all species within the natural range of Port-Orford-cedar, 1995–2001* ..... 3&4-10
Table 3&4-2.—*Port-Orford-cedar standing inventory and harvest volume for private lands* ..... 3&4-11
Table 3&4-3.—*Gross Oregon Federal and presence of Port-Orford-cedar [acres] by Northwest Forest Plan land allocation within the natural range of Port-Orford-cedar in Oregon* ..... 3&4-14
Table 3&4-4.—*Port-Orford-cedar acres on BLM and FS lands grouped by ecoregion and pathology risk regions, Oregon and California* ..... 3&4-22
Table 3&4-5.—*Geographic information system-mapped Port-Orford-cedar and* Phytophthora lateralis *infestation acreage on BLM and FS, post-Biscuit Fire* ..... 3&4-30
Table 3&4-6.—*Current Vegetation Survey: Summary from Forest Inventory Plots of live and dead POC trees* ..... 3&4-33
Table 3&4-7.—*Summary of aerial mortality and defoliation survey results for Port-Orford-cedar in Oregon, 2000–2002* ..... 3&4-33
Table 3&4-8.—*Percent of currently healthy drainages [infested high-risk areas] predicted to become infested within 100 years by alternative* ..... 3&4-47
Table 3&4-9.—*Infested and infection estimates, Oregon* ..... 3&4-52
Table 3&4-10.—*100-year infestation prediction for Oregon by alternative* ..... 3&4-53
Table 3&4-11.—*Average abundance [as indicated by percent cover] of Port-Orford-ceder in plant association groups where POC is prominent in the overstory* ..... 3&4-58
Table 3&4-12.—*Estimated acreages of stands with Port-Orford-cedar prominent in the overstory and infected acres [in parentheses] by geographic area and plant association group* ..... 3&4-59
Table 3&4-13.—*Average abundance [as indicated by percent cover] of Port-Orford-cedar in plant association groups where Port-Orford-cedar is prominent in the ovestory* ..... 3&4-59
Table 3&4-14.—*Snags and downed woody material by plant association group* ..... 3&4-61

Table 3&4-15.—*Relationship of Port-Orford-cedar ecoregions/ geographic areas to risk regions [in acres] where Port-Orford-cedar is prominent in the overstory* ..... 3&4-62
Table 3&4-16.—*Species richness of plant associations containing Port-Orford-cedar by geographic area and plant association group [in average number of plants]* ..... 3&4-64
Table 3&4-17.—*Predicted infestation acres in 100 years by subdivisions of plant association groups where Port-Orford-cedar is prominent in the overstory* ..... 3&4-66
Table 3&4-18.—*Riparian and stream attributes in differing morphologies and relationship to* Phytophthera lateralis ..... 3&4-88
Table 3&4-19.—*Regional hydrologic/aquatic differences and effects from Port-Orford-Cedar-infection* ..... 3&4-90
Table 3&4-20.—*Numbers of wildlife species associated with the Southwest Oregon-Mixed Conifer habitat type* ..... 3&4-100
Table 3&4-21.—*Projected resistant seed availability per breeding zone by alternative* ..... 3&4-111
Table 3&4-22.—*Acres by Northwest Forest Plan land allocation and administrative unit within the range of Port-Orford-cedar in Oregon* ..... 3&4-147
Table 3&4-23.—*Annual probable sale quantity [PSQ] in millions of board feet annually by administrative unit and within the range of Port-Orford-cedar* ..... 3&4-148
Table 3&4-24a.—*Alternative 3 Port-Orford-cedar core acres and resultant PSQ reduction for Oregon* ..... 3&4-151
Table 3&4-24b.—*Alternative 6 Port-Orford-cedar core acres and resultant PSQ reduction for Oregon* ..... 3&4-152
Table 3&4-25.—*Livestock grazing allotments within the range of Port-Orford-cedar on BLM- and FS-administered lands* ..... 3&4-154
Table 3&4-26.—*Summary of average annual Port-Orford-cedar program costs [$] by category and alternative* ..... 3&4-157
Table 3&4-27.—*Demographic statistics within the Oregon portion of the range of Port-Orford-cedar [2000 Census]* ..... 3&4-161
Table 3&4-28.—*Average earnings and unemployment rate for the Oregon counties within the range of POC* ..... 3&4-161
Table 3&4-29.—*Critical elements of the human environment* ..... 3&4-165

Table A7-1.—*BLM special status and FS sensitive animal species that are documented or suspected to occur within the Coos Bay, Medford, and Roseburg BLM Districts and the Siskiyou National Forest* A-59
Table A7-2.—*Threatened [T] or endangered [E] vascular plants within the range of Port-orford-cedar* A-65
Table A7-3.—*Vascular plants listed as BLM Bureau sensitive/assessment and Forest Service sensitive documented or suspected within close proximity of Port-Orford-cedar* A-66
Table A8-1.—*Areas of critical environmental concern and research natural areas within the range of Port-Orford-cedar in Oregon that contain healthy Port-Orford-cedar or are infested with* Phytophthora lateralis A-75

Table A8-2.—*Areas of critical environmental concern and research natural areas within the range of Port-Orford-cedar in Oregon that contain healthy Port-Orford-cedar or are infested with* Phytophthora lateralis A-76
Table A9-1.—*Mortality parameters for SHADOW stream temperature effects* A-80
Table A9-2.—*Summary of predicted shade decrease and temperature increase for August 1, comparison of uninfested and infested riparian areas with 100 percent Port-Orford-cedar* A-80
Table A10-1.—*Draft POC-SEIS public comment period respondents* A-82
Table A12-1.—*Port-Orford-cedar disease-free 6th field (Alternative 3) watersheds* A-186
Table A12-2.—*Port-Orford-cedar disease-free 7th field (Alternative 6) watersheds* A-187

Figures

Figure 1-1.—*The natural range of Port-Orford-cedar* 1-2
Figure 2-1.—*Current acres of Port-Orford-cedar in Oregon and predicted acres of infestations at 100 years by alternative* 2-44
Figure 3&4-1.—*Progression of Port-Orford-cedar root disease within a drainage after* Phytophthora lateralis *is introduced and becomes established* ..... 3&4-44
Figure 3&4-2.—*Port-Orford-cedar breeding blocks* ..... 3&4-109

Maps

Map 1: *Alternative 3 – Uninfested 6th-Field Watersheds Showing Port-Orford-Cedar Locations and Northwest Forest Plan Land Allocations*
Map 2: *Alternative 6 – Uninfested 7th-Field Watersheds, Showing Port-Orford-Cedar Locations and Northwest Forest Plan Land Allocations*
Map 3: Phytophthora lateralis *and Port-Orford-Cedar by Northwest Forest Plan Land Allocation for the Oregon Portions of the Range*
Map 4: *Port-Orford-Cedar Occurrence and Range, and Ecoregions Table*

Acronyms/Abbreviations

ACEC ~ Area of Critical Environmental Concern
BLM ~ Bureau of Land Management
CVS ~ Current Vegetation Survey
EA ~ Environmental Assessment
EIS ~ Environmental Impact Statement
FS ~ Forest Service
GIS ~ Geographic (mapping) Information System
LSR ~ Late-Successional Reserve
NF ~ National Forest
NOAA Fisheries ~ National Oceanic & Atmospheric Administration-Fisheries (formerly NMFS-National Marine Fisheries Service)
NRA ~ National Recreation Area
POC ~ Port-Orford-cedar
PL ~ *Phytophthora lateralis*
PSQ ~ Probable Sale Quantity
RNA ~ Research Natural Area
RMP ~ Resource Management Plan
Region 6 ~ Forest Service Region generally covering Oregon and Washington
Region 5 ~ Forest Service Region generally covering California
SEIS ~ Supplemental Environmental Impact Statement
USFWS ~ U.S. Fish & Wildlife Service
U.S. ~ United States

Summary —

Introduction and Need

Port-Orford-cedar (POC) is a unique conifer growing only in Southwestern Oregon and Northwestern California. For a variety of reasons, including its ability to tolerate ultramafic (serpentine) soils and live along streams and other wet sites, it plays a significant ecological role in some forest communities. POC also supplies unique forest products, including wooden arrow stock, wood for Japanese soaking tubs and temples, aromatic storage boxes for American Indian ceremonial materials, and long-lasting cedar boughs. In 1952 an exotic root disease was identified killing the cedar near Coos Bay. Since that time the disease has spread across much of its range, killing POC and threatening to reduce its ecological function and product availability.

The Agencies have a Need for the maintenance of POC as an ecologically and economically significant species on Bureau of Land Management (BLM) and National Forest (NF) lands. Currently, direction in existing land and resource management plans places an emphasis on reducing the spread of POC root disease and maintaining POC through use of a wide variety of management practices, generally applied at the project level following site-specific analysis. This supplemental environmental impact statement (SEIS) examines the environmental consequences of the current direction and five other alternatives.

Why is the Action Being Proposed?

The existing POC management direction was included in Agency land and resource management plans adopted in 1989 and 1995, with little visible analysis regarding how well that direction would work at the range-wide and long-term scales. The direction generally incorporates BLM or references Forest Service (FS) guidelines and policies directing development and application of all practicable management practices to control the spread of the root disease, and to develop disease-resistant trees through a breeding program to help replace trees lost to the disease.

However, in March, 2002 a decision by the U.S. Court of Appeals for the Ninth Circuit found that a BLM project-specific environmental analysis had not adequately considered cumulative effects to the health of POC over its entire range in view of reasonably foreseeable actions of the Agency and others. A follow-up decision by the U.S. District Court of the District of Oregon ruled that the EIS for the Coos Bay District resource management plan was inadequate under the "National Environmental Policy Act" (NEPA) because it did not include an analysis of reasonable foreseeable future timber sales and other actions on the root disease and POC. The Court went on to enjoin timber sale activities and related road building and maintenance in the project area until

> . . . BLM completes adequate analysis of the direct, indirect, and cumulative impacts on *Phytophthora lateralis* and Port-Orford-cedar.

It is important to note that the Court did not necessarily find a deficiency with the current management direction itself, only that the analysis supporting it was inadequate. This SEIS supplies the missing analysis, and presents alternatives to the current direction for analysis as well, in order to provide a context (or range of effects) from which the decision-makers can make an informed choice about the level of disease control needed.

What Would It Mean Not to Meet the Need?

One of two major objectives of the SEIS is to identify and define the ecological and economic role of POC. The ecological role of POC is described in the Affected Environment SEIS sections for botany, water, fisheries, wildlife, and soils. Other SEIS sections cover economically significance with respect to timber harvest, special forest products, recreation, and other areas. The analysis indicates that with a "passive management" alternative (Alternative 5 in the SEIS), root disease progression would lead to stream temperatures above State standards in some ultramafic soil areas, significant mortality for some populations of endangered coho salmon, loss of shade or physical protection for some rare or unique plants growing in POC plant communities, possible loss of rare genes, and POC mortality that would detract from recreation, wilderness, and other values. However, even this alternative would not lead to extirpation of POC or loss of unique genetic variations.

As a result of the analysis, Alternative 5 arguably does not meet the Need. However, ecological and economic significance is a continuum, with no specific level of effects dictating a "yes/no" point. It appears that a fairly wide range of alternatives could meet the Need, although alternatives that are overly restrictive would affect the Agencies' ability to meet other multiple-use objectives. The analysis displays the positive and negative impacts of each alternative, and it will be up to the decision-makers to choose one that meets the Need, and best meets the Purpose of supplying the most cost-efficient balance of positive and negative effects.

What Action is Proposed?

The Agencies propose to amend the land and resource management plans for the Coos Bay, Medford, and Roseburg BLM Districts and the Siskiyou NF by removing the existing direction for management of POC root disease and replacing it with the direction in Alternative 2. Alternative 2 describes all currently available disease-control practices, dividing them between those that should be applied generally and those that may, depending upon site conditions, be applied to specific management activities. For the latter group, a risk key is included to clarify the environmental conditions that require implementation of one or more of the listed disease-controlling management practices. POC stands in the 162 currently uninfested 7th field watersheds are highlighted for protection under the risk key as well. The differences, when compared with the current direction, are a more consistent implementation of available treatments based on the risk key, and an emphasis placed on keeping PL out of currently uninfested 7th field watersheds. Alternative 2 is described in detail in Chapter 2.

Are There Other Alternatives that Would Meet the Need?

Yes. Many comments were received during the scoping phase for this project (February 10 through March 12, 2003), and during the public comment period for the draft SEIS (June 13 through September 12, 2003). Commenters suggested various ideas for meeting the Need, and many of these were incorporated into alternatives considered in detail. Of the six alternatives considered in detail in this SEIS and summarized in Table S-1, several appear to meet the Need.

What are the Effects of the Alternatives?

The major environmental consequences (effects, or impacts) of the six alternatives are discussed in detail in Chapter 3&4 and summarized on Table S-2. A major finding of the analysis is that POC is not in danger of extirpation under any of the alternatives. POC is at significant risk of root disease infection only on high-risk sites. High-risk sites are low-lying wet areas that are located downslope from already infested areas or below likely sites for future introductions, especially roads. They include streams, drainage ditches, gullies, swamps, seeps, ponds, lakes, and concave low-lying areas where water collects during rainy weather. (POC away from such areas, or near streams or bodies of water, but whose roots do not extend below the high watermark for flooding, are at low risk of infection.)

Table S-1.—*Summary of alternatives considered in detail*

Alternative	Project Analysis	Practices to be Applied	Resistance Breeding [1]
1 - Current Direction	Site-specific.	All known disease-control practices, as needed, and resistant seedling planting as available. Includes many not described in Standards and Guidelines.	Current level
2 - Proposed Action/Proposed resource management amendment	Site-specific with risk key to guide analysis and set limits.	All known disease-control practices, as needed, and resistant seedling planting as available. Current practices are all described in Standards and Guidelines. Emphasis added for 162 currently uninfested 7th field watersheds.	Current level
3	Site-specific with risk key to guide analysis and set limits.	All known disease-control practices, as needed, and resistant seedling planting as available. Current practices are all described in Standards and Guidelines. Also identifies 31 currently uninfested 6th field watersheds for further access limitations and no timber harvest in POC stands.	Current level
4	Site-specific only to determine where to use resistant stock.	Only planting of resistant stock where mortality has had the most adverse impact. No disease-control practices.	Accelerated level
5	Site-specific only to determine where to use existing resistant stock.	Only planting of existing resistant stock where mortality has had the most adverse impact. No disease-control practices.	Use existing developed sources only
6	Site-specific with risk key to guide analysis and set limits.	All known disease control practices, as needed, and resistant seedling planting as available. Current practices are all described in Standards and Guidelines. Also identifies 162 currently uninfested 7th field watersheds for further access limitations and no timber harvest in POC stands.	Current level

[1] Current level will develop disease-resistance seed for all breeding zones within 45 years. Accelerated level will develop this same seed within 10 years. Use of existing developed sources only will maintain the existing seed orchard covering 5 of the 19 breeding zones in Oregon, but stop any further field identification of resistant parents and development of additional zones.

Table S-2.—*Summary and comparison of the environmental consequences [effects] of the alternatives*

Resource/topic	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Pathology	57,300 acres [21%] infested in 100 years, 64% of high risk riparian.	51,600 acres [19%] infested in 100 years, 58% of high risk riparian.	45,800 acres [17%] infested in 100 years, 51% of high risk riparian.	80,300 acres [30%] infested in 100 years, 90% of high risk riparian.	80,300 acres [30%] infested in 100 years, 90% of high risk riparian.	44,700 acres [16%] infested in 100 years, 50% in high risk riparian.
Ecology and Plant Associations	Possible losses in species diversity and ecological function in one or more of 64 identified plant associations where POC is a prominent component; more of a concern in ultramafic soils where POC is a component; effect by alternative is proportional to acres infested. Some rare and/or riparian plant associations could suffer substantial POC mortality, thus altering their contributions to stream shading and structure, nutrient cycling, downed wood, and other functions.					
Botany	There are probably benefits to some rare plants proportional to decreased infestation acres because of reduced shading and other protection. Also Alternatives 1, 2, 3, and 6 road closures reduce noxious weed introductions and trampling. However, some rare plants benefit when nearby cedars die. No negative effects to agency sensitive, threatened, or endangered plants are identified.					
Water and Fisheries	Insignificant coho salmon and steelhead loss due to temperature increases. Possible localized mortality of salmonids from Clorox in fire suppression water drops and tanker spills. Road closures benefit water quality and fish; more so in Alternatives 3 and 6.			Increased temperature in ultramafic areas results in significant coho salmon [ESA listed] and steelhead loss. Less than 5% of coho spawn in ultramafic streams, but temperature increases affect other parts of the system.		Same as Alternatives 1-3.
Wildlife	There are no species dependent specifically upon POC, but spotted owl and murrelet are "may affect" because of large-tree losses in habitat. Because pure stands are the exception, other effects are minimal. In Alternatives 3 and 6, late-successional forest-related wildlife benefits from reduced timber harvest, but reduced Late-Successional Reserve thinning could slightly reduce future habitat for these samespecies. Alternatives 1, 2, 3, and 4 possible localized mortality of aquatic species from Clorox fire-suppression spills or water drops.					
Ultramafic Soils	No known difference in effects to soil productivity. Small POC mortality-related effect on soil stability; highest in Alternatives 4 and 5, lowest in Alternatives 3 and 6.					
Pacific Yew	Yew infections will be rare and inconsequential under all alternatives.					
Genetics	POC survival in all alternatives is sufficient to avoid loss of common genes and prevent large scale population divergence. Loss of rare genes possible, not significantly different than natural levels.					
Resistance	Good major gene resistance and early fruiting of POC, plus very limited genetic variability in the pathogen, predicts successful development of durable resistant stock for replanting infested areas					
	Stock available in all breeding zones within 45 years.			Stock available in all breeding zones in 10 years.	Stock limited to current level [26% of breeding zones].	Stock available in all breeding zones within 45 years.
Fire and Fuels	Increased suppression and fuel treatment costs about 2 percent [Alternative 3 and 6 slightly more]. Alternative 3 would reduce access to 51,000 acres and prohibit using timber harvest for fuels treatment on 2,700 acres of wildland-urban interface. Alternative 6 would reduce access to 19,800 acres and prohibit using timber harvest for fuels treatment on 3,240 acres of wildland-urban interface.			No costs associated with POC disease control [possible fuels increase associated with mortality is insignificant].		See Alternatives 1-3.
Air Quality	Air quality effects are unquantifiable and inconsequential under all alternatives.					
Recreation, Visual, Wilderness, and Wild and Scenic Rivers	Negative effects to some users if roads and areas closed; greatest in Alternative 3 and 6. Positive effects to visuals, wilderness, and wild and scenic river values [esthetic] of reduced mortality.			No restrictions on access. Esthetic impacts increased.		See Alternatives 1-3.
	Resistance breeding mitigates esthetic impacts over time, fastest in Alternative 4; not all areas in Alternative 5.					
Areas of Critical Environmental Concern and Research Natural Areas	The risk of an infestation start in the 14 ACECs or RNAs without PL is proportional to the predicted disease spread for each alternative; highest in Alternatives 4 and 5, lowest in Alternatives 3 and6.					
Cultural Products for Tribes	Insignificant difference between alternatives because of modest levels used and access on other lands.					
Special Forest Products	Current level [4% of bough market], plus firewood and other collections.	Current level of bough collection, and <5% reduction of firewood and other collections.	Current level of bough collection, and slightly more reduction in firewood and other collections than Alternative 2.	Increase of bough harvest by 100 to 200 tons annually, plus slight increase in firewood and other collections from current levels.		Slight increase in bough collection. Reduction in firewood and other collections similar to Alternative 3.
Timber Harvest	Continue current cost to purchasers of about $0.80/thousand board feet.			Removal of current $0.80/thousand bd ft mitigation costs.		Continue $0.80/MBF
	No change.	Incalculable reduction in volume offered.	Decrease in PSQ approximately 0.65 million board feet and no thinning in 6,000 Late-Successional Reserve acres.	No effect of PSQ or volume offered.		Decrease in PSQ approximately 0.9 million board feet and no thinning in 9,000 Late-Successional Reserve acres.
Livestock Grazing	Little effect on permit operations.		Could close roads within, but not to, 2 allotments.	No effect on permit operations.		Possible effects on 3 allotments.
Mining	Potential cost increases for PL-reducing practices and possibly restoration.			Possible restoration costs.	Probably no effect.	Same as Alternatives 1-3.
Direct Costs	$860,000	$846,000	$932,000	$477,000	$93,000	993,000
Environmental Justice and Civil Rights	Current level.	Slight job decrease, primarily affecting Asians and Hispanics.	Job decrease includes 7 timber jobs, a few Asian and Hispanic special forest products collectors.	Job increase of 6 related to bough collection.		Job decrease includes 10 timber jobs, a few Asian and Hispanic special forest products collectors.
Critical Elements	Alternatives 1, 2, 3, and 6 could increase energy transmission costs; other effects are included in resource sections above.					
Note: The planning area includes 1.5 million acres of Federal lands and 272,000 acres with some level of POC stocking, a projected 34,400 of which are infested with root disease.						

There are approximately 272,000 acres of Federal land containing POC in Oregon, with about 33 percent on high-risk sites (including 13 percent currently infested). The percent of the area in high-risk sites varies across the range, from 20 percent in the northwest where POC is broadly dispersed across the landscape, to 60 percent inland where POC is more concentrated in riparian areas. The management direction in the various alternatives would affect the percentage of high-risk sites that will become infested by the root disease in the future. According to predictions described in the Pathology section of Chapter 3&4, the percentage of currently uninfested high-risk areas that will become infested in the next 100 years is 40, 30, 20, 80, 80, and 18 percent for Alternatives 1, 2, 3, 4, 5, and 6, respectively. From these projections, the POC acreage, percent in high-risk sites, and existing infestation rate, a prediction of the acres and percent of area expected to be infested in 100 years under each alternative can be made (see Table S-2).

The predicted root disease infestation rates and resultant POC mortality have "indirect" effects to various ecosystem processes and values, and these vary by alternative (see Table S-2). It is important to note that these indirect effects do not all occur at once, but occur over the next 100 years as the disease advances into new areas. There are also "direct" effects from the Standards and Guidelines themselves. Closing roads or prohibiting timber harvest directly affects forest users, timber outputs, and jobs. In general across the range of alternatives, as the negative direct effects increase, the negative indirect effects decrease, and vice versa (Table S-2).

Can Any of the Adverse Effects be Mitigated?

Chapter 2 includes a detailed discussion of possible mitigation measures for each of the potential and likely adverse effects identified in the SEIS (Table 2-5). These are generally not part of all alternatives, but were considered by the SEIS Team and could be added to the selected alternative by the decision-makers if they chose. These mitigations include applying parts of other alternatives, mixing Clorox bleach away from streams, improving risk mapping, limiting access and use in POC areas, making exceptions for certain uses, and others.

A long-term "mitigation" is included within Alternatives 1, 2, 3, 6, and particularly Alternative 4; and already under way is a resistance breeding program. (Alternative 5 would discontinue the current breeding program, but continue to use resistance stock in the 26 percent of the breeding zones for which it has already been developed.) The Agencies expect the resistance breeding program to mitigate at least some of the adverse indirect effects in the long term (generally 100 years and longer), as POC planted to replace some of those killed by the disease gradually become large enough to provide significant ecological benefits. Alternative 4 is scheduled to have seed for all breeding zones within 10 years, while Alternatives 1, 2, 3, and 6 are scheduled to have seed for all zones within 45 years. Although there are long-term uncertainties in any resistance breeding program, the chance for durable resistance in POC is good because it appears to have major gene resistance, the pathogen itself has a very narrow genetic base indicating a low likelihood of it adapting to kill resistant trees, and POC in seed orchard conditions begins to produce cones as early as age 5, which makes a rapid breeding program possible.

The first resistant POC were field planted in the Biscuit Fire area in November 2003. The ability of resistant seedlings to eventually mitigate disease losses will depend on Agency

funding, time, and on where the Agencies use them. Fortunately, every dead tree need not be replaced by direct planting. POC's propensity for seed production at a relatively young age (around 25 in field conditions) means successful plantings of a few dozen resistant trees in an infested area should be sufficient to begin a cycle of natural regeneration of resistant or partially-resistant stock.

What Factors Will be Used in Making the Decision Between Alternatives?

The BLM State Director and the Forest Supervisor for the Rogue River and Siskiyou NFs will decide which alternatives meet the underlying Need for this proposal. They will also weigh how well each of the alternatives meets the Purpose of slowing the spread of the root disease enough to maintain POC's significant ecological and economic functions, without the cost of the management strategy exceeding its effect on the value of these functions. Since the ecological and economic significance of POC is not a yes/no question, but is best represented as relative value points on a continuum, they will balance two types of information so that a cost/benefit decision can be made about each alternative. The two types of information are addressed in the SEIS by responding to the following two issues:

Question 1. What is the ecological and economic significance of POC in the landscape and how is this affected by various levels of POC mortality?

Considerations include:

- The role of POC in stream function and fish habitat;
- the role of POC in terrestrial habitats for listed, rare, or unique plants;
- the role of POC in terrestrial habitats for listed, rare, or unique animals;
- the role of POC for contemporary Tribal uses;
- the role of POC for boughs and specialty woods;
- the role of POC in maintaining and improving soils;
- whether significant genetic resources are at risk of loss; and
- the role of POC in ecosystem function and the maintenance of significant plant associations.

Question 2. What factors affect the spread of the disease, what management techniques can minimize those factors, and what are the costs and benefits of implementing an appropriate mix of disease-reducing management techniques in terms of (a) direct financial costs, (b) maintaining the ecological and economic value of POC itself, and (c) the positive and negative effects to other (non-POC) resource values or uses?

Considerations include:

- Identification of the current management practices and other factors that may spread the root disease, and their relative importance. These include timber harvest, special forest product collection, off-highway vehicle travel and other recreation activity, mining, fire suppression and fuels treatments, domestic livestock grazing, and activities on private lands.

- Identification of management practices that can reduce disease spread, and their relative effectiveness (these are included in the alternatives).

- Identification of forest uses or management needs that will be constrained by implementation of various management practices, either because of cost or because of reduced access (this is the same list as above).

- Identification of forest resources (other than POC) that will also benefit from implementation of various disease-reducing management practices.

Information about these issues and how each is affected by the alternatives is included in the effects discussions in Chapter 3&4.

What Monitoring is Necessary?

Monitoring is specified as part of each of the alternatives (Chapter 2 and Appendix 5). Where applicable to the specific elements of an alternative, this monitoring includes tracking the success of the resistance breeding program, annual program summaries and evaluation reports, tracking *Phytophthora lateralis* (PL) spread and comparing it to projections in the SEIS, and incorporating POC management requirements in all regularly-scheduled project-implementation monitoring. Pathologists will help evaluate the effectiveness of existing root disease control techniques and help develop others. The Agencies will continue to maintain infestation maps and forest inventories to track progress of the disease.

Which Alternative is the Preferred/Proposed Resource Management Plan Amendment?

Based on consideration of the environmental consequences in the final SEIS, Alternative 2 was found to best meet the Purpose and Need, and is the FS Preferred Alternative and the BLM Proposed Resource Management Plan Amendment. The clarification of existing management practices, related monitoring and research, plus the addition of the POC Risk Key and the added emphasis on uninfested 7th field watersheds, provides good long-term control of PL. Predicted effects to "Endangered Species Act"-listed species are reduced from what would result under current direction and are not significant, and the Agencies' ability to consider fuels, forest health, and habitat improvement treatments within the wildland-urban interface and Late-Successional Reserves is retained. Alternative 2 provides the best balance between control and continuation of other forest uses, and therefore best meets the Purpose and Need.

Chapter 1 — Introduction, Purpose, and Need

Introduction

This supplemental environmental impact statement (SEIS), prepared jointly by the U.S. Department of the Interior (USDI)-Bureau of Land Management (BLM) Oregon/Washington State Office and U.S. Department of Agriculture (USDA)-Forest Service (FS) Region 6, assesses management alternatives for Port-Orford-cedar within BLM districts and one national forest (NF) in Oregon. A decision selecting one of the Action Alternatives from this SEIS would amend the land and resource management plans for the Coos Bay, Medford, and Roseburg BLM Districts, and the Siskiyou NF. The responsible officials are the BLM State Director for Oregon/Washington and Forest Supervisor for the Rogue River and Siskiyou NFs. The Klamath NF, Six Rivers NF, and Shasta-Trinity NF of Region 5 are Cooperators.

Changes Between Draft and Final

The following changes were made to Chapter 1 between the draft and final SEIS. Minor corrections, explanations, and edits are not included in this list.

Changes/edits were made to:

- Acknowledge the role past Federal management has had in the spread of PL;
- clarify the relationship between the Ninth Circuit Court decision and the existing resource management plan direction; and
- clarify that meeting applicable laws is part of the Purpose.

Background

Port-Orford-cedar (*Chamaecyparis lawsoniana* [A. Murr.] Parl.) (Port-Orford-cedar will hereafter be abbreviated POC) is an ecologically and economically important tree species. Its natural range is geographically limited to southwestern Oregon and northwestern California (Figure 1-1), but within that area, it occupies a broad environmental range. Except in the northern part of its range where it is widespread, POC grows primarily along streams and in areas with year-round seepage. It often grows within the active stream channel, where, as large, old trees, it provides shade and long-lasting stream structure (Hansen et al. 2000b). POC can be found on ultramafic soils (serpentines) as well as on nonultramafic soils. Its unique ability to grow well on ultramafic soils makes it the largest tree on many sites, and therefore important for contributing shade and coarse wood in certain stream systems, and for contributing snags and large logs to terrestrial habitats. POC occurs in association with many rare plants, most notably in plant associations on ultramafic soils where it plays a prominent

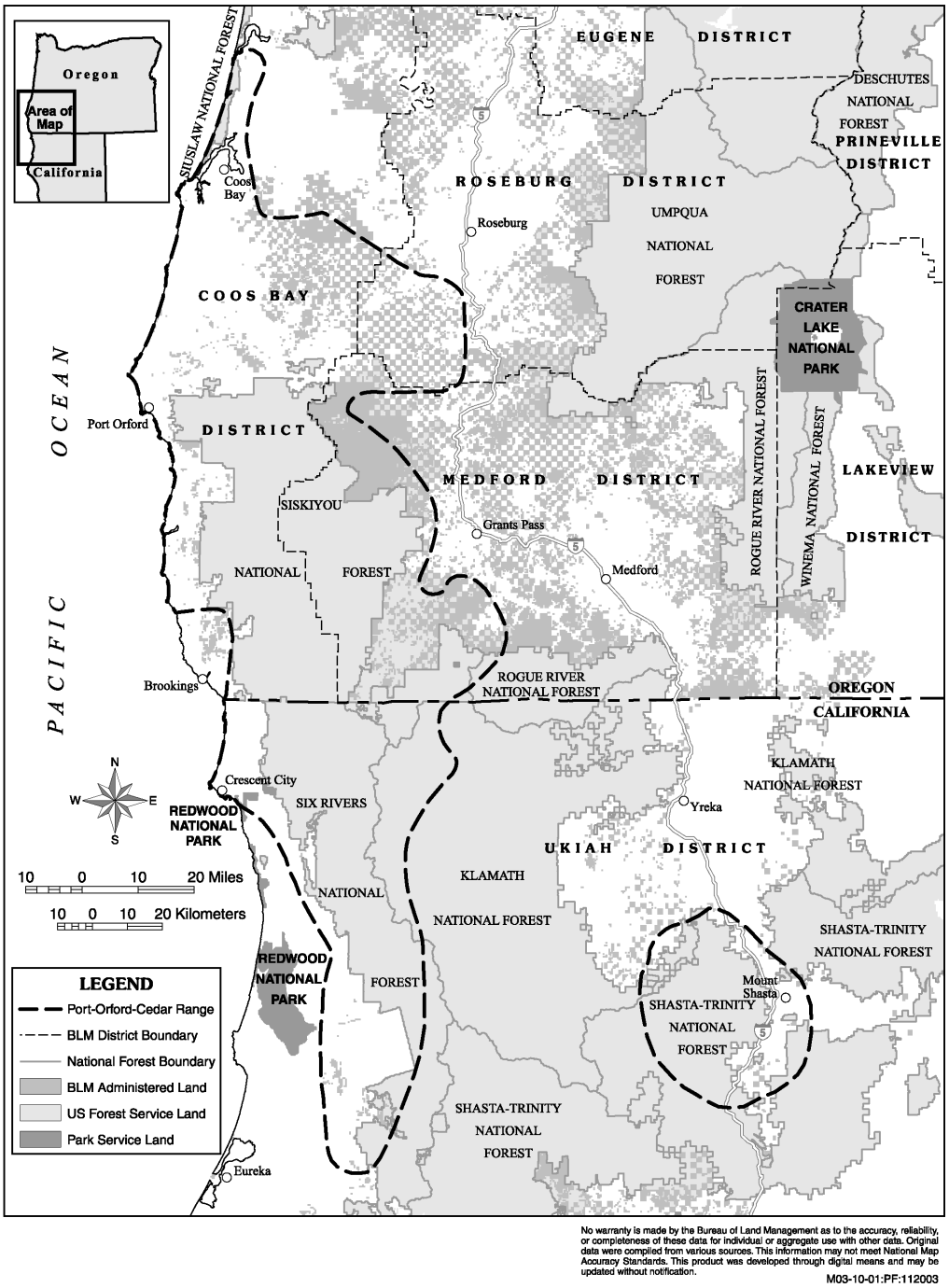

Figure 1-1.—*The natural range of Port-Orford-cedar*

role in the overstory. By recycling calcium onto the surface soil, POC may help improve soil fertility, an important quality in harsh ultramafic environments (Ullian and Jules 2000).

Top quality POC logs are currently valued at $2,500 per thousand board feet, and have been valued as high as $12,000 per thousand board feet. Properties of POC wood that make it valuable are its precise machining capability, decay resistance, resistance to chemical corrosion, and aromatic quality. POC is valued in Japan where it is used as a substitute for Hinoki

cypress (*Chamaecyparis obtusa*) in traditional construction and in the reconstruction of temples and shrines (Hansen et al. 2000b).

POC plays a significant role in the cultural, medicinal, and religious life of many Tribes that live within its range. Because of its durability, POC is still used to construct living and sweat houses, both of which hold ceremonial functions. American Indians use many parts of the POC tree: Shoot tips are used to heal lungs, throats, and toothaches; leaves are used to treat coughs; and bark and twigs are used to treat kidney problems. Regalia items used in religious ceremonies are made from the wood. Other items, such as feathers and hides, are stored in POC trunks because the oils and aroma of the wood repels insects (Heffner 1984).

POC is affected by an exotic root pathogen, *Phytophthora lateralis* (*Phytophthora lateralis* will hereafter be abbreviated PL), which was first documented in a nursery near Seattle, Washington, in 1923. Nearly always fatal to the trees it infects, research shows the spread of the pathogen is linked, at least in part, to transport of spore-infested soil by human and other vectors. Water-borne spores then readily spread the pathogen downslope and downstream. Other vectors include animals, but the spread associated with them is slower and more localized. The pathogen spread south from Seattle via infected nursery stock and infested soil, and was first reported in the natural range of POC in 1952 near Coos Bay, Oregon. By 1960, infected trees were found on the Siskiyou NF, and surveys in 1964, 1974, 1983, and 1986 showed increasing levels of infestation and tree mortality. Infected trees were first identified in California in 1980. During that time, scientists and publics began recommending disease-control actions. In part because the disease was spreading uncontrolled throughout private lands in the Coos Bay area, Agency response at that time was limited and irregular. The pathogen now infests about 9 to 15 percent of the federally-administered POC acreage within the range. Most of this acreage is on sites, such as along streams and roads, at high risk to spread the pathogen. Although the disease has spread throughout much of the range and continues to infect more trees in drainages where it is present, approximately 85 to 91 percent of Federal POC acreage is currently uninfested. This is in part because the disease does not readily move above roads or upslope from streams unless carried by some vector, and some trees have a natural resistance to the disease.

In the late 1980s and early 1990s, public awareness of POC and the root disease affecting it reached a high level. In response to public interest and the Agencies' own concerns, the FS and BLM greatly increased their efforts to reduce new occurrences of PL and to maintain POC as an ecologically and economically significant species. Specific management direction was added to each Agencies' land and resource management plans. In general, this direction relies on site-specific analysis at the project level to decide what disease-control practices are needed in each situation. Available practices include:

- Washing equipment and Agency and contractor vehicles traveling between infested and uninfested areas;
- closing roads to prevent nearby stands from becoming infested;
- limiting access and activities to the dry season;
- treatment of water drawn for roadwork or fire suppression;

- removing POC from along roads to reduce the likelihood of spreading the infestation;
- planting on low-risk sites;
- eradicating the host cedar around infections in order to isolate the infested area; and
- selective breeding to take advantage of the natural resistance exhibited by some trees.

These practices appear to be substantially slowing the spread of the disease and reducing its adverse effects to POC's ecological and economic significance. But while agency actions can reduce the rate of disease spread, factors outside of the agencies control will continue to spread the disease. PL is persistent in the soil for several years, and can be transported by animals, hunters, and other vectors, even to areas that have no roads. On wetter areas in the northern part of the range, infected and uninfected POC are well-distributed across the landscape and regenerate readily on disturbed sites, including road cuts and fills. Where such conditions exist on "checkerboard" Federal lands intermingled with private lands, timber hauling and other use may be unrestricted on public and permit roads across Agency lands. Hence, many of the techniques the Agencies might use, including washing vehicles, removing host trees adjacent to roads, or limiting activities to the dry season, are not available or are less effective on these checkerboard ownerships, or are not cost-efficient given the relatively small gain in protection. However, even without active agency management, it is unlikely the disease will kill all POC trees. This is because (1) they produce massive amounts of seed, (2) many trees are located upslope from roads and streams or on drier areas unfavorable to the pathogen, or (3) some are naturally resistant to the disease. A passive-management alternative is included in the SEIS to examine the likely rate of spread and environmental effects.

A small percent of POC appear resistant to the disease. In resistance tests as old as 16 years, a majority of tested seedlings continue to survive in infested soil. An operational resistance breeding program started by the FS and BLM in 1997 has developed resistant populations. Breeding is advancing relatively quickly, in part because POC can develop seed cones at 4 or 5 years of age or sooner in nursery conditions. Resistant seed has been sown in nurseries to be used to restore areas burned in the 2002 Biscuit Fire in southwest Oregon. The BLM began outplanting resistant stock there in November 2003.

In 2002, a decision by the U.S. Court of Appeals for the Ninth Circuit found that a BLM project-specific environmental analysis (EA) and the underlying resource management plan environmental impact statement (EIS) to which it was tiered, did not adequately consider cumulative effects to the health of POC over its entire range in light of the reasonably foreseeable actions of the Agencies and others. The decision stated that there needs to be consideration of the cumulative range-wide effects of the current management direction and other reasonably foreseeable actions, not just a consideration of the effects within the immediate geographic area affected by the proposed project. Although the Court's decision did not say the current direction is inadequate, and a cumulative effects discussion of that direction is arguably all that is required, it follows that potential alternatives to the current direction need to be considered as well. This SEIS examines the current POC management direction and alternative strategies designed to maintain POC at desired levels in the ecosystem and mitigate the root disease damage.

The Need

The Need to which the Agencies are responding remains the same as in the late 1980s and early 1990s when the Agencies adopted their current management direction. The Agencies have a need for maintenance of POC as an ecologically and economically significant species on BLM and NF lands. POC plays a key role in some forest ecosystems, provides culturally significant products for Tribes, and provides unique forest products.

This Need arises from the presence of an introduced pathogen that has a high potential to spread over much of the range of POC, and 50 years of spread facilitated by various management activities and forest uses, both public and private. The Agencies have an opportunity to affect how fast the disease will spread to remaining uninfested stands and areas at least in the short term, and in most areas whether it will reach some trees at all. The Agencies also have an opportunity to mitigate some of the damage caused by the disease by developing disease-resistant planting stock to replace disease-killed trees, and by planting POC where it does not currently exist.

The Purpose

To meet the need for maintenance of POC as an ecologically and economically significant species on BLM and NF lands, the Agencies are seeking a management strategy that will slow the spread of the root disease enough to maintain POC's significant ecological and economic functions, without the cost of the management strategy exceeding its effect on the value of these functions.

Since the ecological and economic significance of POC is not a yes/no question, but is best represented as relative value points on a continuum, the analysis needs to provide two types of information so that a cost/benefit decision can be made about each alternative. On the one hand, the analysis needs to identify and discuss what *is* the ecologic and economic significance of POC in the landscape and how various levels of mortality negatively affect those values. On the other hand, the analysis needs to examine what factors affect the spread of the disease, what management techniques can minimize those factors and thus reduce disease spread, and therefore what are the costs and benefits of implementing an appropriate mix of disease-reducing management techniques in terms of direct financial costs, maintaining the ecological and economic value of POC itself, and in terms of the positive and negative effects to other (non-POC) resource values or uses.

To put the alternatives in context: The root disease will continue to spread—more quickly under passive agency management, and more slowly under maximum control efforts. Various levels of effort between these two extremes will result in various rates of disease-spread. The SEIS seeks to describe the expected loss in ecological and economic function for each alternative, and compare that with the costs (and benefits) of implementing each alternative in terms of both financial and lost-opportunities (as well as benefits to other resources).

Issues

The following Issues are part of the above Purpose, but are more specifically itemized here to help direct the affected environment and effects discussions in Chapter 3&4. The issues are grouped here to show how the resultant analysis answers the two questions key to the cost/ benefit consideration of each alternative by the decision-makers.

Question 1. What is the ecological and economic significance of POC in the landscape and how is this affected by various levels of POC mortality?

Considerations include:

- The role of POC in stream function and fish habitat;
- the role of POC in terrestrial habitats for listed, rare, or unique plants;
- the role of POC in terrestrial habitats for listed, rare, or unique animals;
- the role of POC for contemporary Tribal uses;
- the role of POC for boughs and specialty woods;
- the role of POC in maintaining and improving soils;
- whether significant genetic resources are at risk of loss; and
- the role of POC in ecosystem function and the maintenance of significant plant associations.

Question 2. What factors affect the spread of the disease, what management techniques can minimize those factors, and what are the costs and benefits of implementing an appropriate mix of disease-reducing management techniques in terms of (a) direct financial costs, (b) maintaining the ecological and economic value of POC itself, and (c) the positive and negative effects to other (non-POC) resource values or uses?

Considerations include:

- Identification of the current management practices and other factors that may spread the root disease, and their relative importance. These include timber harvest, special forest product collection, off-highway vehicle travel and other recreation activity, mining, fire suppression and fuels treatments, livestock grazing, and activities on private lands.
- Identification of management practices that can reduce disease spread, and their relative effectiveness (these are included in the alternatives).
- Identification of forest uses or management needs that will be constrained by implementation of various management practices, either because of cost or because of reduced access (this is the same list as in bullet one above).

- Identification of forest resources (other than POC) that will also benefit from implementation of various disease-reducing management practices.

Information about these issues and how each is affected by the alternatives is included in the effects discussions in Chapter 3&4.

Scoping

Scoping is the term used to identify issues, concerns, and opportunities associated with the proposed action in an EIS. Public involvement in the scoping process began when the Notice of Intent to prepare this SEIS was published in the *Federal Register* (68[27]:6709–6710) on February 10, 2003. The Notice of Intent announced the SEIS would develop alternative management strategies for the Oregon portion of the POC range and analyze effects of those strategies throughout the entire natural range of the species. The Notice described scoping as the time to identify interested and affected individuals and groups, and to identify issues associated with the management of POC. The Notice of Intent and scoping letter was posted to the SEIS website on February 10, 2003, at http://www.or.blm.gov/planning/Port-Orford-cedar_SEIS/. Also on February 10, the Agencies distributed news releases to approximately 68 newspapers or radio stations within or near the range of POC, and began mailing approximately 600 scoping letters to individuals, groups, government agencies, and Tribes identified from district and forest "interested publics" lists as potentially interested in the management of POC on Federal lands in Oregon (see the Culturally Significant Products for American Indian Tribes section in Chapter 3&4 for more detail about Tribes). The letter provided additional detail about the need and the analysis, explained how to remain on the Agencies' mailing list for the draft SEIS and related documents, gave the SEIS website address, and again invited public input.

The Agencies received 77 letters or e-mail messages asking to be on the mailing list; 63 of those also contained other scoping-related comments. These scoping letters helped define the issues and design the alternatives presented in Chapter 2 of this SEIS.

Chapter 2 — The Alternatives

Introduction

This chapter presents six alternatives for the management of Port-Orford-cedar (POC) on the Coos Bay, Medford, and Roseburg Bureau of Land Management (BLM) Districts and the Siskiyou National Forest (NF). Selection of one of the Action Alternatives would amend the land and resource management plans of those four administrative units. The alternatives apply only to lands administered by those four units. The alternatives would not amend any of the Standards and Guidelines for management of late-successional and old-growth-forest-related species adopted in 1994 as the Northwest Forest Plan.

The decision may also affect 5,400 acres owned by the Coquille Tribe. The Act (Public Law 104-208) creating the Coquille Indian Forest requires that these Indian lands be managed subject to the Standards and Guidelines of Federal forest plans on adjacent and nearby Federal lands. The responsible officials for this SEIS are the BLM State Director and Rogue River and Siskiyou National Forests Forest Supervisor. The applicability of the selected alternative for this SEIS and appropriate strategy for POC management on Coquille Forest lands will be determined by separate action of the Bureau of Indian Affairs and the Coquille Indian Tribe. Coquille Forest POC acres are not included in Federal acres described in this SEIS, and the Standards and Guidelines of the alternatives are assumed, for analysis purposes, not to apply to Coquille Indian Forest lands.

Changes Between Draft and Final

The following changes were made to Chapter 2 between the draft and final SEIS. Minor corrections, explanations, and edits are not included in this list.

Changes/edits were made to:

- Clarify the role of the Klamath, Shasta-Trinity, Six Rivers, and Siuslaw NFs;
- change the deciding official for the FS from the Regional Forester to the Forest Supervisor;
- add another alternative, Alternative 6, to respond to public comments suggesting more protection for 7th field watersheds;
- change Alternative 2 to add emphasis to the 162 currently uninfested 7th field watersheds;
- expand the objective statements for several of the alternatives to more clearly include the objectives of controlling the disease on high-risk sites;

- incorporate the Siskiyou NFs' February 15, 2002 compilation of POC (and other) Best Management Practices into the description of the current direction;
- clarify or make minor changes in several of the Standards and Guidelines applicable to Alternatives 2 and 3;
- clarify that use of the POC Risk Key in Alternatives 2, 3, and 6 does not preclude the need to conduct site-specific NEPA-required analysis;
- expand the options with the POC Risk Key to include canceling or redesigning the project;
- include not building roads and closing roads as available options below the risk key;
- change provisions of Alternative 3 so trees exceeding 10 inches diameter at breast height would not be left on sanitized sites;
- several of the Alternatives Eliminated from Detailed Study, because the addition of Alternative 6 responded to them at least in part, and to remove assumptions about priorities between maintaining ecological function and meeting multiple-use objectives;
- move the detailed discussion of forest road rights-of-way agreements to Chapter 3&4;
- clarify that 100-year PL spread predictions are best professional estimates and not absolute;
- reflect minor changes in environmental effects resulting from changes in the alternatives or additional analysis. For example, the PL spread rate is lower for Alternative 2 in response to emphasis added for uninifested 7th field watersheds, and the previously described "significant" effect to listed coho salmon now only applies to certain situations under Alternatives 4 and 5; and,
- add additional mitigation measures and clarify that they are not part of the Alternatives unless separately selected by the decision-makers.

Background/Existing Port-Orford-Cedar Standards and Guidelines

POC root disease was first identified within the natural range of POC near Coos Bay in 1952. POC in this part of the range are often well-distributed across the landscape, but typically make up only a small percentage (usually less than 5 percent) of the composition in any given stand of trees. Trees growing away from roads and streams are not as vulnerable, and those killed near roads and streams are often quickly replaced by other species. After 50 years of disease spread in the Coos Bay area, 70 to 80 percent of the trees are uninfected and the rate of disease spread has slowed.

In succeeding years, the disease moved south and east to the Siskiyou NF and Roseburg and Medford BLM Districts, and by the early 1980s had reached into the upper Smith River Watershed on the Six Rivers NF in Region 5. POC often makes up isolated remnants in unique habitats (ultramafic soils) or is scattered along the banks of streams and rivers in these areas. As the mortality of POC began to be of greater concern, several publications were issued describing the spread and effects of the disease, and offered strategies for control. These publications included "Port-Orford-Cedar Root Rot on the Siskiyou National Forest" (Harvey et al. 1985); "Siskiyou National Forest Tree Improvement Plan" (USDA-FS 1988); "Port-Orford Root Disease" (Roth et al. 1987); and "Ecology, Pathology, and Management of Port-Orford-Cedar (*Chamaecyparis lawsoniana*)" (Zobel et al. 1985). Though individual NFs and ranger districts had been instituting POC root disease management activities in their own areas for some years, there was no attempt to develop a coordinated effort for Federal lands prior to the mid-1980s.

After meeting with the Western Natural Resources Law Clinic on January 21, 1986 to discuss their concerns about management of POC and its root disease, and the Western Natural Resources Law Clinic's formation of a Citizens' Panel in February 1986, an interregional Port-Orford-cedar Coordinating Group was formed by the FS and BLM in May 1987. The Coordinating Group was composed of a line officer, pathologists, ecologists, geneticists, representatives from the NFs with POC, and a representative of the BLM. The purpose of the group was to coordinate all activities affecting POC within and between FS Regions 5 and 6 and the BLM. The Coordinating Group was charged with developing an action plan directed at the issues of highest concern (inventory, research needs, management, and public education). The "Region 5-Region 6 Port-Orford-Cedar Root Disease Action Plan" was completed in 1988. This document was a formal commitment by both Regional Foresters for (1) Inventory and Monitoring, (2) Research, (3) Public Involvement and Education, and (4) Management Policy. The 1989 "Siskiyou National Forest Land and Resource Management Plan" described this commitment as providing the support necessary to insure the viability and continued presence of POC in the ecosystem throughout its native range on FS-administered lands.

When the "Siskiyou National Forest Land and Resource Management Plan" was completed in 1989, it referenced the 1988 Action Plan as its primary management strategy for controlling and mitigating the spread of the disease. During the next 6 years, BLM and FS extensively mapped POC and the root disease, began resistance breeding, closed roads either seasonally or permanently, began sanitation treatments along high-risk roads, developed a test for determining the presence of the disease agent in water and soil, and pioneered and standardize many other treatments.

The POC program manager, an interregional FS position, was added in 1989 to oversee the activities of the POC coordinating group. The FS established this full-time position to serve as a vital link in coordinating and completing the tasks listed in the Action Plan and to provide a lead person for evaluation and transfer of new technology as research findings become available for management of POC and its root disease.

In 1993, the Forest Ecosystem Management Assessment Team rated POC as having a 10 percent likelihood of becoming restricted to refugia under "Option 9" (the basis for the Northwest Forest Plan), and suggested a mitigation measure of

> . . . close roads and restrict further road construction in watersheds that contain uninfected stands (e.g., inland California populations).

The decision-makers for the NWFP did not adopt this mitigation measure apparently either because it could be better and more appropriately considered at the planning unit level (USDA-FS and USDI-BLM 1994b, *p. 29*), was redundant, or was too costly in relation to the uncertain benefits, the untested or ineffective nature of the measure, or the adverse effect on other resources or programs (USDA-FS and USDI-BLM 1994b, *p. 33*).

In 1994, the BLM issued the "Port-Orford-Cedar Management Guidelines." The Guidelines contain management objectives, implementation strategies, measures for timber sale and service contracts to minimize spread of the pathogen, and specifications for equipment washing and cleaning. The intent of the Guidelines is to assist in retaining POC as a viable part of the forest ecosystem and to reduce the occurrence of the root disease. The BLM Guidelines recommended administrative procedures and best management practices to be considered on a site-specific basis and analyzed in "National Environmental Protection Act" (NEPA) documents. In August, 1995, the BLM created and also filled a full-time Port-Orford-cedar Coordinator position.

The FS reviewed accomplishment of the tasks within the Action Plan in April 1995. The review determined that the majority of the items on the Action Plan had been accomplished or concluded and that ongoing items, such as monitoring, had been incorporated into individual forest plan management direction and forest-wide Standards and Guidelines. Based on these findings, the FS found that the Action Plan had been completed and could be concluded. The Regional Foresters accepted the recommendation and the Action Plan ceased to be operative May 16, 1995.

The Coordinating Group continues to function as a clearinghouse of information, to transfer technologies, and to coordinate rangewide activities dealing with POC. Two Federal agency coordinators are responsible for disseminating information, coordinating activities to insure that protective measures are understood and used, educating the public on issues surrounding POC, and pursuing measures that will protect this species in its natural habitat.

In general, the current Standards and Guidelines for both agencies place an emphasis on reducing the spread of *Phytophthora lateralis* (PL) and maintaining POC through various management practices applied at the project level following project-specific analysis. Although management practices may be locally effective, the disease continues to spread. In 1996 the disease was discovered to have spread to the disjunct population of POC in the Sacramento River drainage, over 150 road miles and in a different river drainage from the nearest known infection.

In January 1995 the Northcoast Environmental Center, along with several other environmental organizations, filed an action claiming the FS and BLM had failed to comply with the requirements of NEPA in developing their Action Plan and Guidelines, respectively. Plaintiffs sought an order enjoining the FS and the BLM

> . . . to prepare a comprehensive, inter-regional EIS on their management of the Port-Orford-cedar and its habitat . . . [and in the meantime] . . . to undertake all necessary actions to prevent the spread or introduction of *Phytophthora lateralis* and to maintain healthy diverse Port-Orford cedar stands and habitat . . .

which meant ceasing all road construction and maintenance, off-road vehicle use, timber harvest, mining, and commercial cedar bough and mushroom collection in the affected area, which encompasses southwestern Oregon and northwestern California. In August 1996, the U.S. District Court ruled that the plaintiffs could not challenge under the "Administrative Procedures Act" government "programs" in general. The Court found that the alleged "Port-Orford-cedar Program" was a term loosely applied to all the actions that the government took regarding managing POC, including public education efforts, research, and sharing databases. Such a general program was not a "final agency action" reviewable under the "Administrative Procedures Act." As to challenges to specific decisions such as the adoption of the "BLM Port-Orford-cedar Management Guidelines" in the BLM's resource management plan decisions, the Court found that the Guidelines merely contained possible control strategies for root disease which managers may or may not select in subsequent site-specific NEPA decision processes. The Court concluded that since the Guidelines did not require district managers to take any action or make any specific proposal or commit any resources, it was reasonable for the government to determine that the Guidelines did not constitute a major Federal action significantly affecting the quality of the human environment.

Plaintiffs appealed the decision to the Ninth Circuit. The Ninth Circuit in 1998 affirmed the District Court on the grounds that there was no final agency action and that the POC management documents do not constitute a major Federal action affecting the environment. The Court based its decision in part on an assumption that the government agencies would prepare a NEPA document before they proposed to implement particular control strategies with significant environmental impacts.

The Sandy-Remote Lawsuit

The BLM proposed timber sales during 1996 within a portion of the Coos Bay BLM District known as the Sandy-Remote Analysis Area. The spread of POC root disease was among the issues identified in the environmental analysis (EA), with treatments specified to follow the 1994 "Port-Orford-Cedar Management Guidelines." This decision became the subject of a lawsuit, Kern v. BLM, which followed up on the language in the Northcoast Environmental Center decision suggesting that a NEPA action would be ripe when the government took an action implementing a control strategy for managing the POC root disease. In one of their counts of alleged NEPA violations, the litigants in Kern contended that both the EA and the overriding EIS for the 1995 "Coos Bay Resource Management Plan" contained insufficient analysis of the range-wide cumulative effects of proposed timber harvesting on the spread of the root disease. Although the District Court ruled that the site-specific EA adequately addressed the impacts to POC within the watershed containing the proposed projects, the Ninth Circuit reversed on the grounds that the EIS to which the EA was tiered did not include an adequate analysis of effects of the adoption of control strategies on the species as a whole, and that the deficiencies of this tiered document were not addressed by the analysis in the EA of only the impacts on the affected watershed.

On February 12, 2003, under direction from the March 2002 decision by the U.S. Court of Appeals for the Ninth Circuit, the U.S. District Court for the District of Oregon ruled that

> . . . the EIS for the Coos Bay District is inadequate under NEPA because it does not include an analysis of reasonably foreseeable future timber sales and other actions on *Phytophthora lateralis* and Port Orford cedar. In the absence of an EIS analyzing the impact of reasonably

> foreseeable timber sales within the Coos Bay District under the proposed RMP, the Sandy-Remote Area EA is inadequate under NEPA because it lacks an analysis of the cumulative impacts of such sales within the Coos Bay District.

The Court went on to enjoin timber sale activities and related road building and maintenance in the Sandy-Remote area that involve harvest of POC until

> . . . BLM completes adequate analysis of the direct, indirect and cumulative impacts on PL and POC.

This supplemental EIS is intended to fully rectify the deficiencies identified in the February 12, 2003 District Court decision and the March 2002 decision of the Ninth Circuit.

The Siskiyou NF has reviewed the Sandy-Remote Decision and, because of the similarity of their land management plan Standards and Guidelines and related analysis to the BLM plans, has determined similar deficiencies might exist in their plans. Further, because of a history of cooperation between the two Agencies regarding management of POC and the root disease, the Forest chose to participate in this analysis in the hope of adopting the same Standards and Guidelines as the BLM.

NFs in Region 5 similarly reviewed the court decision and determined that, although they were willing to help with the analysis and might borrow from it in the future, they would participate in the SEIS only as cooperators. The NF considers the existing POC management direction on these units to be more complete and more adequately analyzed in their respective land management plan EISs than was the case for the Oregon administrative units. Including these units as cooperators and addressing the potential environmental effects to POC in California from alternatives considered by the four action administrative units in Oregon meets the Court requirement for a cumulative effects analysis for the proposed action.

Similarly, the 1994 "Management Plan for the Oregon Dunes National Recreation Area" (Siuslaw NF) was deemed to adequately address their nearly 100 acres of POC, and the unit opted not to be a partner or cooperator in this SEIS. Also similarly, this analysis includes the actions under the 1994 plan for these acres as part of its cumulative impacts analysis.

The Supplemental Environmental Impact Statement

The Council on Environmental Quality regulations implementing NEPA direct that agencies supplement an EIS

> . . . if the agency makes substantial changes in the proposed action that are relevant to environmental concerns; or if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts (40 CFR 1502.9(c)(1)(i) and (ii)).

In this case the proposed action is the selected alternatives in the land and resource management plans of the Coos Bay, Medford, and Roseburg BLM Districts and the Siskiyou NF. There are significant new circumstances or information relevant to environmental concerns and bearing on the these action or their impacts. To respond to a court-identified deficiency in the existing EIS for the Coos Bay BLM District and likelihood or possibility that the EISs

for the other plans have the same or similar deficiency, the Agencies need to amend these previous land and resource management plan EISs to display the direct, indirect, and cumulative impacts of their current management on PL and POC. It follows that potential alternatives to the current direction need to be analyzed as well, in order to provide a context, or range of effects, within which the decision-maker can consider the required analysis and make an informed choice.

All alternatives would only affect a small portion of the land and resource management plan Standards and Guidelines, or their supporting EISs, for the affected administrative units. The proposed changes do not constitute an action separate and distinct from the existing land and resource management plans of the Agencies and do not warrant a new EIS. Therefore, it is appropriate to analyze the effects of the Proposed Action and alternatives in a supplemental EIS to the final EISs for the three BLM districts and one NF affected.

Endangered Species Consultation

The BLM and FS have begun consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA)-Fisheries as required by the "Endangered Species Act." Biological evaluations covering wildlife, botany, and fish, are in Appendix 7. These species are also discussed in the Wildlife, Botany, and Water and Fisheries sections of Chapter 3&4.

The Planning Area

The planning area for this SEIS is the federally-administered land within the natural range of POC (Figure 1-1) within the Medford, Coos Bay, and Roseburg BLM Districts and the Siskiyou NF, generally in southwest Oregon (the Siskiyou NF extends slightly into California). No management direction is included here for other Federal lands, other American Indian trust lands, or state and private lands. However, cumulative impacts from expected management activities on these other lands, including NFs in California, were considered as part of the effects analysis in this SEIS. NFs in California within the range of POC contributed to the analysis in this SEIS as cooperators. There are no native POC on BLM-administered lands in California.

There will be two records of decision: The State Director for Oregon/Washington BLM will make the decision for the BLM districts; and the Forest Supervisor for the Rogue River and Siskiyou NFs will make the decision for the Siskiyou NF.

The decision may affect 5,400 acres owned by the Coquille Tribe. The Act (Public Law 104-208) creating the Coquille Indian Forest requires that these Indian lands be managed subject to the Standards and Guidelines of Federal forest plans on adjacent and nearby Federal lands. The applicability of the selected alternative for this SEIS and appropriate strategy for POC management on Coquille Forest lands will be determined by separate action of the Bureau of Indian Affairs and the Coquille Indian Tribe. Coquille Forest POC acres are not included in Federal acres described in this SEIS, and the Standards and Guidelines of the alternatives are assumed, for analysis purposes, not to apply to Coquille Indian Forest lands.

Relationship of Alternatives to Existing Management Plans

If one of the Action Alternatives is selected, the direction established by the record of decision for this SEIS would remove the existing POC Standards and Guidelines in the land and resource management plans for three BLM and one FS administrative units (see direction described under the No-Action Alternative, Alternative 1) and replace them with the Standards and Guidelines of the selected alternative.

Bureau of Land Management

Adoption of one of the action alternatives would be consistent with 43 CFR 1610.5-5 and would amend the resource management plans for the Medford, Coos Bay, and Roseburg BLM Districts in Oregon. Because the action alternative would modify only a small portion of each of these resource management plans, plan revisions would not be necessary (43 CFR 1610.5-6).

When a decision is made to prepare an EIS, the amending process follows the same procedure required for preparation and approval of the plan (43 CFR 1610); consideration is limited to that portion of the plan being considered for amendment. The BLM resource management planning process includes nine steps—the planning steps that pertain to this SEIS include:

- Issue identification;
- data collection;
- formulation of alternatives;
- estimation of effects;
- selection of the Preferred Alternative; and
- selection of the proposed plan amendment.

If several plans are being amended simultaneously, a single EIS may be prepared to cover all amendments (43 CFR 1610.5-5).

Forest Service

Adoption of one of the action alternatives would result in amendment of the "Siskiyou National Forest Land and Resource Management Plan" (forest plan) in Region 6.

If an amendment to a forest plan results in a significant change in the plan, the "National Forest Management Act" and its 1982 implementing regulations under which this SEIS is prepared, require that the amendment process follow the procedures used in the initial development of the plan. If the proposed change in the plan is not significant, public notification and completion of the NEPA procedures are still required [16 USC 1604 (f)(4) and 36 CFR 219.10(f)]. Significant change in the plan is determined by different criteria than those used in evaluating significance in the NEPA process. For the "National Forest Management

Act" requirement, the Forest Service Manual 1922.51 and .52 provides specific direction as follows.

> Forest Service Manual 1922.51 – Changes to the Forest Plan that Are Not Significant.
>
> 1. Actions that do not significantly alter the multiple-use goals and objectives for the long-term land and resource management.
>
> 2. Adjustments of management area boundaries or management prescriptions resulting from further on-site analysis when the adjustments do not cause significant changes in the multiple-use goals and objectives for long-term land and resource management.
>
> 3. Minor changes in Standards and Guidelines.
>
> 4. Opportunities for additional management practices that will contribute to achievement of the management prescription.
>
> Forest Service Manual 1922.52 – Changes to the Forest Plan That Are Significant.
>
> 1. Changes that would significantly alter the long-term relationship between levels of multiple-use goods and services originally projected (36 CFR 219.10(e)).
>
> 2. Changes that may have an important effect on the entire forest plan or affect land and resources throughout a large portion of the planning area during the planning period.

None of the alternatives would result in a significant change to the Siskiyou forest plan. The alternatives would not significantly alter the multiple-use goals and objectives for the long-term land and resource management. Changes in the various alternatives to management prescriptions would not result in significant changes (in part because the additional protection areas of Alternatives 3 and 6 are mostly located in reserves), and changes to the Standards and Guidelines would be minor, and in some respects better contribute to achievement of many existing forest plan objectives. The alternatives would not significantly alter the long-term relationship between levels of goods and services originally projected, and would not have an important effect on the entire forest plan or affect resources throughout a large portion of the planning area. Therefore, the selection of any of the alternatives described in this SEIS would not constitute a significant forest plan amendment as defined for the "National Forest Management Act," planning steps beyond those conducted from this SEIS are not required, and the deciding official is the Forest Supervisor.

The Alternatives

Overview

There are six alternatives introduced here and described in detail in following sections. These alternatives apply to the Medford, Coos Bay, and Roseburg BLM Districts and the

Siskiyou NF. If one of the Action Alternatives is adopted, the Standards and Guidelines of that alternative would replace the existing Standards and Guidelines for management of POC. For reasons described in the Background section, management direction for the Klamath, Six Rivers, Shasta-Trinity, and Suislaw NFs is not being considered for change at this time. The current direction for these forests is held constant across all of the alternatives listed below, and is used in the cumulative effects discussions in later sections of this SEIS. The current POC management direction for these NFs is displayed in Appendix 3, and is considered under Cumulative Effects near the beginning of Chapter 3&4. Summaries of management practices for other lands, including those administered by the National Park Service, are also included in the Cumulative Effects and Background sections in Chapter 3&4.

Alternative 1 — Continue Existing Direction (the No-Action Alternative): This alternative continues the current direction in the land and resource management plans of the BLM districts and the Siskiyou NF. In general, this direction (Standards and Guidelines) places an emphasis on reducing the spread of PL and maintaining POC using all available means as appropriate. Under this direction, the Agencies have employed a combination of ongoing research to find additional tools and evaluate their effectiveness, monitoring of disease spread, public and within-Agency education, interagency and interregional cooperation and coordination, development of resistant stock, and application of a wide range of disease-controlling management practices applied at the project level following project-specific analysis. As a result, POC root disease control is considered, and control techniques are applied, at all levels of project planning and execution, including wildland fire fighting. In addition to the relevant Standards and Guidelines shown in this chapter, a summary of specific disease-control efforts implemented by the Agencies in Fiscal Years 2001 and 2002 is included in Appendix 2, and serves as the assumed approximate level of management activity that would continue to occur under this alternative.

Alternative 2 — Proposed Action: This alternative continues all of the research, monitoring, education, cooperation, resistance breeding, and disease-controlling management practices of Alternative 1 to reduce the spread of PL and maintain POC. For this alternative, however, the Standards and Guidelines specifically describe all currently available disease-control practices, dividing them between those that should be applied generally (such as community outreach and restoration) and those that may, depending upon site conditions, be applied to specific management activities (such as timber sales). For the latter group, a risk key is included to clarify the environmental conditions that require implementation of one or more of the listed disease-controlling management practices. The risk key also requires management to reduce significant risk to 162 currently uninfested 7th field watersheds (Map 2). The principal differences, when compared to Alternative 1, are a more detailed and updated description of the array of available disease-control treatments, more consistent implementation of those treatments based on the risk key, and an emphasis placed on keeping PL out of currently uninfested 7th field watersheds.

Alternative 3: This alternative contains all of the management elements of Alternative 2 except the risk key linkage to 7th field watersheds, and seeks to slow the spread of PL even more by adding additional protection for 31 currently uninfested 6th field watersheds having at least 100 acres of stands containing POC. Specific protection measures are prescribed for the POC stands within these watersheds (POC core areas), and somewhat different protection is prescribed for the remainder of these watersheds (POC buffers) to lessen the possibility of infection within the POC core.

Alternative 4: This alternative would remove current site-specific measures used to control the root disease spread, but would accelerate the resistance breeding program. The resistance breeding program is designed to supply seedlings to replace (at the same site or elsewhere) POC killed by the disease. Quickly replacing dead POC in natural stands with resistant POC seedlings, and planting microsites at less risk of exposure to PL, would be emphasized.

Alternative 5: This alternative would remove current site-specific measures used to control the root disease spread and discontinue the resistance breeding program. All current management described in Alternative 1 would be discontinued except for the operational POC seed production orchards. Seedlings from existing resistant seed orchard trees would continue to be used to reforest areas of mortality occurring in the same breeding zone, but resistant seed for other breeding zones would not be developed.

Alternative 6: This alternative contains all of the management elements of Alternative 2, and seeks to slow the spread of PL even more by adding additional protection for 162 currently uninfested 7th field watersheds having at least 100 acres of stands containing POC. Specific protection measures are prescribed for the POC stands within these watersheds (POC core areas), and somewhat different protection is prescribed for the remainder of these watersheds (POC buffers) to lessen the possibility of infection within the POC core.

Standards and Guidelines for Each Alternative

Alternative 1 — Continue Existing Direction

The alternative meets the Council on Environmental Quality requirements for a No-Action Alternative described at CFR 1502.14(d).

This alternative continues the current direction in the land and resource management plans of the BLM districts and the Siskiyou NF. In general, this direction (Standards and Guidelines) places an emphasis on reducing the spread of PL and maintaining POC using all available means as appropriate. Under this direction, the Agencies have employed a combination of ongoing research to find additional tools and evaluate their effectiveness, monitoring of disease spread, public and within-agency education, interagency and interregional cooperation and coordination, development of resistant stock, and application of a wide range of disease-controlling management practices applied at the project level following project-specific analysis. As a result, POC root disease control is considered, and control techniques are applied, at all levels of project planning and execution, including wildland fire fighting. In addition to the Standards and Guidelines shown here, a summary of specific disease-control efforts implemented by the Agencies in Fiscal Years 2001 and 2002 is included in Appendix 2, and serves as the assumed approximate level of management activity that would continue to occur under this alternative.

The objectives of this alternative, as stated in existing plan direction, are to:

- Reduce the spread of root disease.
- (*For BLM*) Retain POC as a species, identify resistant individuals, and incorporate them into a tree improvement program. Incorporate PL control strategies as management objectives in Riparian Reserves, Late-Successional Reserves, and Matrix. Provide POC as a primary forest product, promote public involvement in POC management, and develop an implementation schedule of the POC Management Program.
- (*For FS*) Insure the viability and continued presence of POC in the ecosystem throughout its native range on FS-managed lands. POC is to be managed as a major component of appropriate plant associations in areas of low to moderate risk of infection. Appropriate practices identified from experience and research should be applied on a site- or drainage-specific basis to prevent or reduce the spread and severity of root disease.

General Direction

The existing Standards and Guidelines (management direction) for the administrative units in Oregon are displayed as follows.

Existing Direction — Roseburg, Medford, and Coos Bay BLM Districts

Page 60 of the "Roseburg District Record of Decision and Resource Management Plan" (1995) states:

> Conform all management activities within the range of Port-Orford-cedar to the guidelines described in the BLM Port-Orford-cedar Management Policies to mitigate damage caused by *Phytophthora lateralis*. Site specific analyses for projects within the range of Port-Orford cedar will consider possible effects on the species.

Similar language appears on page 75 of the "Medford District Record of Decision and Resource Management Plan" (1995) and page 52 of the "Coos Bay District Record of Decision and Resource Management Plan" (1995).

The "Port-Orford-Cedar Management Guidelines" (1994a) document is displayed in its entirety in Appendix 1. It includes the following sections:

I. Introduction
II. *Phytophthora lateralis* and Port-Orford-Cedar
III. *Phytophthora lateralis* and Pacific Yew
IV. Management Objectives for Port-Orford-Cedar
V. Implementation Strategy to Achieve Port-Orford-Cedar Management Objectives
  A. Proactive management: limit the spread of *Phytophthora lateralis* and reduce the number of infested areas
  B. Retain Port-Orford-Cedar as a species, identify resistant individuals, and

incorporate them into a tree improvement program
C. Incorporate *Phytophthora lateralis* control strategies as management objectives in Riparian Reserves, Late-Successional Reserves, and in the Matrix
1. Riparian Reserves
2. Late-Successional Reserves
3. Matrix
D. Provide Port-Orford-Cedar as a primary forest product
E. Public Involvement
F. Develop a budget and implementation schedule for the Port-Orford-Cedar Program
VI. Mitigation Measures for Timber Sale and Service Contracts

APPENDICES
Appendix 1: Synopsis of Region 5 and 6 Port-Orford-Cedar Coordinating Group Action Plan
Appendix 2: General Specifications for a Washing Station
Appendix 3: Equipment Cleaning Checklist
Appendix 4: Project Analysis and Implementation
ACKNOWLEDGEMENTS
PEER REVIEWERS
REFERENCES

Existing Direction — Siskiyou National Forest

The following is from page IV-63 of the "Siskiyou National Forest Land and Resource Management Plan" (1989).

Forest-wide Standards and Guidelines

12-8: Strategies for POC shall be integrated into environmental analyses and project planning for all areas that support POC. An example is to interplant existing plantations that are scheduled for planting or have been planted. POC should be managed as a major component of the appropriate plant association in areas of low to moderate risk of infection. Representative areas within plant associations containing POC will be identified and protected.

Appropriate practices identified from experience and research should be applied on a site- or drainage-specific basis to prevent or reduce the spread and severity of POC root disease. Additional information and suggested practices can be found in "Port-Orford-Cedar Root Rot on the Siskiyou National Forest" (Harvey et al. 1985); "Siskiyou National Forest Tree Improvement Plan" (Tibbs et al. 1988); "Port-Orford Root Disease" (Roth et al. 1988), and "Ecology, Pathology, and Management of POC (*Chamaecyparis lawsoniana*)" (Zobel et al. 1985).

Of special significance to the support of management of POC was the "Region Five-Region Six Port-Orford-Cedar Root Disease Action Plan" dated June 29, 1988. This is a formal commitment by both Regional Foresters for (1) Inventory and Monitoring, (2) Research, (3) Public Involvement and Education, and (4) Management Policy. In short, this commitment provides the support to insure the viability and continue presence of POC in the ecosystem throughout its native range on Forest Service-managed lands.

To emphasize the importance of achieving success in this effort, specific examples of requirements are listed below:

1. Silvicultural prescriptions for sites having potential for growing POC will provide for the establishment of the species through natural or artificial regeneration and maintenance as a viable stand component through the current and future rotations. Prescription analysis will also consider distribution of POC so that spacing will inhibit spread of the disease, particularly in susceptible habitats.

2. Road construction and use that can potentially affect POC will be evaluated and appropriate control measures used that limit the spread of the disease. Road closures or controlled access can be used as part of the overall management scheme to reduce the risk of contamination of individual areas (such measures should be documented in the road management objectives).

3. Logging systems used in infested POC stands should minimize disturbance and redistribution of soil. In a given case, this might exclude use of ground-yarding equipment such as tractors or rubber-tired skidders. In other situations, it might require full suspension of logs during yarding operations with skyline systems or helicopters. It might also be necessary to operate during the drier time of the year to reduce soil movement.

The accomplishments of the 1988 "Region Five-Region Six Port-Orford-Cedar Root Disease Action Plan" were reviewed in 1995, with the decision that the majority of the items of the Action Plan had been completed. Specific completed tasks included giving general inventory directions to the affected NFs, establishing local maps, issuing directions for field monitoring, and preparing a report on the effects of disease-control measures. Continuing Action Plan items include active POC/PL forest monitoring programs and collaborating with the BLM, National Park Service, and private landowners.

Additional emphasis on POC and control of PL was added to the management strategies for the Siskiyou NF with the February 15, 2002 release of "Interim Direction for Best Management Practices (BMPs) for Noxious Weed Prevention and Management, Port-Orford-cedar Root Diseases Prevention and Management, and Sudden Oak Death Prevention and Management." The BMPs are goal statements and related practices to, along with reducing the spread of noxious weeds and Sudden Oak Death, reduce spread of PL. Direction focuses on roads but also includes other projects and the use of Clorox.

Alternative 2 — General Direction Plus Port-Orford-Cedar Risk Key (Proposed Action)

This alternative builds upon the research, monitoring, education, cooperation, resistance breeding, and disease-controlling management practices of Alternative 1 to reduce the spread of PL and maintain POC. For this alternative, however, the Standards and Guidelines specifically describe all currently available disease-control practices, dividing them between those that would be applied generally (such as community outreach and restoration) and those that may, depending upon site conditions, be applied to specific management activities (such as timber sales). For the latter group, a risk key is included to clarify the environmental conditions that require implementation of one or more of the listed disease-controlling management practices. The risk key also requires management to reduce significant risk to 162

currently uninfested 7th field watersheds (Map 2). The difference, when compared to Alternative 1, is a more detailed and updated description of the array of available disease-control treatments, more consistent implementation of those treatments based on the risk key, and emphasis on keeping PL out of currently uninfested 7th field watersheds.

The objectives of this alternative are to:

- Maintain POC on sites where the risk for infection is low;
- reduce the spread and severity of root disease in high-risk areas to retain its ecological function to the extent practicable;
- reestablish POC in plant communities where its numbers or ecosystem function have been significantly reduced; and
- reduce the likelihood of root disease becoming established in disease-free 7th field watersheds.

General Direction

Integrated Management Approach. Implement an integrated approach to dealing with PL which includes prevention, restoration, detection, evaluation, suppression, and monitoring. Management goals are directed toward maintaining POC and reducing root disease losses. Elements of the management strategy include management of POC bough cutting, community outreach, genetics, interagency coordination, planning, wildland fire operations, snag retention, project-specific direction, risk key, management practices, and monitoring.

In portions of the natural range, POC is widespread across the landscape. In these areas, POC conservation would emphasize management on sites naturally at low risk for infection. In many forest types, management of POC can focus on sites where conditions make it likely to escape infection by PL, even if the pathogen has already been established nearby. POC on such sites often has escaped infection because the sites have characteristics that are unfavorable for the spread of the pathogen. These sites are above and away from roads, uphill from creeks, on ridgetops, and on well-drained soils.

In the majority of the natural range, POC is localized on moist microsites (such as along streams) or sites favorable for establishment of the species. In these areas, opportunities for managing for POC on sites unfavorable to the pathogen are more limited. Treatments to prevent new infestations would be emphasized in this portion of the range, and there is a potential for eradication treatments in certain circumstances.

Restoration of Port-Orford-Cedar. Restore POC to sites within its natural range (Figure 1-1) where the species is essential for meeting land and resource management plan objectives for both aquatic and terrestrial ecosystems, Tribal, or product uses or function. This would be accomplished using resistant and nonresistant (generally on low-risk sites or away from potential infection sources) stock for reforestation and other elements of the integrated management approach.

Adaptive Management. Adaptive management is a continuing process of action-based planning, monitoring, researching, evaluating, and adjusting with the objectives of improving the implementation and achieving the goals of the selected alternative. Under the concept of adaptive management, new information would be evaluated and a decision would be made

whether to make adjustments. The Agencies would continue to develop and evaluate techniques to protect POC, and prevent disease intensification and spread within and around areas where PL infestations already occur.

Bough Cutting. To reduce or eliminate the spread of PL by POC bough cutters, limit POC bough cutting to roadside sanitation, commercial thinning, and precommercial thinning units (or stewardship contracts with specific provisions to protect and enhance POC).

POC bough collection shall be by permit only, and require:

- Dry season operations;
- designation of access and egress routes;
- designation of parking areas;
- unit scheduling (collect all uninfested areas prior to infested areas);
- washing of boots and equipment;
- daily inspections;
- stopping operations during and after rains; and
- easily identifiable areas where boughs are to be collected.

Community Outreach. Continue to improve public awareness of the root disease and the need to control it by using methods such as periodic press releases; distributing posters and pamphlets; coordinating with Tribal groups; creating and maintaining POC websites; conducting public symposiums; preparing and installing informational signs on or at trailheads, gates, and other closures; and/or other measures. Consider focusing these efforts on user groups most likely to engage in activities at more risk for spreading PL. Coordinate with state, local, industrial, and small woodland owners to help meet overall POC management objectives.

Eradication. In watersheds or other geographic areas where PL infestations are localized or infrequent in comparison to the amount of POC, POC eradication may be tried as a management technique to prevent/reduce spread of the disease and reduce the need for other management practices in the long term. If experience demonstrates techniques and conditions where this treatment can be effective, its use can be increased. Additional tools for eradicating PL in the soil would be sought, developed, and implemented as evidence warrants.

Genetics. Develop resistant stock and make it available for all POC reforestation and restoration projects.

The existing interagency resistance breeding program would be continued as needed, contingent on available funding. The objectives are to (1) select and evaluate families for resistance and develop durable resistance to PL while maintaining broad genetic diversity within the species, and (2) produce seed genetically resistant to PL for deployment throughout the range of where PL is present. The POC resistance breeding program would continue as follows:

- Develop operational resistant seed for breeding zones (breeding blocks plus elevation zones) based upon management needs within the range of POC;

- continue efforts to inform the public about the availability and use of resistant seed;
- find ways to provide resistant seed to non-Federal landowners; and
- monitor the operational performance of resistant plantings.

In addition, collect and maintain about 0.5 pound of resistant seeds for each POC breeding zone in organized conservation seedbanks. This seed would be reserved exclusively for reforesting areas after the occurrence of stand-replacement events such as large-scale wildfires. Where possible, resistant POC seedlings would be planted in such locales, with the goal to reintroduce POC to all pre-event locations.

Interagency Coordination. The agencies would continue to coordinate management practices including research, genetic resistance breeding, and public education.

Planning. Consideration of how to achieve the POC management objectives would be addressed, as applicable, in new NEPA documents, watershed analyses, Late-Successional Reserve assessments, wild and scenic river management plans, transportation planning (roads analysis process or transportation management objectives), fire management plans, recreation planning, and other activities or strategies in all watersheds with POC.

Wildland Fire Operations. Management strategies to prevent/reduce spread of PL would be a part of wildland fire preparedness planning. When practicable, these measures would be incorporated into firefighting activities. Such practices may include treating firefighting water with Clorox bleach or other registered material to kill waterborne PL spores, washing vehicles, and washing tools and clothing. However, POC issues may become a secondary priority during wildland fire operations. While management objectives for POC are a concern, safety of firefighters and the public, and protection of property is always a higher priority. Existing or "in-place" disease-controlling management practices such as road closures may be compromised.

Road closures and other compromised POC disease-controlling measures would be reinstalled following suppression and emergency rehabilitation unless changed circumstances indicate otherwise. Fire rehabilitation efforts would include POC and PL considerations.

Snag Retention. Emphasize the retention of POC snags in Riparian Reserves because they are resistant to decay and the resultant down logs can provide durable structural components for both aquatic and terrestrial ecosystems. Retention numbers should consider that few additional large POC snags are likely to become available in the near future in infested areas because of the current mortality and presence of PL. This direction is particularly applicable to plant associations on utramafic soils and other locations where POC can be some of the largest and most abundant trees.

Disease Export. Where the agencies have reason to believe heavy equipment working in infested stands would next travel through or to substantially uninfested private or public POC areas, such as in uninfested watersheds or different administrative units, heavy equipment, including road maintenance equipment that has left surfaced (rocked or paved) roads in infested POC areas, would be washed upon leaving infested project areas to minimize

transport of infested soil to uninfested areas. Washing areas would be located as described under Management Practice 11 (Washing Project Equipment) in the following Management Practices section.

Project-Specific Direction and Port-Orford-Cedar Risk Key

One or more of the management practices listed under the following Management Practices subheading would be applied to site-specific management activities when a need is indicated by the Port-Orford-Cedar Risk Key, Table 2-1. This approach precludes the need for additional project-specific analysis of risk because the risk key describes conditions where risk reduction management practices are assumed (expected) to be applied. When a project-specific application of the risk key shows the risk is low, no additional management practices are needed. Project-specific NEPA analysis will appropriately document the application of the risk key and the consideration of the available management practices. Application of the risk key and application of resultant management practices (if any), will make the project consistent with the mid- and large-geographic and temporal-scale effects described by the SEIS analysis, and will permit the project analysis to tier to the discussion of those effects.

Table 2-1.—*Port-Orford-Cedar Risk Key: Site-specific analysis to help determine where risk reduction management practices would be applied*

1a. Are there uninfected POC within, near [1], or downstream of the activity area whose ecological, Tribal, or product use or function measurably contributes to meeting land and resource management plan objectives?	
1b. Are there uninfected POC within, near [1], or downstream of the activity area that, were they to become infected, would likely spread infections to trees whose ecological, Tribal, or product use or function measurably contributes to meeting land and resource management plan objectives?	
1c. Is the activity area within an uninfested 7th field watershed [2] as defined for Alternative 6 (see Table A12-2).	*If the answer to all three questions, 1a, 1b, and 1c, is no, then risk is low and no POC management practices are required.*
If the answer to any of the three questions is yes, continue.	
2. Will the proposed project introduce appreciable additional risk [3] of infection to these uninfected POC?	*If no, then risk is low and no POC management practices are required.*
If yes, apply management practices from the list below to reduce the risk to the point it is no longer appreciable, or meet the disease control objectives by other means, such as redesigning the project so that uninfected POC are no longer near or downstream of the activity area. If the risk cannot be reduced to the point it is no longer appreciable through practicable and cost-effective treatments or design changes, the project may proceed if the analysis supports a finding that the value or need for the proposed activity outweighs the additional risk to POC created by the project.	

[1] In questions 1a and 1b, "near" generally means within 25 to 50 feet downslope or 25 feet upslope from management activity areas, access roads, or haul routes; farther for drainage features; 100 to 200 feet in streams.
[2] Uninfested 7th field watersheds are listed on Table A12-2 as those with at least 100 acres of POC stands, are at least 50% federal ownership, and are free of PL except within the lowermost 2 acres of the drainage.
[3] *Appreciable additional risk* does not not mean "any risk." It means that a reasonable person would recognize risk, additional to existing uncontrollable risk, to believe mitigation is warranted and would make a cost-effective or important difference (see Risk Key Definitions and Examples for further discussion.

For the application of this risk key, the definition of *project* would not be limited to any one type of management activity. For example, projects such as road maintenance projects, livestock grazing permits, recreation management projects and permits, fuelwood permits, non-POC special forest products permits, and other uses likely to introduce significant risk to essential POC would require implementation of applicable management practices at the time of planning or reissuance of permits when indicated by application of the key.

The objective of the risk key is to identify project areas/situations where new infections should be avoided, and guide the application of one or more of the management practices until the risk is acceptably mitigated. The risk key describes circumstances under which the various risk reducing management practices would be applied where needed.

Port-Orford-Cedar Risk Key Definitions and Examples

Additional risk ~ The intent is to mitigate or avoid the potential risk for infection, commensurate with the value of the potentially affected resource and the cost of the mitigation or avoidance, that is appreciably above background or existing risk levels. Where background or existing potential risk of infection levels are low, such as in uninfested inventoried roadless areas (see Map 3), an apparently minor activity such as a permitted one-time event or trail maintenance, might create appreciable additional risk. In checkerboard ownerships near private timberlands, near roads that have reciprocal rights-of-way agreements not addressing POC, or near major public use areas, such activities would likely not create appreciable "additional" risk since the risk already exists. In other words, mitigation (application of management practices or other options identified in the risk key) is only required by the key when, in the context of the risk coming from already existing activities essentially beyond the practical control of the Agencies, it can make a cost-effective and important difference.

Measurably contributes to meeting land and resource management plan objectives ~ The uninfected POC in question is so located, or covers such a geographic area such, that it measurably contributes to meeting land and resource management plan objectives and/or all applicable laws and regulations. The effects discussions in this SEIS provide much of the basis for this determination; if no adverse effect is identified for POC mortality, then the likelihood of various mortality having an adverse effect on land and resource management plan objectives is low.

Land and resource management plan objectives ~ Includes, but is not limited to, maintaining forested landscapes, species diversity, soil stability, stream temperatures (including State 303(d) requirements), buffering seasonal stream flow fluctuations, supplying large wood from streams and wildlife, visual quality, habitat for rare or unique plants, habitat for threatened, endangered, sensitive/special status, Survey and Manage, or other Agency-emphasis species, product collection and harvest, wilderness values, research opportunities, and genetic diversity.

Measurably contributes to ~ Means the POC at risk from the proposed activity makes a meaningful and unique contribution to the plan objective in question. Where POC is a small percentage of the stand or does not provide unique stand attributes (not providing the largest trees in the stand, for instance), its loss is probably not meaningful when measured against management objectives. Similarly, where stream shading, bank stabil-

ity, and other riparian functions are readily performed by other species onsite, POC mortality is probably not meaningful. Where POC mortality could affect rare or unique plants, but mortality has been demonstrated to benefit such plants, POC mortality is probably not meaningful.

On the other hand, where POC is a significant portion of the riparian vegetation and its loss would likely lead to creating or exacerbating stream temperature, bank stability, turbidity, or other problems, POC is making a meaningful contribution to land and resource management plan objectives. Significant geographic areas in wilderness are making a meaningful contribution. POC as a large percentage of the stand in recreation or visually sensitive areas are probably making a meaningful contribution. Where POC is part of the reason for the designation of a research natural area or area of critical environmental concern, it is making a meaningful contribution. POC protecting rare plants, or serving as nest structures for listed species, are probably making a meaningful contribution if substitutes are not readily available. It is more likely that POC is making a meaningful contribution to land and resource management plan objectives if the site is within the 90,900 acres in Oregon where POC is prominent in the overstory (see Table 3&4-12, Ecology section).

Management Practices

Management practices are designed to:

- Prevent/reduce the import of disease into uninfested areas (offsite spores picked-up and carried into an uninfested project area);
- prevent/reduce the export of disease to uninfested areas (onsite spores moved to offsite, uninfested area); and
- minimize increases in the level of inoculum or minimize the rate of spread in areas where the disease is localized or infection is intermittent.

One to several of the management practices from the list below would be selected and implemented when there is a management need indicated by the POC Risk Key. No priority is assumed by the order listed below; the one or combination of specific practices best fitting the nature of the risk and the site-specific conditions would be applied when indicated by the risk key. Practices can be modified or partially implemented if such changes still meet risk reduction objectives and/or better fit site conditions. As noted in the Pathology section of the SEIS, combinations of practices can be more effective than single practices, depending on site-specific circumstances.

1) Project Scheduling: Schedule projects during the dry season or incorporate unit scheduling (Management Practice 3) and vehicle and equipment washing (Management Practice 11) as part of project design.

2) Utilize Uninfested Water: Use uninfested water sources for planned activities such as equipment washing, road watering, and other water-distribution needs, or treat water with Clorox bleach to prevent/reduce the spread of PL (see Appendix 4 for Clorox bleach label and instructions for use).

3) Unit Scheduling: Conduct work in all timber sale and other activity units or areas where PL is not present before working in units infested with PL.

4) Access: Designate access and egress routes to minimize exposure to PL.

5) Public Information: Increase public awareness of the root disease and the need to control it by using informational signs on or at trailheads, gates, and other closures, and holding coordination meetings with adjacent industrial and small woodland landowners.

6) Fuels Management: Clean boots, vehicles, and incorporate other management practices to avoid moving infested soil out of treatment areas. Incorporate unit scheduling and vehicle and equipment washing as described in Management Practice 1 as part of project design. Select water sources as described in Management Practice 2. Specify travel routes as shown in Management Practice 4.

7) Incorporate POC Objectives into Prescribed Fire Plans: Incorporate POC objectives (such as sanitation) into prescribed fire treatment plans. These include using uninfested or treated water sources and, potentially, aiding with eradication treatments.

8) Routing Recreation Use: Route new trails (off-highway vehicle, motorcycle, mountain bike, horse, and foot) away from areas with POC or PL, or provide other mitigation such as seasonal closures. Trailheads would be relocated and/or established trails would be rerouted in the same manner where trails present significant risk to POC, or provide other mitigation such as site hardening.

9) Road Management Measures: Implement proactive disease-prevention measures including not building roads, not using existing roads, seasonal or permanent road closures, road maintenance, and/or sanitation removal of roadside POC to help reduce the likelihood of spreading the disease—especially to high-risk areas and/or identify prevention measures at a site-specific or drainage-specific level. Road design features include pavement over other surfacing, surfacing over no surfacing, removal of low water crossings, drainage structures to divert water to areas unfavorable to the pathogen, and waste disposal.

10) Resistant POC Planting: Plant resistant POC 25 feet apart or in approximately 10 tree clusters at 100 to 150-foot spacing to lessen the potential for root grafting (a source of PL spread). Silvicultural prescriptions for sites having potential for growing POC would provide for the establishment of the species through natural or artificial regeneration and maintenance as a viable stand component through the current and future rotations.

11) Washing Project Equipment: Wash project equipment prior to beginning work in uninfested project areas, when leaving infested areas to work in uninfested areas, and when leaving the project area to minimize the transportation of infested soil to uninfested areas. Equipment includes maintenance and harvest equipment coming in contact with soils, and project vehicles, including trucks and crew vehicles, leaving surfaced roads or traveling on other roads deemed at risk for spreading disease (generally project area secondary roads around diseased POC). Project areas should be compartmentalized by road system in areas with mixed ownership (Federal and private). A road system with

infested areas and noninfested areas would be considered infested. Washing areas should be placed at optimum locations for minimizing spread, such as at entry/exit points of the road system with Federal control. Washing should take place as close as possible to infested sites. Wash water would be from uninfested water sources or treated with Clorox bleach. Wash water should not drain into watercourses or into areas with uninfected POC. Ideally, equipment should not travel for any substantial distance prior to being washed unless being transported on surfaced roads. Equipment moving into uninfested areas may be washed miles away as long as they do not travel through infested areas to reach their destination. Effectiveness testing indicates large reductions in inoculum by washing. Additional information about washing, and suggested parameters for washing stations, can be found in Appendix 2 of the BLM "Port-Orford-Cedar Management Guidelines," which can be found in Appendix 1 of this SEIS. An updated equipment cleaning checklist can be found in Appendix 13 of this SEIS, and a Clorox bleach label and updated mixing instructions are in Appendix 4 of this SEIS.

12) Logging Systems: Use non-ground-based logging systems (cable or helicopter).

13) Spacing Objectives for Port-Orford-Cedar Thinning: POC spacing objectives during thinning projects (commercial or precommercial) should be to create discontinuous POC populations across the management unit.

14) Non-Port-Orford-Cedar Special Forest Products*:* No special forest products permits, including firewood permits, would be issued in the wet season where POC is present, unless administration previously mentioned for Bough Cutting under General Direction can be implemented. Educate the public on the risks associated with collecting in areas with POC.

15) Summer Rain Events: Apply permit or contract clause or otherwise require cessation of operations when indicators such as puddles in the roadway, water running in roadside ditches, or increases in soil moisture (as measured by moisture meter or equivalent) indicate an unacceptable increase in the likelihood of spreading PL.

16) Roadside Sanitation: Remove or kill POC along both sides of the road. Recommended minimum width is 25 feet above the road or to the top of the cutbank, and 25 to 50 feet below the road. Roads that are open year-round generally pose the highest risk and would benefit most from sanitation treatment. Maintenance would be essential to retain benefits. POC should be re-treated as soon as possible after they reach a height of 6 inches above ground level. Sanitation treatments could be incorporated as part of routine road maintenance.

17) Site-Specific POC Management: Where possible, emphasize management of POC on sites where conditions make it likely that they will escape infection by PL, even if the pathogen has already been established nearby or may be introduced in the future. POC above roads, uphill from creeks, on ridgetops, and on well-drained sites are less likely to become infected. Emphasis may include priority retention during thinning or other silvicultural treatments, and planting to increase the presence of POC in areas unfavorable to the pathogen.

Monitoring

The monitoring plan for this alternative is in Appendix 5.

Alternative 3 — Port-Orford-Cedar Cores and Buffers in 6th Field Watersheds

This alternative contains all of the management elements of Alternative 2 except the risk key linkage to 7th field watersheds, and seeks to slow the spread of PL even more by adding additional protection for 31 currently uninfested 6th field watersheds having at least 100 acres of stands containing POC. Specific protection measures are prescribed for the POC stands within these watersheds (POC core areas), and somewhat different protection is prescribed for the remainder of these watersheds (POC buffers) to lessen the possibility of infection within the POC core.

The objectives of this alternative are to:

- Maintain POC on sites where the risk for infection is low;
- reduce the spread and severity of root disease in high-risk areas to retain its ecological function to the extent practicable;
- accelerate reestablishment of POC in plant communities where it has been significantly reduced in numbers by root disease; and
- apply additional management techniques to reduce the likelihood of root disease becoming established in disease-free 6th field watersheds.

General Direction

Except for the specific requirements for the POC cores and buffers described below, and minor differences in the monitoring plan shown in Appendix 5, and not including the risk key linkage to 7th field watersheds, all direction for Alternative 2 applies to this alternative.

Management of Port-Orford-Cedar Cores

Analysis of watersheds with greater than 100 Federal acres in stands that include POC (not including plantations where POC did not previously occur) shows that there are currently 31 6th field watersheds in Oregon where at least the Federal lands are uninfested with PL (see Map 1). These stands occur in Matrix as well as various Reserve land allocations. Uninfested POC stands within these watersheds (about 34,000 acres) would be referred to as POC cores (see Table 2-2 and Appendix 12). POC cores are not necessarily contiguous acres. POC cores are represented in red on Map 1 using existing geographic information system (GIS) stand mapping. Actual watersheds included and POC core boundaries would depend on the absence of PL (at this time) and where POC occurs on the ground. Stands with any level of POC are included. Watersheds no longer qualify for POC cores and buffers if 5 percent or more of the POC core area becomes infested with PL.

The following measures apply to POC cores:

Table 2-2.—*Alternative 3, summary of 6th field watershed cores and buffers* [1]

	Federal acres					
District or Forest	Number of watersheds	Core Matrix/ Riparian Reserve/ Adaptive Manage-ment Area acres	Core reserve acres	Buffer acres	Federal and private acres in watershed	% Federal owner-ship
Coos Bay	0	0	0	0	0	0
Medford	9	1,633	5,449	91,990	162,124	61
Roseburg	1	5	105	6,773	25,561	27
Siskiyou	21	3,772	23,055	361,703	407,179	95
Total	31	5,419	28,609	460,464	594,863	83

[1] See Appendix 12 for a complete list of watersheds.

1) Minimize Entry: Administratively controllable entry into POC cores would be minimized. For example, product collection or other special use permits would not be issued in these areas.

2) Transportation Analysis: A transportation analysis would be conducted to determine road needs for the POC cores. Management objectives would minimize the road system within the POC core, which could result in decommissioning parts of the existing road system. New (discretionary) road construction would not be permitted.

3) No Vehicles: To the extent road access is controlled by the Agencies, all vehicular traffic would be excluded, with the exception of administrative access. Off-highway vehicle use would not be permitted.

4) No Timber Harvest: Timber harvest, including salvage, would be prohibited, unless a stand-replacing event results in the area no longer qualifying as a POC core area. Stand treatments not involving timber harvest would be permitted.

5) Water Sources: To the extent consistent with firefighter safety and water availability, wildland fire operations within the POC cores would utilize water from within the uninfested watershed. Water sources would be mapped.

6) Trails: New trails would not be built in POC cores. Whenever practicable, move existing trails so they do not pass through POC cores.

7) Roadside Sanitation: Remove or kill all POC along both sides of all roads not permanently closed. Recommended minimum width is 25 feet above the road or to the top of the cutbank, and 25 to 50 feet below the road. Maintenance would be essential to retain benefits. POC should be re-treated as soon as possible after they reach a height of 6 inches above ground level.

8) Eradication: All areas within the POC cores that become infested with PL in the future would be considered for eradication treatments. Where practicable, the objective is to reduce and eventually eliminate PL from POC cores. Eradication treatments could be a source of commodities.

Management of Port-Orford-Cedar Buffers

To reduce the likelihood of introducing root disease within POC cores, the remainder of the 6th field watershed containing POC cores would be managed as a POC buffer. This includes all land allocations. The measures below for POC buffers are intended to reduce the possibility of introducing PL into the POC cores, as described below. There are 31 POC buffers in the analysis area, ranging from 3,285 to 27,743 acres. On Map 1, Federal lands within the buffers are shown in four colors depending on their land use allocation.

The following measures apply to POC buffers:

1) Transportation Analysis: A transportation analysis would determine road needs for the POC buffers. Management objectives would minimize the road system available for public use, particularly for vehicle traffic, both within and entering the 6th field watershed. This may include, but does not necessarily mandate, reduction in the total number of road miles. Emphasis would be on limiting public road use to the dry season with seasonal closures of selected roads.

2) Water Sources: Planned management actions (outside of wildland fire operations) would use water from within the POC core or buffer, or from sources known to be uninfested. To the extent consistent with firefighter safety and water availability, wildland fire operations within the POC buffer would utilize water from uninfested sources when possible.

Monitoring

The monitoring plan for this alternative is in Appendix 5.

Alternative 4 — Passive Project Management with Accelerated Resistance Breeding

This alternative has no site-specific or project-specific requirements to reduce the spread of PL, but would accelerate the resistance breeding program. The resistance breeding program is designed to supply seedlings to replace (at the same site or elsewhere) POC killed by the disease. Quickly replacing dead POC in natural stands with resistant POC seedlings, and planting microsites at less risk of exposure to PL, would be emphasized.

The objectives of this alternative are to:

- Maintain POC on sites where the risk for infection is low;
- permit the disease to run its course in high-risk areas;
- attempt to quickly reestablish POC in plant communities where it has been significantly reduced in numbers by root disease.

General Direction

Except when coincident with other management activities or programs, or when there is potential to spread the root disease from infested federally-administered lands to adjacent

uninfested private lands, active Federal forest efforts to limit the spread of the pathogen would be discontinued. Examples of when coincident treatments would continue would be when washing vehicles for the control of noxious weeds, relocating a trail for other reasons, or discriminating against POC when thinning next to a road.

Genetics. The ongoing interagency breeding program at the FS Dorena Genetic Resource Center located at Cottage Grove, Oregon, would be intensified. Operational containerized seed orchards, organized into previously identified breeding zones, would be developed at a faster pace and maintained to produce resistant seed. Screening and breeding activities to increase the level and diversity of resistance available would accelerate for those zones of concern. Any forms of partial resistance are likely to need several cycles of selection and breeding to be of most benefit—with POC, this can be accomplished much faster than with most other forest tree species. Further research would be done to uncover more information on the array and number of resistance mechanisms available, and their underlying basis. For testing and reforestation purposes and for orchard development, an adequate production flow of rooted cuttings would also be assured.

Resistant stock would be developed and made available for all POC reforestation and restoration projects. About 50 to 75 percent of resistant seedlings or root cuttings have survived during exposure to PL in short-term (1 or 2 year) greenhouse and raised-bed testing, compared to 0 to 5 percent for the most susceptible.

The existing interagency resistance breeding program would be continued as described in a POC interagency agreement between the FS and BLM. The objectives of this agreement are to (1) select and evaluate families for resistance and develop durable resistance to PL while maintaining broad genetic diversity within the species, and (2) produce seed genetically resistant to PL for deployment throughout the range of POC where PL is present. The POC resistance breeding program would continue as follows:

- Develop operational resistant seed for breeding zones (breeding blocks plus elevation zones) based upon management needs within the range of POC;
- continue efforts to inform the public about the availability and use of resistant seed;
- find ways to provide resistant seed to non-Federal landowners; and
- monitor the operational performance of resistant plantings.

In addition, about 0.5 pound of resistant seed for each POC breeding zone in organized conservation seedbanks would be collected and maintained. This seed would be reserved exclusively for reforesting areas after the occurrence of stand-replacement events such as large-scale fires. Where possible, resistant POC seedlings would be planted in such locales, with the goal to reintroduce POC to all pre-fire locations.

Snag Retention. In Riparian Reserves, emphasize the retention of POC snags because they are resistant to decay and the resultant down logs can provide durable structural components for both aquatic and terrestrial ecosystems. Retention numbers should consider that few additional large POC snags are likely to become available in the near future in infested areas because of the current mortality and presence of PL. This direction is particularly applicable

to plant associations on utramafic soils and other locations where POC can be some of the largest and most abundant trees.

Monitoring

The monitoring plan for this alternative is in Appendix 5.

Alternative 5 — Passive Project Management with Reduced Resistance Breeding

This alternative has no site-specific or project-specific requirements to reduce the spread of PL, and it would discontinue the resistance breeding program. All current management activities described in Alternative 1 would be discontinued except for the operational POC seed production orchards. Seedlings from existing resistant seed orchard trees would continue to be used to reforest areas of mortality occurring in the same breeding zone, but resistant seed for other breeding zones would not be developed.

The objectives of this alternative are to:

- Maintain POC on sites where the risk for infection is low; and
- permit the disease to run its course in high-risk areas.

General Direction

Except when coincident with other management activities or programs, or when there is potential to spread the root disease from infested federally-administered lands to adjacent uninfested private lands, active Federal forest efforts to limit the spread of the pathogen would be discontinued. Examples of when coincident treatments would continue would be when washing vehicles for the control of noxious weeds, relocating a trail for other reasons, or discriminating against POC when thinning along a road..

Snag Retention. In Riparian Reserves, emphasize the retention of POC snags because they are resistant to decay and the resultant down logs can provide durable structural components for both aquatic and terrestrial ecosystems. Retention numbers should consider that few additional large POC snags are likely to become available in infested areas because of the current mortality and presence of PL. This direction is particularly applicable to plant associations on utramafic soils and other locations where POC can be some of the largest and most abundant trees.

Monitoring

The monitoring plan for this alternative is in Appendix 5.

Alternative 6 — Port-Orford-Cedar Cores and Buffers in 7th Field Watersheds

This alternative contains all of the management elements of Alternative 2, and seeks to slow the spread of PL even more by adding additional protection for 162 currently uninfested 7th field watersheds having at least 100 acres of stands containing POC. Specific protection measures are prescribed for the POC stands within these watersheds (POC core areas), and

somewhat different protection is prescribed for the remainder of these watersheds (POC buffers) to lessen the possibility of infection within the POC core.

The objectives of this alternative are to:

- Maintain POC on sites where the risk for infection is low;
- reduce the spread and severity of root disease in high-risk areas to retain its ecological function to the extent practicable;
- reestablish POC in plant communities where it has been significantly reduced in numbers by root disease; and
- apply additional management techniques to reduce the likelihood of the root disease becoming established in disease-free 7th field subwatersheds.

General Direction

Except for the specific requirements for the POC cores and buffers described below, and minor differences in the monitoring plan shown in Appendix 5, all direction for Alternative 2 applies to this alternative.

Management of Port-Orford-Cedar Cores

Analysis of watersheds with greater than 50 percent Federal ownership and with greater than 100 Federal acres in stands that include POC (not including plantations where POC did not previously occur) shows that there are currently 162 7th field watersheds in Oregon where at least the Federal lands are uninfested or essentially uninfested (see below) with PL (see Map 2). These stands occur in Matrix as well as various Reserve land allocations. Uninfested POC stands within these watersheds (about 49,000 acres) would be referred to as POC cores (see Table 2-3 and Appendix 12). POC cores are not necessarily contiguous acres. POC cores are represented in red on Map 2 using existing GIS stand mapping. Actual watersheds included and POC core boundaries would depend on the absence of PL (at this time) and where POC occurs on the ground. Stands with any level of POC are included. Watersheds no longer qualify for POC cores and buffers if 5 percent or more of the POC core area becomes infested with PL. Because these watersheds some times empty into a larger stream

Table 2-3.—*Alternatives 2 and 6, summary of 7th field watershed cores and buffers* [1]

	Federal acres					
District or Forest	Number of watersheds	Core Matrix/ Riparian Reserve/ Adaptive Management Area acres	Core reserve acres	Buffer acres	Federal and private acres in watershed	% Federal ownership
Coos Bay	0	0	0	0	0	0
Medford	18	8	7,137	22,201	33,414	88
Roseburg	0	0	0	0	0	0
Siskiyou	144	6,343	35,881	193,799	244,867	96
Total	162	6,351	43,018	216,000	278,281	95

[1] Includes watersheds with up to 2 acres PL; excludes watersheds with less than 50% Federal administration. See Appendix 12 for a complete list of watersheds.

that is infested, infestations within the lowest 2 acres of the watershed (and lowest 200 feet of stream) do not count against the current uninfested status or the 5 percent.

The existing mapping protocols used for determining the 7th field watersheds shown on Map 2 are not necessarily consistent between administrative units or with standard 6th field mapping. If 7th field watershed maps are revised to a regional standard in the future, only buffer areas would be affected. POC core areas identified with the existing protocol would be considered permanent unless 5 percent or more become infested, or they are changed through a future NEPA decision.

The following measures apply to POC cores:

1) Minimize Entry: Administratively controllable entry into POC cores would be minimized. For example, product collection or other special use permits would not be issued in these areas.

2) Transportation Analysis: Pending required transportation analyses, close all discretionary roads in POC cores except mainline (tie) roads. New (discretionary) road construction would not be permitted.

3) No Vehicles: To the extent road access is controlled by the Agencies, all vehicular traffic would be excluded, with the exception of administrative access. Off-highway vehicle use would not be permitted.

4) No Timber Harvest: Timber harvest, including salvage, would be prohibited, unless a stand-replacing event results in the area no longer qualifying as a POC core area. Stand treatments not involving timber harvest would be permitted.

5) Water Sources: To the extent consistent with firefighter safety and water availability, wildland fire operations within the POC cores would utilize water from within the uninfested (portion of the) watershed. Water sources would be mapped.

6) Trails: New trails would not be built in POC cores. Whenever practicable, move existing trails so they do not pass through POC cores.

7) Roadside Sanitation: Remove or kill all POC along both sides of all roads not permanently closed. Recommended minimum width is 25 feet above the road or to the top of the cutbank, and 25 to 50 feet below the road. Maintenance would be essential to retain benefits. POC should be re-treated as soon as possible after they reach a height of 6 inches above ground level.

8) Eradication: All areas within the POC cores that become infested with PL in the future would be considered for eradication treatments. Where practicable, the objective is to reduce and eventually eliminate PL from POC cores. Eradication treatments could be a source of commodities.

9) Land Exchange: Consider land exchanges to block-up these watersheds and obtain control of access routes, especially on serpentine soils.

Management of Port-Orford-Cedar Buffers

To reduce the likelihood of introducing root disease within POC cores, the remainder of the 7th field watershed containing POC cores would be managed as a POC buffer. This includes all land allocations. The measures below for buffers are intended to reduce the possibility of introducing PL into the POC cores, as described below. There are 162 POC buffers in the analysis area, ranging from 71 acres to 3,600 acres. On Map 2, Federal lands within the buffers are shown in four colors depending on their land use allocation.

The following measures apply to POC buffers:

1) Transportation Analysis: A transportation analysis would determine road needs for the POC buffers. Management objectives would minimize the road system available for public use, particularly for vehicle traffic, both within and entering the 6th field watershed. This may include, but does not necessarily mandate, reduction in the total number of road miles. Emphasis would be on limiting public road use to the dry season with seasonal closures of selected roads.

2) Water Sources: Planned management actions (outside of wildland fire operations) would use water from uninfested areas within the POC core or buffer, or from other sources known to be uninfested. To the extent consistent with firefighter safety and water availability, wildland fire operations within the POC buffer would utilize water from uninfested sources when possible.

Monitoring

The monitoring plan for this alternative is in Appendix 5.

Alternatives Considered But Eliminated From Detailed Study

An EIS must rigorously explore and objectively evaluate all reasonable alternatives. The range of alternatives is limited by the requirement to fulfill the Purpose and Need to which the Agencies are responding in proposing the alternatives.

Many of the alternatives considered by the interdisciplinary team were eliminated from detailed study in attempts to find reasonable alternatives that would fulfill the underlying Need for the Proposed Action and the Purpose of this SEIS. The Need, as described in Chapter 1, is

> . . . the need for maintenance of POC as an ecologically and economically significant species on BLM and NF lands. POC plays a key role in the forest ecosystem because it serves as a component of many habitats and plant communities, provides culturally significant products for Tribes, and provides unique forest products.

This Need leads to Purposes to reduce disease introductions, slow the spread of the disease where present, and/or mitigate the occurrence of the disease on POC, to the degree such treatments are needed and cost-effective. The Agencies also must continue to meet all applicable laws governing management of NF and BLM lands, and, to the degree practicable, meet their multiple-use mandates, including providing access to products, public use, and wildland fire suppression. Since the progression of the root disease over time can neither be completely stopped even with a very conservative alternative, and since POC will not be extirpated from large areas even under a no management alternative, the interdisciplinary team chose to include a relatively wide range of alternatives for consideration in detail to ensure a reasonable range of resource effects relative to each issue. Alternatives were more likely to be eliminated from detailed study because they were too much like other alternatives, not because they did not meet the Purpose and Need.

Among potential alternatives considered were various strategies proposed by the public during the scoping and public comment process, as well as some strategies proposed by Agency staff. Some proposals reflected belief that the disease would run its course no matter what efforts were made to prevent its spread, and a combination of natural resistance and tree placement would be sufficient to provide for continuation of POC. Alternatives 4 and 5 best respond to these types of comments. Some proposals suggested prevention of new infections by prohibiting road access, harvest, and other management activities. These proposals are addressed by Alternatives 3 and 6. Many proposals suggested that application of various control measures which the agencies were already implementing, along with careful monitoring and development of additional strategies, would allow for forest use, products, and POC protection. These comments are best addressed by Alternatives 1 and 2. The interdisciplinary team appreciated the number of knowledgeable comments received during scoping. Many of the issues addressed in Chapter 3&4, as well as elements of the alternatives, came directly from scoping.

More Proactively Harvest Within Port-Orford-Cedar Stands

This alternative would reduce the spread of the disease by more actively thinning POC stands to reduce root contact between trees, cutting trees rooted into infested streams, and removing trees immediately upslope from riparian areas where POC serves a key function. This alternative would also actively salvage dead cedar in all land allocations where quantities exceed those required to meet other management objectives.

This alternative was not analyzed in detail for two reasons. First, it is a variation on the No-Action Alternative that encourages or permits such treatments where site-specific analysis indicates it would benefit aquatic resources. Salvaging dead cedar is permitted to some degree in all alternatives (although generally not in the POC cores in Alternatives 3 and 6), and can already be accelerated under existing guidelines. Second, an across-the-board increase in POC thinning and streamside sanitation would not meet the Need for maintenance of POC as an ecologically significant species, because it would remove trees in important riparian and stream habitats regardless of risk.

Retain Most Disease-Control Techniques, Particularly in High Public Use Areas, But Do Not Close Roads

This alternative would manage the spread of root disease by application of the full range of management techniques except closing roads. Roads would remain open for recreation, extraction, and other forest use. This is essentially a variation on other alternatives. Alternatives 1 and 2, and to a large extent Alternative 3, provide a menu of treatments to be applied based on site-specific conditions and disease-control needs. Managers can choose to close roads or apply other measures. The discussions of effects in Chapter 3&4, particularly the effects in the Pathology section, address the specific Standards and Guidelines, land use, and management practices that most affect POC root disease spread. Managers can make that balance to the extent other techniques adequately control root disease spread, and as public use favors keeping roads open. Roads would not be closed without first completing a transportation analysis. It would be unreasonably arbitrary to foreclose the possibility of closing unneeded roads which pose a risk to POC.

Retain All Port-Orford-Cedar Old-Growth Stands and Large Trees

This alternative would prohibit harvest of large POC and old-growth stands of POC. It would help address the concerns that: Larger trees are killed at higher percentage and take longer to replace; ecosystem function and persistence in the ecosystem continues after POC die; the old-growth POC remaining on Federal lands is only a fraction of the old-growth POC that historically occurred within the POC range; and, because of the root disease, old-growth POC would likely not become well distributed on the entire 80 percent of the Federal forests managed as Reserves. This alternative is very similar to Alternatives 3 and 6, and to some degree Alternatives 1 and 2, in that (1) about 80 percent of the landscape is in reserves that preclude old-growth harvest, (2) the percent of POC acreage in Reserves may exceed 90 percent because POC is a riparian species over much of the eastern part of its range, (3) Alternatives 3 and 6 place additional Matrix POC off-limits to harvesting, and (4) ecologically significant POC within Matrix areas may still be considered for retention in site-specific analyses. This alternative is also similar to Alternative 1 in that the amount of old-growth or large POC tree harvest taking place now is extremely limited. However, the exclusion of all harvest would thwart the objective of supplying wood for specialty products, and would limit sanitation and other silvicultural options for meeting POC and other stand management objectives. Furthermore, the retention of additional trees outside of riparian and other reserves would be of limited value because POC is used by terrestrial wildlife at a lower rate than other tree species.

Restore Old-Growth to its Presettlement Range

This alternative would prohibit harvest of any large trees and attempt to restore old-growth to presettlement levels. Resistant stock could be used. The aspect of this alternative prohibiting harvest of any large trees is discussed under Retain All Port-Orford-Cedar Old-Growth Stands and Large Trees section above. Restoring POC to presettlement levels is not feasible because of uncontrollable aspects of the root disease, and the costs involved. While devoting sufficient land, time, protection, seed, and seedlings to this single objective could provide substantial esthetic and ecological benefits, costs would be exorbitant and other multiple-use objectives would not be met. Such an alternative would require eradication of the disease at

a large scale, which has not yet shown to be effective. Aspects of this alternative are met by the Proposed Action which encourages planting on low-risk sites beyond those currently occupied by POC (see the Need in Chapter 1, the objective statements for Alternative 2 in Chapter 2, and the Planting Assumption in the Assumptions and Clarifications section early in Chapter 3&4.)

Provide For Restoration of Port-Orford-Cedar on Sites Impacted by *Phytophthora lateralis*

This alternative would examine different strategies for introducing resistant stock, include evaluation and success criteria, and describe changes in other management practices if resistant stock is not successful. This alternative is a variation of elements of several of the alternatives considered in detail. The resistance breeding program common to five of the alternatives (although at different levels), as well as the Planting Assumption (found in the Assumptions and Clarifications section early in Chapter 3&4) common to these same alternatives, propose to replace ecologically significant POC lost to disease. Overall monitoring requirements call for tracking disease spread and reconsidering the management direction as appropriate. Alternatives 4 and 5 are identical, except for emphasis on resistance breeding; the expectations from that program are described and contrasted with the effects of discontinuing the current breeding program. Alternatives 1, 2, 3, and 6 rely on a mix of management strategies that would ensure minimizing root disease spread even if resistant stock does not meet expectations. No alternative, except Alternative 4, places full reliance on the resistance breeding program. Although the other alternatives (1, 2, 3, and 6) assume that the long-term effects of the resistance breeding program would mitigate the loss of existing POC to disease, these benefits would not be realized in the near future. Hence, there are no specific provisions for relaxing management practices in favor of using resistant stock in those alternatives.

Plant Port-Orford-Cedar In Other Suitable Habitats

The alternative would vigorously plant POC in wet, but upslope, open, alder, and other low-risk areas suitable for its survival and growth. This alternative would help provide POC products for the future and potentially help maintain POC in some habitats. This alternative is included in other alternatives. The Need statement in Chapter 1 includes:

> The agencies also have an opportunity to mitigate some of the damage caused by the disease by developing disease-resistant planting stock to replace disease-killed trees.

The Planting Assumption (found in the Assumptions and Clarifications section early in Chapter 3&4), applicable variously to all alternatives, includes the assumption that resistant POC will be planted on sites not previously occupied by POC. Use of this technique exclusively, however, would not meet the Purpose and Need, since POC is an important component of some streamside habitats and should be maintained.

Design Different Management Strategies for Different Parts of the Range to Address Different Conditions

This alternative recognizes there are significant differences in the location and ecological function of POC between the northwest part of the range (where POC grows away from streams, across the landscape) and the rest of the range (where POC is more of a riparian species). In the northwest part of the range, up to 80 percent of the POC grows away from streams and roads, and is therefore not at risk from these two primary infestation sources. In other parts of the range, particularly on the ultramafic soils, POC can be primarily limited to Riparian Reserves, and therefore can be put at risk by activities that put the pathogen in the streams. This alternative would prescribe different measures for these different parts of the range. This alternative is essentially a variation of Alternatives 2, 3, and 6, because the application of the risk key in these alternatives would result already in the variable treatments suggested. A discussion of this point, the variable treatments likely to result between the North Coast Risk Region and the rest of the range from application of the risk key, can be found under the Differences in Risk Regions subheading in the Comparison of Alternatives section of this chapter.

Intensively Evaluate Individual Plant Association Group (PAG) Sites and Implement PAG-Specific Management Criteria

This alternative would identify representative samples for each of the 90 PAGs that are distributed across the range of POC in which POC is prominent. Close examinations of POC ecological functions and subpopulation characteristics would be performed, including determining genotypic differences using allozyme studies, DNA marker techniques, and common garden study plots. Based upon PAG-specific data, specific management regimes would be conceived and desired treatments implemented. Individual management criteria would be applied to each site, including collecting and retaining seed from representative PAG sites in every breeding block. This alternative is not considered in detail because analysis has determined that PL will not completely eliminate POC from any given PAG, nor will it eliminate significant genetic variation, so such intensive scrutiny and management are not warranted. Such an alternative is not necessary to meet the Need, and therefore would not meet the cost-effectiveness test in the Purpose.

Increase Port-Orford-Cedar by Encouraging Planting On Private Lands

This alternative would continue development of resistant POC in quantities sufficient to meet private land needs. This alternative would have the benefit of providing POC products and potentially meeting certain ecosystem and habitat needs. This alternative is a variation of Alternatives 1, 2, 3, 4, and 6 that specifically identify a goal of supplying resistant seedlings to private and state lands. It is particularly similar to Alternative 4, which emphasizes the resistance breeding program. Further, language has been added to Alternatives 2, 3, and 6 to

> . . . coordinate with state, local, industrial, and small woodland owners to help meet overall POC management objectives.

Impose Stronger Protections

This alternative, suggested by public comments during scoping, would impose stronger protections for POC throughout their entire natural range by:

1) Withdrawing all uninfested areas from mineral entry;
2) banning new road building and road reconstruction;
3) closing Level 1 and 2 roads and trails in, or leading into, uninfested watersheds;
4) prioritizing road closure over the practice of "sanitation" logging;
5) prohibiting motorized vehicles in all inventoried roadless areas (see Map 3);
6) prohibiting motorized vehicles in landscapes affected by the Biscuit Fire, including the watersheds of Rough and Ready, Rancherie, Baldface, and Fall and Baker Creeks; and
7) evaluating the benefits of wilderness protection for inventoried roadless areas (see Map 3) to prevent/reduce the spread of PL.

Some aspects of this alternative are included in other alternatives. The SEIS emphasizes that roads are the most significant agent of disease spread, and options to close roads, not use roads, or not build roads in the first place are included in the management practices below the risk key in Alternatives 2, 3, and 6. Discussion in the Pathology section makes it clear to managers using the key that road closures are superior to sanitation in terms of reduced risk. Closing roads in uninfested 6th and 7th field watersheds to the extent allowed under current permits and laws is a feature of Alternatives 3 and 6, respectively. Most motor vehicle use is already prohibited in inventoried roadless areas.

Regarding withdrawing all uninfested areas from mineral entry, the discussion under the alternative Close Roads and Eliminate Mining in Wilderness to Exclude *Phytophthora lateralis* in this section is illustrative. As noted there, mining is an important and legitimate use of public lands, providing raw materials for a variety of industrial uses. Congress considered these uses so important that the 1964 "Wilderness Act" had a grace period for filing and beginning operations on mining claims in wilderness. Such a sweeping restriction was not included in any alternative because there are other measures that can be taken under the Standards and Guidelines of Alternatives 1, 2, 3, and 6 that would more strategically meet the Need. On NFs, operations of any size, and even most prospecting, requires a plan of operation to be filed with the local administrative unit if the proposed activity would likely cause significant disturbance of surface resources. Applications typically trigger an EA or other NEPA analysis. Depending upon the risk, the Agency is required to provide reasonable terms and conditions for the operation. In this case, requirements to follow the same POC management practices used on other Agency activities would be binding on the claimant. The BLM rules are similar. Evaluating the benefits of wilderness protection for all inventoried roadless areas, or otherwise eliminate vehicles from all inventoried roadless areas goes beyond the Purpose and Need and is beyond the scope of this analysis. While it is clear in the analysis that any management decision that reduces access to the forests is likely to slow the spread of the disease, the SEIS provides analysis for what amounts to various levels of access and management restrictions by examining a range of alternatives defined in part by exclusions in, or emphasis on, uninfested watersheds. There is a strong correlation between these uninfested watersheds and roadless areas. Further, management activities are currently very limited in inventoried roadless areas, and project-specific NEPA evaluation of additional activities would be expected, within the range of POC, to consider effects to potentially significant populations of POC. A need for a carte blanche closure is not indicated by this analysis.

Site-specific decisions about management of areas affected by the Biscuit Fire are outside the scope of this programmatic SEIS and are more appropriately considered in NEPA documents specific to the Biscuit Fire.

Focus on Prevention Rather Than Mitigation or Control

This alternative would try to eliminate all new infections by eliminating management activities and most other access into uninfested areas of any size. Given the uncertainties about the resistance breeding program and the potential ecological value of POC, considering the fact that remaining Federal population is only a percentage of the historic population levels, substantial efforts toward disease prevention should be included in one or more alternative. This alternative is a variation of Alternative 6, which identifies and prohibits most management activities in POC in uninfested 7th field watersheds, and applies all elements of Alternative 2. No alternative considers "eliminating management activities" because to do so would not meet the Agencies' multiple-use goals or requirements of the "O&C Act," and nothing in the analysis indicates that such a drastic measure is necessary to accomplish the desired objective.

Limit Risky Activities Such as Bough Harvest to the Matrix

This alternative would restrict bough cutting to the Matrix to prevent bough-cutting related infections from about 80 percent of the Federal lands. This alternative is a variation of a Standard and Guideline in Alternatives 2, 3, and 6 which severely restricts all bough cutting. Further, such a limitation would probably not meet the Purpose and Need because illegal bough cutting and accidental cutting in reserves would be difficult to enforce if bough cutting were allowed nearby in the Matrix. This cutting in the Matrix would continue to contribute significantly to the spread of disease. The effects of this activity can be better mitigated by the educative influence through the permitting process, rather than a strict prohibition which would be very costly and difficult to enforce.

Broaden Risk Analysis to Include Road Maintenance, Road Use, Recreation Use, and Other Broad-Scale Activities Not Necessarily Subject to Project-Level or NEPA Analysis

This alternative would require routine forest use and management activities to be examined for the effect on root disease spread, and mitigation or control measures applied as appropriate. This alternative is a variation on other alternatives considered in detail. Alternatives 1, 2, 3, and 6 already have such requirements. For Alternative 1, as described in Appendix 2, road maintenance techniques and road-side sanitation are examples of activities triggered by road use and location, not by specific projects. Water sources are mapped, roads are closed, trails are moved, the public is informed about how to avoid spreading the disease, roads crossing streams are removed, road maintenance and other crews regularly clean vehicles and are aware of the location of infested areas, and integrated planning takes place. For Alternatives 2, 3, and 6, there is a specific requirement to apply the risk key to such activities at the time of planning or reissuance of permits.

Eliminate Timber Harvest in Port-Orford-Cedar Areas

This alternative would prohibit timber harvest in POC stands, thereby reducing the likelihood of carrying the pathogen into uninfested stands, or out of infested stands. This approach is applied to POC stands in currently uninfested watersheds in Alternatives 3 and 6. Application of this approach to the entire range would not meet the Need for making POC products available, or meet the Purpose of allowing the Agencies to continue to meet other multiple-use mandates, including the extraction of a wide range of products. On lands managed for regularly-scheduled timber harvest, POC typically makes up no more than 5 to 10 percent of the stands. Even if the agencies harvested no POC, the prohibition against harvesting in these stands would have a substantial effect on other harvest objectives. The discussion of the Northwest Forest Plan in Chapter 3&4 shows POC stands in Matrix/Adaptive Management Area/Riparian Reserves to be 92,600 acres, and discussion in the Timber Harvest section for uninfested watersheds shows probable sale quantity (PSQ) comes from about 42 percent of these acres at an average rate of 0.29 million board feet per thousand acres. At this rate, the 92,600 acres would contribute roughly 11 million board feet annually of the 49 million board feet PSQ for the Oregon portion of the POC range under the Northwest Forest Plan. This alternative would also prohibit the use of commercial silvicultural treatments for the maintenance of POC, or to meet other objectives in POC stands including Late-Successional Reserve habitat improvement or fuels reductions. While such an emphasis would undoubtedly reduce the spread rate, disease spread would continue via other human vectors. Other human vectors besides logging, for example, are implicated in all but one of the five or six longest-distance spreads. Singling out this particular activity for such a drastic measure is not warranted under the analysis and is not necessary to achieve the objectives.

Prohibit Logging During the Wet Season When the Likelihood of Disease Spread is Highest

This alternative would limit the likelihood of spreading POC root disease by limiting timber harvest to dry periods when the likelihood of moving infested soil is lowest. This treatment is already included as a management practice available under Alternatives 2, 3 and 6, reading in part

> . . . schedule projects during the dry season or . . .

and an additional management practice describing cessation of activities following dry-season storm events. Additionally, such scheduling is already practiced to the extent possible in order to protect soils, roads, and streams, particularly for ground-based skidding. To place further restrictions than these two, when coupled with existing seasonal restrictions for nesting wildlife and other purposes, would be unnecessarily duplicative. It would also not meet the Purpose that control measures be cost-effective. Limiting harvest while other uses continue during the wet season could reduce, but not nearly eliminate, disease spread.

Reverse *Phytophthora lateralis* Infestations and Eliminate it from the Landscape

This alternative would eliminate the root disease from the range of POC by temporarily (estimated 10 years) removing all POC in, around, and for up to 200 feet downstream of infested areas, and keep them free of POC long enough for the pathogen to die-out of the soil. This alternative is not feasible or practical for several reasons. First, the pathogen currently infests an estimated 34,400 acres in Oregon, an acreage (plus surrounding buffers) that would be prohibitively expensive if not impossible to treat. Second, the impact of killing these trees all at once, particularly downstream from the infestations, may have a worse effect than the gradual advance of the disease. Third, while eradication success is promising enough to try in isolated cases such as in POC cores (Alternatives 3 and 6), limited Agency experience with eradication treatments has shown that treatments are not always successful. The pathogen can persist in the soil for many years. In very limited trials so far, even prescribed fire has, to date, not been uniformly demonstrated to kill the pathogen. Fourth, even if eradication were typically more successful, some infestations would escape the treatment. For example, although research shows infections to be typically located within 525 feet of an upstream infection source, anecdotal evidence indicates the disease can travel much farther. Fifth, trees naturally resistant to the disease would be removed with such treatments. Finally, the disease would not be removed from private lands, so there would continue to be an infection source.

Treatments suggested by this alternative are already included in Alternatives 2, 3 and 6 to some extent. Eradication treatment is one of the management options, and will be used on limited infections. An eradication treatment for a small, isolated infestation is being done on the Shasta-Trinity NF, for example. These alternatives call for an increase in eradication if this technique proves successful.

Manage According to Stand-Specific Risk Assessment Methods

This alternative would employ methodologies for identifying elements of risk (value, hazard, exposure, and susceptibility), and a resulting range of possible management objectives and strategies to deploy on a landscape scale (Jimerson et al. 1999; USDA-FS and USDI-BLM 2003b). This alternative is essentially a variation of Alternatives 2, 3, and 6, because these alternatives acknowledge inherent POC values and then, embedded as an integral component of the risk key, identify relative hazard based upon exposure and susceptibility on a project basis. Information, including detailed maps of POC and relevant risk factors, needed to accomplish this at the range-wide scale through this SEIS, is not available. As maps are improved and additional site-specific information becomes available, it can be incorporated into site-specific analysis (under the risk key in Alternatives 2, 3, or 6, for example).

Close Roads and Eliminate Mining in Wilderness to Exclude *Phytophthora lateralis*

This alternative would administratively, or by purchase, eliminate existing mining claims in the Kalmiopsis (and any other) Wilderness Area and restore access roads. The alternative would not meet the element of the Purpose to continue to meet multiple-use needs by provid-

ing access to products. Mining is an important and legitimate use of public lands, providing raw materials for a variety of industrial uses. Congress considered these uses so important that the 1964 "Wilderness Act" had a grace period for filing and beginning operations on mining claims in wilderness, and such claims remain valid as long as they are maintained. Closing such claims could constitute a "taking," and would require purchase by the Federal government. Also, such a restriction may not have the desired effect, because the sources of infestations near mining activity are simply not well known.

Finally, there are other measures that can be taken under the Standards and Guidelines of Alternatives 1, 2, 3, and 6. On NFs, operations of any size, and even most prospecting, requires a plan of operation to be filed with the local administrative unit if the proposed activity would likely cause significant disturbance of surface resources. Applications typically trigger an EA or other NEPA analysis. Depending upon the risk, the Agency is required to provide reasonable terms and conditions for the operation. In this case, requirements to follow the same POC management practices used on other Agency activities would be binding on the claimant. Infection risk from mine operations are currently reduced because the Kalmiopsis claim owner has been using helicopters to bring in equipment, and travels the road via horseback.

The BLM rules are similar to those described above.

Include Disease Control Provisions for Sudden Oak Death

This alternative would provide Standards and Guidelines for the prevention and eradication of Sudden Oak Death. Although there are some similarities between the diseases, there are also substantial differences. At this time, scientists and land managers have no way of predicting the movement of Sudden Oak Death, *Phytophthora ramorum*, across the range of POC in southwestern Oregon or northern California. In California, the pathogen is present and causes disease in many plant species in coastal areas, with the disease being most abundant and severe in forest types with a significant component of tanoak. Since the disease was discovered and identified in 2000, it has increased dramatically in California and now extends to within 125 miles of the Oregon border. Presently, the disease is not known to occur in Del Norte County or northern Humboldt County, California. In Oregon, the disease has been found at 22 locations within a 9 square-mile area near Brookings, now regulated by Oregon Department of Agriculture. Infesting not more than 55 acres, all of these areas have been cut and burned in an effort to eradicate all populations of the pathogen. There have also been discoveries of Sudden Oak Death in nursery stock near Gresham, Oregon, that were (apparently) successfully eradicated. None of the current known Oregon locations are within the natural range of POC.

Research is underway in California to describe factors that affect spread of the disease across the landscape, but at present these are poorly understood. Therefore, spread of the disease cannot be predicted. Sudden Oak Death has not been analyzed as part of POC-SEIS because too little is known about the disease-spread mechanisms and pathology to design proven control measures. *P. ramorum* has only been clearly known and studied for a few years. Too little is known about the disease for development of an impacts analysis and disease management evaluation.

PL is a root disease, but *P. ramorum* attacks plant stem and leaf tissues. While the major host species for *P. ramorum* and PL share some habitats and occupy some of the same plant associations, there are obvious host differences in the species range, habitats occupied, and life history that suggest a different disease mechanism is operating. POC is generally restricted to sites near groundwater; moisture regime strongly influences community development and plant associations within the range of POC. Tanoak is not strongly dependent on a consistent supply of soil moisture and is usually found on sites that are much drier than those for POC. The range of tanoak extends much further south into the hotter, drier climates of the central California coast range (and even into the Sierra) than does POC. In California, there is a correlation between the spread of *P. ramorum* into tanoak and its association with high population levels of California laurel (*Unbellularia californica*). There is no known connection between high population levels of California laurel tree, sometimes called Oregon myrtle, and POC. Additionally, *P. ramorum* has been found to kill or injure a wide variety of host species, while PL is only known in two host species (Anonymous 2002).

The differences between *P. ramorum* and PL and their host species are enough to suggest that the difference in environmental affects resulting from each disease and the difference in disease management practices would be substantial.

Close More Roads within Federal Lands

This alternative would close roads in uninfested Federal lands, especially those also going through nearby infested private lands. This alternative was not considered in detail because there are provisions within other alternatives to consider closing roads where needed and appropriate. But in particular, a substantial increase in road closures is not possible in many cases, at least not without purchasing existing private interests to those roads. The limitations on closing roads with reciprocal rights-of-ways or other encumbrances are discussed in the Encumbered Forest Roads section of Chapter 3&4.

Comparison of the Effects of the Alternatives

Introduction: Descriptions of ongoing management and other activities taking place in the forest are provided in the Affected Environment portions of the Timber Harvest, Special Forest Products, Recreation, Fire and Fuels, Mining, Livestock Grazing, and other "management activities" sections in Chapter 3&4. The alternatives have direct effects on these activities, and these are described under Environmental Effects below. However, these activities, and other disease-spread vectors (such as wildlife, private land use, and downslope and down-stream movement), provide the basis for understanding the disease spread. The elements of these activities that spread the disease (such as vehicles, feet, and equipment) and the relative importance and risk associated each, are addressed in the Pathology section in Chapter 3&4. Then, in the Effects of the Alternatives part of the Pathology section, the elements of the various alternatives (each designed to address, mitigate, or otherwise counteract a spread vector or practice) are considered, and a 100-year disease spread prediction is made for each alternative. Finally, it is this 100-year disease spread prediction that is the basis for estimating the ecological effects for each alternative for Water and Fisheries, Wildlife, Botany, Ecology and Plant Associations, and other resources where POC may be a significant contributor. As a result, it is the Pathology section that is the heart of the analysis.

Combining the effects of various forest uses and the effects (on disease spread) of the various alternatives, the Pathology section provides a cumulative effect of all activities on disease spread, which in turn serves as the basis for the "indirect" or ecological effects.

Disease Spread: Three risk regions differ in the way POC is distributed on the landscape relative to the primary disease spread avenues of water and roads. Put another way, the risk regions differ in the percentage of POC acres potentially affected by root disease in the future. In the North Coast Risk Region (Coos Bay BLM District and Powers Ranger District on the Siskiyou NF), POC is well-distributed across the landscape because of favorable moisture conditions. POC at high risk to infection because of proximity to streams and roads is approximately 20 percent of the total POC acreage. Because PL has been in this area more than 50 years, much of that time without active Agency disease-control measures, the disease has reached approximately 75 percent of these high-risk sites, or 15 percent of the total POC acreage. Because spread is limited almost exclusively to high-risk sites, this area is approaching disease saturation and the annual new infestation rate has substantially declined from previous decades.

In the Oregon portions of the Siskiyou Risk Region (Siskiyou NF) and Inland Siskiyou Risk Region (Roseburg and Medford BLM Districts), POC is more concentrated in riparian areas, raising the percent of POC acres in proximity to water and therefore at high risk to infestation. Higher road density and more checkerboard ownership pattern in the Inland Siskiyou Risk Region further increases the area at high risk, so the area of POC at high risk to infestation in these two risk regions is 40 and 60 percent, respectively. The root disease has not been in these areas as long, and the potential for rapid expansion of the disease acres is still high.

The Standards and Guidelines of each alternative affect the percentage of high-risk sites that will become infested within the next 100 years. The predictions consider not only the provisions of the alternatives and the kinds of activities and uses taking place, but the location and context of Federal lands within the larger POC landscape. In addition to the 272,000 acres of POC stands and estimated 34,400 acres of infestation on Federal lands in Oregon, there are over 50,000 acres of POC and over 8,500 acres of infestation on private lands, often checkerboarded with agency lands and being actively managed for timber production at all times of the year.

According to predictions detailed in the Pathology section of Chapter 3&4, the percentage of currently uninfested high-risk areas that will become infested within the next 100 years is predicted to be 40, 30, 20, 80, 80, and 18 percent for Alternatives 1, 2, 3, 4, 5, and 6, respectively. Combining each of these predictions with the existing infestation level, and the portion of the area at high risk, results in the 100-year infestation percentage and acreage calculations shown in Table 2-4. These numbers are best professional estimates of average PL spread rates made after considering the characteristics of the landscape, the level and nature of forest uses, and the requirements of the individual alternatives. They may or may not prove true for the stated 100 years, but required monitoring will track actual PL spread and alert the Agencies if any changes in the strategy are needed in the future. For at least the first decade, these predictions provide a sufficient estimate both of the magnitude of effect (expected to be within 0 to 5 percent) and the relative differences between the alternatives and between risk regions to allow the decisions-makers to make a reasoned choice from among the alternatives.

Table 2-4.—*100-year infestation prediction for Oregon by alternative* [1]

Alternative	% of risk region high risk	Currently infested high-risk area [as % of risk region] [1]	Uninfested high-risk area [as % of risk region]	% of uninfested high-risk areas predicted to become infested [new] in 100 years [2]	Uninfested high-risk areas predicted to become infested [as % of risk region] [3]	Total [new and current] area to be infested in 100 years [as % of risk region]	Total [new and current] area to be infested in 100 years [in acres] [4]	Total [new and current] area to be infested in 100 years [as % of high-risk areas only]
North Coast Risk Region *[126,248 acres]*								
1	20	15	5	40	2	17	21,500	85
2	20	15	5	30	2	17	20,800	82
3	20	15	5	20	1	16	20,200	80
4 & 5	20	15	5	80	4	19	24,000	95
6	20	15	5	18	1	16	20,100	79
						[Current]	[18,900]	[75]
Siskiyou Risk Region [Oregon portion] *[116,374 acres]*								
1	40	11	31	40	12	23	27,200	58
2	40	11	31	30	9	20	23,600	51
3	40	11	31	20	6	17	20,000	43
4 & 5	40	11	31	80	25	36	41,700	89
6	40	11	31	18	6	17	19,300	41
						[Current]	[12,800]	[27]
Inland Siskiyou Risk Region *[29,341 acres]*								
1	60	9	51	40	20	29	8,600	49
2	60	9	51	30	15	24	7,100	40
3	60	9	51	20	10	19	5,600	32
4 & 5	60	9	51	80	41	50	14,600	83
6	60	9	51	18	9	18	5,300	30
						[Current]	[2,600]	[15]
Totals *[271,963 acres]*								
1	33	13	21	40	8	21	57,300	64
2	33	13	21	30	6	19	51,600	58
3	33	13	21	20	4	17	45,800	51
4 & 5	33	13	21	80	17	30	80,300	90
6	33	13	21	18	4	16	44,700	50
						[Current]	[34,400]	[38]

[1] Projected infestation is assumed to be within the high-risk areas; does not include an estimated 0.1% per year on low-risk sites, much of which is offet by regeneration and growth.
[2] From Table 3&4-6.
[3] Previous two columns multiplied together.
[4] Mortality in infested areas is expected to be about 90%; table does not include replacement with resistant stock.

As shown in Table 2-4, the total area predicted to be infested at 100 years in Oregon varies between 16 and 30 percent (from 13 percent today) depending upon alternative. The percent of high-risk areas predicted to be infested in 100 years is also displayed because some effects, such as water temperature, are dependent more on the percent of PL infestation near streams, not the percent infestation on the entire landscape. The percent of high-risk riparian areas predicted to be infested in 100 years varies between 50 and 90 percent (from 38 percent today), depending upon the alternative. In both cases, the 100-year infestation percentage varies by risk region. Regardless of risk region, however, it is important to note that POC is not at risk of extirpation. Under the "no management" alternative, Alternative 5, disease infestation is predicted to reach 30 percent of all POC acres in 100 years (from 13 percent today), with no risk region exceeding 50 percent.

Differences in Risk Regions: In the North Coast Risk Region, most (75 percent) of the high-risk areas are already infested. Since the alternatives primarily affect the percentage of high-risk areas to become infested in the future, there is little difference in 100-year infestation percentage between the alternatives in this area (16 to 19 percent of the total area, 80 to 95 percent of high-risk riparian areas). The similarities in this region between all of the

action alternatives become more apparent upon examining the way they would be applied. The risk key in Alternatives 2, 3, and 6 requires project-specific management actions to be applied when there is appreciable additional risk to uninfested POC in the area whose ecological, Tribal, or product use or function measurably contributes to land and resource management plan objectives. If there are few uninfested areas nearby, or if those uninfested areas make no measurable contribution to ecological, Tribal, or product use or function (use or function that is not equally met elsewhere or by other species), the key will not lead to the application of any project-specific management practices. This situation will likely occur more often than not in this risk region because most high-risk areas are already infested, and because the terrestrial distribution of POC places 80 percent of its acres on low-risk sites. The various effects sections in this SEIS (see Summary and Comparison of Effects, Table 2-5) support this generalization that few important functions will be at risk; they do not identify any significant adverse ecological effect in this risk region from any of the alternatives.

In the Inland Siskiyou and the Oregon portion of the Siskiyou Risk Regions, the differences between alternatives are more pronounced. The 100-year infestation prediction varies from 17 to 36 percent in the Siskiyou Risk Region, and 18 to 50 percent in the Inland Siskiyou Risk Region, between the most and least protective alternatives. The alternatives also vary in the percent of high-risk riparian areas infested, from 41 to 89 percent in the Siskiyou Risk Region and 30 to 83 percent in the Inland Siskiyou Risk Region, between the most and least protective alternatives. These percentages become particularly meaningful on ultramafic soils where POC can be prominent and is often the largest species present. On such soils, mortality can decrease stream shading, reduce fish survival, and have other measurable and predictable adverse effects. Compounding this mortality is the likelihood of future high-intensity fire. In the same 100 years, wildland fire could kill up to 50,000 acres of POC, or up to 35 percent of the combined Inland Siskiyou and Siskiyou Risk Regions in Oregon. These percentages are not additive; some of the future fire mortality is the same as that predicted for PL.

Effects: A graphic representation of the predicted 100-year disease spread is shown in Figure 2-1. Of the 272,000 acres of POC on Federal lands in Oregon, an average of 33 percent (from Table 2-4) or about 90,000 acres, is high risk. The roughly 35,000 acres of current infestation is assumed to be nearly all in these acres.

In 100 years, the disease is predicted to spread to between 44,700 acres and 80,300 acres, depending on the alternative selected. (Anticipated replacement with resistant stock is not included.) The incremental difference between the alternatives is readily apparent. It is this incremental difference that is bought by the costs of the various alternatives, but that provides the differences in environmental effects between the alternatives. The effects analysis in this SEIS is designed to describe these differences.

For resource effects that are spread more or less evenly across the landscape, such as retention of genetic resources, availability of special forest products, or wildlife nesting habitat, the difference between the alternatives is a small percentage of the total POC acreage (16 to 30 percent, from 13 percent today), and therefore no significant environmental effects are identified for any of the alternatives. However, for resource effects that are closely related to water, such as stream temperature, fish habitat, or habitat for certain unique plants, the differences between the alternatives is much more pronounced. In these generally water-related high-risk areas, the difference between the alternatives range from 50 to 90 percent of

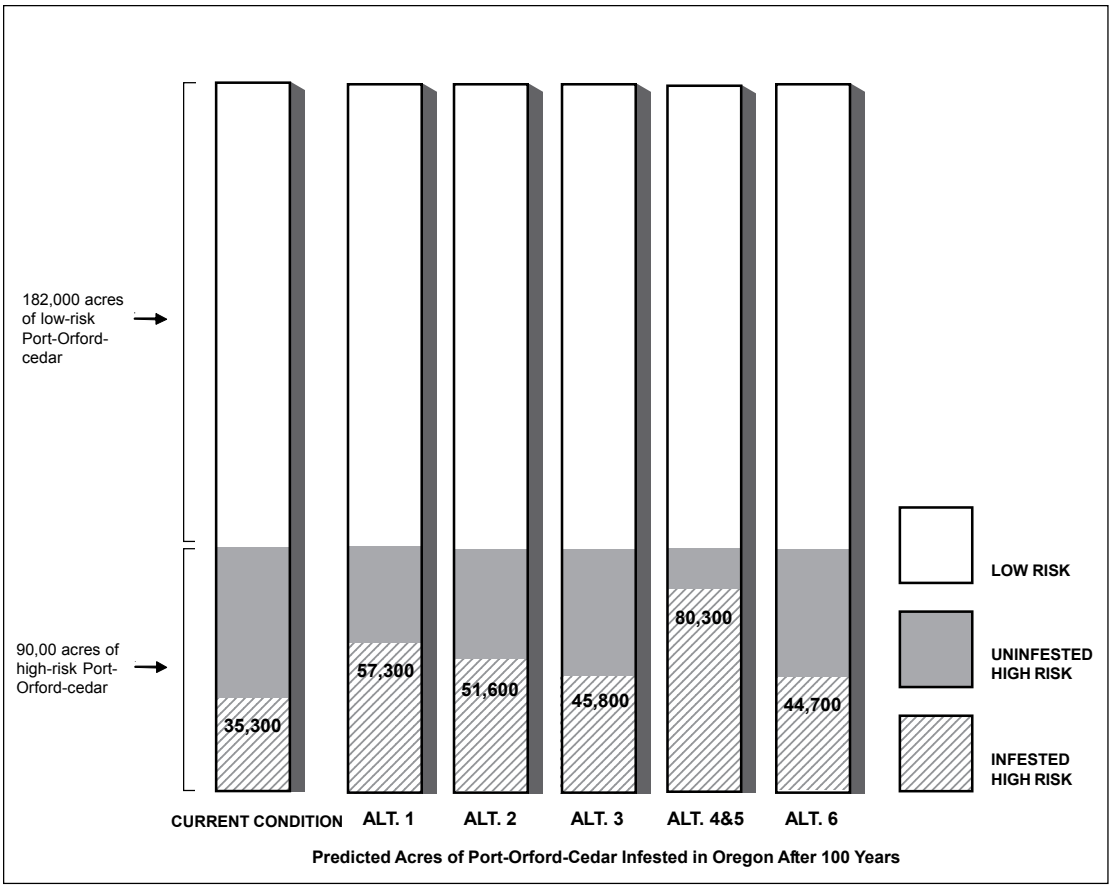

Figure 2-1.—*Current acres of Port-Orford-cedar in Oregon and predicted acres of infestations at 100 years by alternative*

the area infested in 100 years (from 38 percent today).

The degree to which POC mortality-related, or indirect, effects vary by alternative is summarized in Table 2-5 and described in detail in Chapter 3&4. It is important to note that these indirect effects, those resulting from POC mortality, do not all occur at once, but are predicted to occur over the next 100 years as the disease advances into new areas.

There are also direct effects from the Standards and Guidelines themselves. The exclusion of timber harvest in the POC core areas in Alteratives 3 and 6, for example, would reduce scheduled harvest levels and reduce opportunities to treat fuels build-ups and diversify habitats. On the other hand, POC-related road closures can also benefit soil stability and water quality resources. These direct effects for each alternative are also displayed in Table 2-5. In general, across the range of alternatives, as the negative direct effects increase, the negative indirect effects decrease, and vice versa.

The various combinations of risk region, ultramafic soils, riparian areas, and POC prominence leads to a complex combination of affected environments and effects that generally defies range-wide generalizations. However, the effects (both positive and negative) listed on Table 2-5 are greatest in the Siskiyou and Inland Siskiyou Risk Regions where mortality differences between the alternatives are greatest, and lower in the North Coast Risk Region where differences between the alternatives are generally slight or nonexistant. The nature of

Table 2-5.—*Summary and comparison of the environmental consequences [effects] of the alternatives*

Resource/topic	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Pathology	57,300 acres [21%] infested in 100 years, 64% of high risk riparian.	51,600 acres [19%] infested in 100 years, 58% of high risk riparian.	45,800 acres [17%] infested in 100 years, 51% of high risk riparian.	80,300 acres [30%] infested in 100 years, 90% of high risk riparian.	80,300 acres [30%] infested in 100 years, 90% of high risk riparian.	44,700 acres [16%] infested in 100 years, 50% in high risk riparian.
Ecology and Plant Associations	Possible losses in species diversity and ecological function in one or more of 64 identified plant associations where POC is a prominent component; more of a concern in ultramafic soils where POC is a component; effect by alternative is proportional to acres infested. Some rare and/or riparian plant associations could suffer substantial POC mortality, thus altering their contributions to stream shading and structure, nutrient cycling, downed wood, and other functions.					
Botany	There are probably benefits to some rare plants proportional to decreased infestation acres because of reduced shading and other protection. Also Alternatives 1, 2, 3, and 6 road closures reduce noxious weed introductions and trampling. However, some rare plants benefit when nearby cedars die. No negative effects to agency sensitive, threatened, or endangered plants are identified.					
Water and Fisheries	Insignificant coho salmon and steelhead loss due to temperature increases. Possible localized mortality of salmonids from Clorox in fire suppression water drops and tanker spills. Road closures benefit water quality and fish; more so in Alternatives 3 and 6.			Increased temperature in ultramafic areas results in significant coho salmon [ESA listed] and steelhead loss. Less than 5% of coho spawn in ultramafic streams, but temperature increases affect other parts of the system.		Same as Alternatives 1-3.
Wildlife	There are no species dependent specifically upon POC, but spotted owl and murrelet are "may affect" because of large-tree losses in habitat. Because pure stands are the exception, other effects are minimal. In Alternatives 3 and 6, late-successional forest-related wildlife benefits from reduced timber harvest, but reduced Late-Successional Reserve thinning could slightly reduce future habitat for these samespecies. Alternatives 1, 2, 3, and 4 possible localized mortality of aquatic species from Clorox fire-suppression spills or water drops.					
Ultramafic Soils	No known difference in effects to soil productivity. Small POC mortality-related effect on soil stability; highest in Alternatives 4 and 5, lowest in Alternatives 3 and 6.					
Pacific Yew	Yew infections will be rare and inconsequential under all alternatives.					
Genetics	POC survival in all alternatives is sufficient to avoid loss of common genes and prevent large scale population divergence. Loss of rare genes possible, not significantly different than natural levels.					
Resistance	Good major gene resistance and early fruiting of POC, plus very limited genetic variability in the pathogen, predicts successful development of durable resistant stock for replanting infested areas					
	Stock available in all breeding zones within 45 years.			Stock available in all breeding zones in 10 years.	Stock limited to current level [26% of breeding zones].	Stock available in all breeding zones within 45 years.
Fire and Fuels	Increased suppression and fuel treatment costs about 2 percent [Alternative 3 and 6 slightly more]. Alternative 3 would reduce access to 51,000 acres and prohibit using timber harvest for fuels treatment on 2,700 acres of wildland-urban interface. Alternative 6 would reduce access to 19,800 acres and prohibit using timber harvest for fuels treatment on 3,240 acres of wildland-urban interface.			No costs associated with POC disease control [possible fuels increase associated with mortality is insignificant].		See Alternatives 1-3.
Air Quality	Air quality effects are unquantifiable and inconsequential under all alternatives.					
Recreation, Visual, Wilderness, and Wild and Scenic Rivers	Negative effects to some users if roads and areas closed; greatest in Alternative 3 and 6. Positive effects to visuals, wilderness, and wild and scenic river values [esthetic] of reduced mortality.			No restrictions on access. Esthetic impacts increased.		See Alternatives 1-3.
	Resistance breeding mitigates esthetic impacts over time, fastest in Alternative 4; not all areas in Alternative 5.					
Areas of Critical Environmental Concern and Research Natural Areas	The risk of an infestation start in the 14 ACECs or RNAs without PL is proportional to the predicted disease spread for each alternative; highest in Alternatives 4 and 5, lowest in Alternatives 3 and6.					
Cultural Products for Tribes	Insignificant difference between alternatives because of modest levels used and access on other lands.					
Special Forest Products	Current level [4% of bough market], plus firewood and other collections.	Current level of bough collection, and <5% reduction of firewood and other collections.	Current level of bough collection, and slightly more reduction in firewood and other collections than Alternative 2.	Increase of bough harvest by 100 to 200 tons annually, plus slight increase in firewood and other collections from current levels.		Slight increase in bough collection. Reduction in firewood and other collections similar to Alternative 3.
Timber Harvest	Continue current cost to purchasers of about $0.80/thousand board feet.			Removal of current $0.80/thousand bd ft mitigation costs.		Continue $0.80/MBF
	No change.	Incalculable reduction in volume offered.	Decrease in PSQ approximately 0.65 million board feet and no thinning in 6,000 Late-Successional Reserve acres.	No effect of PSQ or volume offered.		Decrease in PSQ approximately 0.9 million board feet and no thinning in 9,000 Late-Successional Reserve acres.
Livestock Grazing	Little effect on permit operations.		Could close roads within, but not to, 2 allotments.	No effect on permit operations.		Possible effects on 3 allotments.
Mining	Potential cost increases for PL-reducing practices and possibly restoration.			Possible restoration costs.	Probably no effect.	Same as Alternatives 1-3.
Direct Costs	$860,000	$846,000	$932,000	$477,000	$93,000	993,000
Environmental Justice and Civil Rights	Current level.	Slight job decrease, primarily affecting Asians and Hispanics.	Job decrease includes 7 timber jobs, a few Asian and Hispanic special forest products collectors.	Job increase of 6 related to bough collection.		Job decrease includes 10 timber jobs, a few Asian and Hispanic special forest products collectors.
Critical Elements	Alternatives 1, 2, 3, and 6 could increase energy transmission costs; other effects are included in resource sections above.					
Note: The planning area includes 1.5 million acres of Federal lands and 272,000 acres with some level of POC stocking, a projected 34,400 of which are infested with root disease.						

each of the various effects, and the affected environment in which those effects occur, are described in detail in Chapter 3&4.

Resistance Breeding: Alternatives 1, 2, 3, 4, and 6 include some level of resistance breeding for all breeding zones, and Alternative 5 would only use resistance stock in the 26 percent of the breeding zones for which it has already been developed. There is an expectation that the resistance breeding program will mitigate at least some, and potentially many, of the adverse indirect effects in the long term, as POC killed by the disease are gradually replaced by planted resistant stock and their offspring. Alternative 4, scheduled to have seed for all breeding zones within 10 years, would be able to begin mitigating disease-related mortality up to 35 years sooner in some zones than Alternatives 1, 2, 3, and 6. Although there are long-term uncertainties in any resistance breeding program, the chance for durable resistance in POC is good because it appears to have major gene resistance, the pathogen has very low genetic variability indicating a low likelihood of it adapting to kill resistant trees, the pathogen spreads relatively slowly, and POC begin to produce cones as early as age 5 in greenhouse conditions which makes a rapid breeding program possible.

However, because uncertainties about Agency funding in Alternatives 1, 2, 3, and 6 (which include language *per available funding*), and the long timeframes involved for planted POC to be large enough to substantially mitigate adverse effects of POC mortality, the expected benefits are generally not included in the effects summarized on Table 2-5. The level of benefit will depend on the success and application of the breeding program. Planting resistant stock can only reduce, not increase, negative effects displayed in the effects discussions. Fortunately, every dead tree need not be replaced by direct planting. POC begins fairly prolific seed production earlier than other conifers, typically by age 25 in natural stands and possibly sooner for tended planted stock. Successful plantings of a few dozen resistant trees per acre in an infested area should be sufficient to begin a cycle of natural regeneration of resistant or partially-resistant stock with adequate genetic variability. In any event, however, significant reduction of the adverse indirect effects summarized in Table 2-5 will probably not begin to occur until resistant trees exceed 100 years of age, and will not occur at all in some breeding zones if the program is not funded.

Potential Mitigation Measures

The implementing regulations of NEPA, at CFR 1502.14(f) and CFR 1502.16(h), require identification of measures to mitigate adverse environmental impacts. It is important to note that the alternatives considered in this SEIS are themselves different levels of mitigation measures that apply to other forest management and use. All currently known measures to mitigate the spread of PL are included in some form in one or more of the alternatives. Even measures that have not been proven, such as eradication, are encouraged for trial and evaluation in one or more of the alternatives. The monitoring section specifies continued evaluation of various PL-reducing management techniques so management can best mitigate the spread of PL on future activities.

In Alternatives 2, 3, and 6, the definition of an *activity* with respect to the use of the risk key is purposely broad in order to force consideration of the full range of potential PL-spreading activities.

The resistance breeding program is another mitigation program, and one that can be used to

mitigate adverse effects in sensitive habitats. Where POC losses occur near sensitive or listed wildlife, botanical, or fish species, opportunities to plant resistant stock will be identified and implemented as appropriate.

Mitigation for direct effects to other programs are included in the alternatives as well. For example, a provision for some level of bough harvesting in Alternatives 2, 3, and 6, helps reduce the job losses attributable to bough harvest restrictions. This will help mitigate adverse effects identified in the Environmental Justice and Civil Rights sections.

Measures that would be somewhat more effective than any of the alternatives at slowing the spread of PL include more road closures; indeed, large area closures. Given the analysis of the likely spread of the disease, and the need for other uses of our public lands, and the emphasis already given to road closures in one or more of the alternatives, consideration of additional closures would not meet the Need. This topic is dealt with in the Alternatives Considered but Eliminated from Detailed Study section.

Potential and likely adverse effects identified in Chapter 3&4 are listed in Table 2-6, along with possible mitigation measures for each. The mitigation option of selecting a different alternative is also a choice, and is not included in the table. In general, mitigation measures listed here are ones not explicitly part of the referenced alternative, or at least not part of the alternative at levels that would completely mitigate the adverse effect described.

Table 2-6.—*Identified adverse environmental effects and possible mitigation measures*

Resource Elements	Adverse Effect	Possible Mitigation
Pathology	Disease spread and related effects to private, other units, long-distance spread; mostly in Alternatives 4 and 5.	1] Clarify "reduced spread" objective of Alternatives 4 and 5, by adding "avoid disease export" provision from Alternative 2. 2] Increase public education in offsite areas regarding the risk of receiving disease from unfamiliar equipment. 3] Encourage State to enact POC root disease measures on non-Federal lands. 4] Develop disease-resistant seedlings for use on private lands, and on sites not currently occupied with POC.
	Increase in POC infestations and mortality on Agency lands.	Function, not mortality, is the effect; mitigation for function loss discussed under other headings.
Ecology	Possible POC mortality-caused reduction in plant diversity; greatest in Alternatives 4 and 5.	1] Improve risk-mapping of POC to improve efficiency and effectiveness of disease-reduction measures. 2] Plant disease-resistant stock or alternate species in affected areas.
Botany	Possible POC mortality-related negative effects to some rare species; potentially greatest in Alternatives 4 and 5.	1] Plant disease-resistant stock or alternative species in affected areas. 2] Identify species and sites most affected by POC mortality, and protect or plant those sites specifically. 3] Map uninfested water sources.
Water	POC mortality-related increase in stream temperatures in ultramafic soils, particularly in Alternatives 4 and 5.	1] Plant disease-resistant stock or alternate species in affected areas. 2] Apply the uninfested watershed provisions of Alternative 3 or 6 to specific watersheds.
Fisheries	Streams in ultramafic soils, POC mortality-related negative effect on coho [ESA listed] in upper Illinois River Watershed, and on steelhead in Alternatives 4 and 5.	1] Plant disease-resistant stock or alternate species in affected areas. 2] Map uninfested water sources.
Wildlife	POC mortality-related slight general long-term effect on snag, down wood, and riparian-dependent species not detectable at the landscape scale; greatest with Alternatives 4 and 5.	1] Plant disease-resistant stock or alternate species in affected areas. 2] Map uninfested water sources.
	"May affect" spotted owl and murrelet from large tree loss in preferred alternative.	None known; alternatives themselves are mitigation measures applied to various forest activities.
	Alternatives 3 and 6 prohibition on commercial thinning in POC cores prevents silvicultural acceleration of late-successional habitat; slight effect.	1] Permit commercial thinning in POC cores in Late-Successional Reserves. 2] Thin and leave material on site, if consistent with fuels objectives.
Wildlife and Fish	Possible isolated Clorox-related mortality of fish and other aquatic species from fire-suppression tanker spills or water drops in Alternatives 1, 2, 3, and 6.	1] Attempt to limit water drops on streams by educating suppression crews of the risk so they can direct drops accordingly. 2] Fly farther to get uninfested water. 3] Neutralize Clorox in water by adding aeration or treating with chemical neutralizer such as ammonium salts [which may have their own risks]. 4] Drop from higher-up to increase spread [limiting amount in stream] and increase volatilization [evaporation] of the active ingredient. 5] Only add Clorox bleach to tankers after leaving the stream area.
Fire	1 to 2% cost increase and potential increase in burned acres to implement disease-control measures in Alternatives 1, 2, 3, and 6.	1] Remove POC disease control measures for fire-fighting, especially in dry weather and conditions where introduction risk is low. 2] Permit water dips from rivers during summer flows when movement of PL is low.
Fuels	Slight reduction in acres of fuels treated in Alternatives 1, 2, 3, and 6, and additional reduction in wildland-urban interface acres treated in Alternatives 3 and 6.	1] Ease Alternative 3 and 6 POC core and buffer harvest restrictions, just for fuels treatment. 2] Improve fuel treatment flexibility by reducing spotted owl or other resource seasonal or area restrictions. 3] Map uninfested water sources.

Recreation	Some restrictions on OHV use and road access in Alternatives 1 and 2; greatest in Alternatives 3 and 6; could displace some users and intensify use in other areas.	1] Identify more appropriate use areas and educate using public. 2] Apply seasonal, rather that complete, closures where possible.
	POC mortality-related loss of scenic quality, especially near water-related activities; greatest in Alternatives 4 and 5.	1] Design developed sites to keep use away from POC. 2] Sanitize between use areas and POC before mortaltiy occurs.
Wilderness	Possible POC mortality-related reduction in wilderness values; greatest in Alternatives 4 and 5.	1] Plant disease-resistant stock or alternate species in affected areas consistent with management policies. 2] Try eradication treatments if permitted by management policies.
Areas of Critical Environmental Concern and Research Natural Areas	Areas devoted to botanical study or exceptional value adversely affected by POC mortality; greatest with Alternatives 4 and 5.	1] Specifically limit access. 2] Educate user to the risks and provide shoe-cleaning stations. 3] Add PL considerations into the management plan for each area. 4] Map uninfested water sources.
Cultural Products for Tribes	Slightly reduced access to products from road and area closures and harvest restrictions in Alternatives 1 and 2, and more so in Alternatives 3 and 6.	1] Make exceptions for Tribal collections. 2] Work with Tribes to identify collections areas. 3] Map uninfested water sources.
	Slight but immeasurable POC mortality-related reduction in long-term collectable POC products; greatest in Alternatives 4 and 5.	1] Plant disease-resistant stock or alternate species in affected areas. 2] As large-tree mortality occurs, harvest and store logs for later use. 2] Encourage resistant POC planting on Tribal or private lands, or Federal lands not currently occupied with POC.
Special Forest Products	Nearly complete restriction on POC bough sales, and slight restrictions on firewood, mushrooms, and other products, in Alternatives 1 and 2, and more so in Alternatives 3 and 6.	1] Educate collectors about risks and direct them to open collection areas. 2] Identify bough collection areas for long-term stewardship contracting. 3] Encourage development of private POC bough orchards.
Timber Harvest	$0.80/thousand board feet POC-related harvest cost in Alternatives 1, 2, 3, and 6, and PSQ reduction of 0.65 million board feet in Alternative 3; 0.9 million board feet in Alternative 6.	1] Do not apply Alternative 3 or 6 POC cores to Matrix lands [would negate largest gain]. 2] Designate the POC cores and buffers as Late-Successional Reserves and remove Late-Successional Reserve designation from corresponding habitat elsewhere [a Northwest Forest Plan amendment].
Environmental Justice/Civil Rights	Loss of 7 timber jobs in Alternative 3, and 10 timber jobs in Alternative 6.	See mitigation for Timber Harvest and Special Forest Products.

Chapter 3&4 — Affected Environment and Environmental Consequences

Introduction

Chapter 3 (Affected Environment) and Chapter 4 (Environmental Consequences) have been combined in this document to more clearly present information to readers. In the Resource Elements That Address Issues section of the chapter, the description of a resource or environmental component appears just before the description of environmental effects to that resource or component. Most environmental impact statements (EISs) place these sections in separate chapters.

This chapter presents information about those aspects of the environment that are likely to be most directly affected by the management prescribed in the alternatives, those whose ecological, Tribal, or product use or function might be significantly affected by POC management. It also presents the direct and indirect effects (or impacts) of management under the alternatives. This constitutes a presentation of the cumulative impacts of each alternative. Together these form the scientific and analytic basis for the Comparison of the Effects of the Alternatives section in Chapter 2.

Changes Between Draft and Final

The following changes were made to Chapter 3&4 between the draft and final SEIS. Minor corrections, explanations, and edits are not included in this list.

Changes/edits were made to:

- Expand the discussion of what information might be incomplete or unavailable, including a discussion of possible effects of future wildland fire;
- add additional discussion about cumulative effects, including a discussion of past harvest and how large POC numbers might compare with historical levels;
- bring the discussion about reciprocal rights-of-way agreements into this chapter from Chapter 2;
- add analysis assumptions, including a Planting Assumption (found in the Assumptions and Clarifications section of this chapter) describing expectations for performance of outplanted resistant stock;
- remove or modify two references to recent POC mapping because it is not included in the Agencies' geographic information system (GIS) database used for the SEIS (because it did not change);

- add effects for new Alternative 6 for all resource elements, and change the effects for Alternative 2 in response to added emphasis for the 7th field watersheds;
- add supporting data about the effectiveness of PL control measures and describe the basis for the pathology effects for each alternative;
- correct numbers in many of the Ecology section tables;
- consider plant association-specific detail to the Ecology and the Water and Fisheries sections to more precisely predict effects to fish;
- remove the "significant adverse" effect predicted for listed coho in Alternatives 1, 2, 3, (and 6);
- add a discussion of future wildland fire and their likely effect on POC;
- increase discussion of off-highway vehicles;
- add a separate Livestock Grazing section;
- add a separate Mining section;
- fine-tune the effects of the Alternative 3 (and 6) uninfested watersheds on probable sale quantity (PSQ) and the ability to use timber sales to treat fuels in wildland-urban interface;
- show increased costs for sanitation in Alternative 3 (and 6), and long-term cost savings by accelerating the resistance breeding program;
- address Executive Order 13212 and associated BLM direction to address potential effects of the alternatives on locating and transmitting energy.

Incomplete and Unavailable Information

One step in preparing an EIS is to evaluate whether information about effects of a proposed action is incomplete or unavailable and, if so, to disclose that fact and make certain findings about the relevance, importance, and/or costs of acquiring data that could help fill any such gaps.

When encountering a gap in information, the question implicit in the Council on Environmental Quality regulations (40 CFR 1502.22(a)) on incomplete or unavailable information was posed: Is this information

> . . . essential to a reasoned choice among alternatives?

No such information gap is identified.

As noted in the Background section of Chapter 2, Port-Orford-cedar (POC) root disease was introduced to the natural range of POC more than 50 years ago, after raising the concern of nursery pathologists in the Seattle, Washington, area for decades previous to that. Scientific study and management experience by the Agencies and others is considerable. Pathologists with the Forest Service (FS), States of Oregon and California, and Oregon State University, have devoted years to the study and management of POC root disease.

The management practices discussed in the alternatives are generally ones with which the Agencies are well experienced. While conclusive research regarding the effectiveness of each specific practice is sometimes weak or lacking, basic studies of disease indicators have been at least minimally studied for nearly every practice, sufficient to make professional judgments regarding their likely effectiveness. For example, while the effectiveness of washing vehicles on reducing the spread of the disease has not been studied directly (because of the numbers of variables involved), washed vehicles have been reexamined, finding that washing reduced inoculum about 95 percent. A reduction in the risk posed by a washed vehicle traveling through uninfested areas is thus appropriately inferred.

Neither are the observed pathology relationships unique to POC. Where conclusions or inferences must be made without complete POC data, scientists rightfully build on data from similar relationships or results with similar pathogens more thoroughly studied. Subsequent new information about POC root disease has historically supported such inferences, although the new data improves precision.

A source of potential uncertainty arises from both the geographic and temporal scales of this analysis. POC mortality under each of the alternatives is projected for 100 years, and is based on several assumptions founded on the study of the first 50 years of mortality and spread. While these assumptions are reasonable, they are by no means certain to 100 years. Monitoring is prescribed to detect significant departures from predicted disease spread. Departures themselves would trigger further analysis. At this point in time, these predictions provide a sufficient estimate both of the magnitude of effect and the absolute differences between the alternatives and between risk regions to allow a reasonable prediction of indirect environmental effects, and allow the decision-makers to make a reasoned choice from among the alternatives.

Compounding the PL-mortality prediction is the likelihood of future high-intensity fire. In the same 100 years, wildland fire could kill up to 50,000 acres of POC, or up to 35 percent of the combined Inland Siskiyou and Siskiyou Risk Regions in Oregon. These percentages are not additive; some of the future fire mortality is the same as that predicted for *Phytophthora lateralis* (hereafter referred to as PL).

Normally, there is uncertainty when evaluating effects at the programmatic scale (such as this supplemental EIS [SEIS]), because the proposed action neither authorizes nor evaluates any specific management proposal. To the extent such uncertainty might relate to disease spread, it is considered minor. Assumptions in this SEIS about forest management activities, for example, are based in part upon agency experience with POC-related forest management activities that began in earnest in the 1980s. And while the Standards and Guidelines of the various alternatives provide for site-specific application of various management practices based upon consideration of the conditions at each site, both the language of the Standards and Guidelines, and experience with implementation and existing forest conditions, make

reasonable predictions about such application possible. Nevertheless, site-specific effects of management can only be known, with any degree of specificity, at subsequent, site-specific levels of analysis and planning. Effects are projected as specifically as possible for purposes of the analysis in this SEIS.

Some scoping comments expressed a belief that POC is on its way to becoming extinct or only minimally represented within its natural range, and that only closing access to the forest will save the cedar. The analysis displayed in the following sections does not support such a position. Because the pathogen virtually requires standing water to infect trees, high-risk areas are limited and definable. POC even a few feet away from water or seasonally saturated soils is at little risk regardless of the management strategy imposed. Further, it is possible to make reasonable predictions about the future spread of PL, the disease-causing pathogen. Other than Pacific yew growing with POC, the pathogen affects only POC and does not have an alternate or hidden host, nor does it travel through the air. PL has very low levels of genetic variation, and so is not likely to adapt to different species or even to resistant POC. Predicting the spread of the disease and the resultant adverse environmental effects is possible, at least to a sufficient degree that the selection of one of the action alternatives will yield a predictable environmental effect.

Considerable precision (and thus, certainty) could be added to this analysis if Agency POC maps were more detailed and then individually analyzed for relevant risk levels and agents. Existing maps are based partly on stand or vegetation-type inventories or stand exam maps and sometimes do not reflect the specific location of included POC. As discussed in the Background section of this chapter, the precise number of acres of POC is unknown, and varies depending upon the mapping criteria used. These details can be correctly relegated to site-specific analysis. The existing information, coupled with existing scientific knowledge of diseases as a whole, is sufficient to establish basic relationships well enough that any new information would not likely reverse or nullify these relationships. There is sufficient information about the pathogen and about the effects of the various alternatives for decision-makers to confidently make a reasoned choice from among the alternatives.

There are other uncertainties. The recently enacted forest health initiative could increase the level of management activity in POC areas, particularly in the wildland-urban interface. The SEIS includes assumptions about levels of forest management and use. Activities under a forest health initiative will likely fall under those activity-level assumptions. If they do not, the "National Environmental Policy Act" (NEPA) analysis for those activities, as well as the monitoring of PL spread required in the alternatives in this SEIS, would help determine if there are (additional) adverse effects.

There is also uncertainty regarding the resistance breeding program. With resistant trees having been exposed to the pathogen for 16 years at the longest, the durability of resistance is unproven. There is also the possibility the pathogen would adapt to the resistant stock. These possibilities are described in detail in the Genetics section and elsewhere. Finally, the SEIS creates uncertainty about the resistance breeding program in its own language by stating the resistance breeding program would, in Alternatives 1, 2, 3, and 6, continue at current levels "per available funding." In light of these uncertainties, the final SEIS places more emphasis on prevention and less emphasis on mitigation, than was the case in the draft SEIS. And in no case is an adverse environmental effect prediction in Chapter 3&4 reduced or softened because of benefits expected from resistant stock, unless that benefit it specifically

identified to come from such stock. This separation permits the decision-makers to examine the environmental effects as if the resistance breeding program did not exist at all.

These uncertainties, their limits and their effects, are well addressed in the appropriate effects sections in Chapter 3&4. While additional information would often add precision to effects estimates, the basic data and central relationships are sufficiently well established that any new information would not likely reverse or nullify relationships. Although new information would be welcome, no missing information was identified that is essential to a reasoned choice among the alternatives.

Cumulative Effects

Cumulative impacts (effects) to the environment are defined in the Council on Environmental Quality regulations as those that result from the incremental effects of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency or person undertakes them (40 CFR 1508.7). The alternatives described in Chapter 2 would require that various PL-controlling measures be applied to future agency management activities. The management activities, and the PL-controlling measures proposed to be applied to them under the various alternatives, would affect the environment in the six ways listed below (additional details about each of these effects appear elsewhere in this chapter).

1) *There are effects from the management activities themselves.* The future agency management activities to which the PL-controlling measures would be applied are those occurring near or within stands of POC, and include timber harvest, off-highway vehicle use, special forest product collection, fuels treatment, livestock grazing, and so forth. These activities are described in the Affected Environment portions of the Resource Elements that Address Issues section later in this chapter. These Affected Environment discussions provide the basis for the PL-spread prediction, and the basis for the direct effects of the PL-controlling measures on the management activity, each described separately below. The non-POC related environmental effects of these management activities, such as effects on soils, water, visual quality objectives, and so forth, are already discussed in the EISs for the land and resource management plans being supplemented by this SEIS. This SEIS neither proposes or authorizes these actions.

2) *PL spread prediction.* The future management activities described above themselves affect, or facilitate the spread of PL—this is the major issue for this SEIS. Using probabilities that various activities will transport PL, the Pathology section combines:

- The descriptions of all of the future management activities from the Affected Environment sections described above;
- knowledge of other PL-spread vectors (such as downstream water flow, root grafts, wildlife movement, and other minor human activity);
- the level and nature of management activities on non-Federal lands as described later in this section; and

- the disease controlling measures of the various alternatives described in Chapter 2, into an overall estimate of PL spread over the next 100 years. This estimate of future PL spread on Federal lands in Oregon is described in the Pathology effects section for each alternative, and is expressed both in acres and as a percentage of currently uninfested high-risk sites expected to become infested. In other words, the Pathology section describes the cumulative effect on PL spread on Federal lands in Oregon, of all management activities as affected by the Standards and Guidelines of the various alternatives.

3) *Direct effects of the POC alternatives on management activities.* The Standards and Guidelines of the various (action) alternatives would affect the conduct of future management activities. For example, Alternatives 2, 3, and 6 generally increase costs, reduce road construction, prohibit certain special forest products collections, require Clorox treatment of fire suppression water, and so forth. Some alternatives identify areas where timber harvest and new road construction is prohibited altogether. These effects are described in the effects section for each of the resource elements.

4) *The direct effects of the POC alternatives on resources.* Where the reasonably predictable effects of various Standards and Guidelines are positive to resource elements, such as road closures for Water and Fisheries, or vehicle washing helping reduce the spread of noxious weeds, those effects are identified in various resource element Effects sections as well. Negative effects, to the extent they can be quantified, are also identified. An example is the effect of required roadside sanitation on wildlife habitat. A description of negative resource effects of PL-controlling treatments is limited, however, for two reasons. One is that most PL-controlling measures will be selected from a menu of options that permit managers to tailor the treatment to site-specific conditions. Managers have the opportunity to select the treatment that best fits the site conditions, minimizing adverse effects while securing good PL control. Thus any negative environmental effects will be considered at the site-specific scale before specific disease-controlling practices are selected and implemented. The other reason is the existence of resource-protecting best management practices in the underlying management plans. Sanitation, for example, will not place equipment on steeper slopes than permitted in, the underlying plan, or result in bare soils or soils disturbances beyond existing limits. Projects would be required to meet watershed disturbance limits, if any, and meet relevant visual quality objectives.

5) *The effect of PL-related mortality (or the positive effect of preventing mortality).* The PL-spread predictions made in the Pathology section drive effects predictions for resource elements whose ecological functions are dependent, in part, on POC. For example, since PL kills 90 percent of the POC in stands in infests (and more in the larger size classes), POC mortality along streams in ultramafic soils where few other species are available to replace them, will decrease shading and increase temperatures in these streams. If stream temperatures are already fish-limiting, this POC mortality will adversely affect fish. These effects are described in resource element sections for Ecology and Plant Associations, Wildlife, Water and Fisheries, Botany, and for portions of other resource elements such as Wilderness and Culturally Significant Products for American Indian Tribes. Even benefits not specific to POC are identified. For example, on serpentine soils, POC provides shade for certain rare plants, or provides physical barriers

against the disturbance of such plants by off-highway vehicle travel.

6) *The effects of the various alternatives on POC and related resources off of Federal lands or in California are predicted to the specificity possible.* Because the California NFs are currently implementing PL-controlling management practices for all risk-producing activities, the effects of the Oregon alternatives are very small, but include the possibility of long-distance spread to California. This possibility is discussed in the Pathology section. And because most private forestland management includes only minimal PL-control if any, the effect of the alternatives on PL on private lands is again so slight by comparison that it is not quantifiable. POC, PL, current management practices, and the possibility of spreading PL to or from other Federal or private lands is discussed in more detail below.

The combination of these effects described under the various resource elements in this chapter, coupled with relevant effects in the underlying land and resource management plan EISs, represent the cumulative effects of the alternatives. Given the programmatic nature and scale of this SEIS, most of the environmental consequences discussed represent a general projection of the accumulated effects of management actions that are reasonably assumed to occur under the various alternatives and in the context of other existing Standards and Guidelines and practices on the affected Federal lands, and on other Federal and private lands within the range of POC. In general, estimating more specific effects depends so much on the particulars of each situation and the combination of PL-controlling measures applied, that additional discussion would be speculative. The project analyses where the specific application of one or more of the PL-controlling practices are applied, would be an appropriate place for additional discussions. It can be generalized, however, that the more conservative alternatives in terms of POC protection will have corresponding beneficial effects to unique plants, water, fisheries, and wildlife, at least if they do not increase the level of unusually intense wildfires.

California Portion of the Range

The natural range of POC extends from the planning area into the northwest corner of California. Approximately 10 percent of the POC found on Federal lands is within California, located on the Six Rivers, Klamath, and Shasta-Trinity NFs (and Redwood National Park). These Forests are cooperators in this SEIS, and helped with the analysis. Although the action alternatives do not apply to these Forests, some of the effects sections in this chapter specifically include California because the resource effects could spill into California, or because of the possibility of transporting the disease back and forth across the border. Timber hauling, equipment movement, and other factors are discussed within the Pathology and Timber Harvest sections specifically, and do pose a small but potential risk of cross-state infestation. The Recreation section notes that off-highway vehicles and other recreation equipment (such as boat trailers) drive across the border or are trucked, potentially moving PL across the border or other long distances. The community outreach and other provisions of Alternatives 2, 3, and 6 could help reduce the likelihood of PL spread by these activities, by focusing education efforts specifically on these uses. The Disease Export Standard and Guideline in Alternatives 2, 3 and 6 is specifically designed to reduce movement of PL offsite, including to California.

The existing management direction for the California forests is included in Appendix 3 in this SEIS, and is held constant for the purposes of analyzing the effects of the action alternatives (that apply only to Federal lands in Oregon). As described in the Pathology section, projections for Alternative 1 apply, to the detail of this analysis, to the California forests. Selection for Oregon of an alternative that is more active in restricting spread of the disease would have a slight but corresponding reduction in the spread rate predicted for California, because of changes in the risk of the pathogen being transported to California. Selection of Alternatives 4 or 5, however, could substantially increase the risk of additional disease export events to California. Secondary effects of that changed spread rate, for California, would parallel the effects described for Oregon, but be correspondingly smaller.

Private and Tribal lands account for an estimated 2,000 to 5,000 acres of POC in California. There are no known infestations of PL on California Tribal lands. The Hoopa and Yurok Tribes follow management practices designed to minimize the potential for introduction of PL and to limit its impact if an introduction occurs. Significant populations of POC are present on California State Park land at Jedediah Smith and Castle Crags State Parks. POC along the Sacramento River at Castle Crags State Park is infested with PL where, because of its proximity to Interstate Highway 5, it poses a risk for importation to other parts of the POC range. As discussed later in this chapter, there is POC and PL on Redwood National Park lands in California. Movement of PL between these lands and Federal lands in Oregon is possible, but unlikely. POC is harvested on other private timberlands in California. Movement of PL , with approximately 100 to 200 thousand board feet shipped to Oregon annually for milling or export (see Timber Harvest on Private Land section for further details).

Siuslaw National Forest, Oregon Caves National Monument

Of the 90 or so acres on the Siuslaw NF at the Oregon Dunes, approximately half is along roads and highways and is variously infested with PL in much the same pattern as the private lands that separate the Dunes from other Federal lands in the POC range. The remaining acres are in isolated stands within the sand dunes themselves, in management zones prohibiting off-highway vehicle traffic. Given the isolation, and the presence of PL elsewhere on the Dunes and in surrounding private lands, the likelihood of PL spread from nearby BLM or Siskiyou NF lands is immeasurable under all alternatives.

Oregon Caves National Monument is surrounded by NF, some with PL. There is no PL in the 200+ acres in the Monument with POC and Monument objectives include keeping PL out. Although threats to the Monument come from PL-infested stands along the highway leading into the Monument, hiking trails from the surrounding Siskiyou NF also enter the Monument. Continuation of current or higher levels of PL control (Alternatives 1, 2, 3, and 6) would help achieve Monument objectives. Alternatives 2 and 6 in particular would be most helpful, as the 7th field watershed encompassing the northeastern one-third of the Monument is one identified as being currently uninfested and thus is emphasized in those alternatives.

Port-Orford-Cedar Management on Non-Federal Lands in Oregon

There are no requirements for POC management in the “Oregon Forestry Practices Act.” A few private landowners in the range of POC have requested information on cedar management from local Forestry Assistance foresters. Usually the information provided is of a

general nature, and includes management practices such as operating during the dry season, avoiding sites infested with PL, and avoiding roads and skid trails in stands with a POC component. However, little attention is given to POC by most small-tract landowners. Several private landowners have test plantations of resistant stock provided by the FS Dorena Genetic Resource Center. There is interest among private woodland groups in the availability of this resistant stock for future plantings.

Non-Federal lands near Coos Bay contain approximately 8,500 acres of nonroadside infestation (compared with 319 acres on the Coos Bay BLM District) and represent a chronic source of PL for export to other lands throughout the range. An infestation in the Sacramento River Drainage in California is believed to have been transported on logging equipment from the Coos Bay area. The likelihood of such long-distance spread is discussed in the Pathology section and considered in disease projections.

Timber Harvest on Private Lands within the Range of Port-Orford-Cedar

Silvicultural practices on private lands within the range of POC include commercial thinning and regeneration harvesting and their related treatments of burning, planting, spraying of herbicides, pre-commercial thinning, pruning, and fertilization. Recent declines in Federal harvests, economic conditions, and the increase in mills specializing in smaller material has led to shorter rotations and more regeneration harvesting. Rotation ages average 45 years on the coast, and 60 to 90 years in the interior.

Approximately 70 percent of private timber harvest is done with skyline cable-yarding systems and the balance is done with ground-based systems on slopes less than 40 percent. The likelihood of PL spread is substantially reduced with skyline cable-yarding, whether partial- or full-suspension. Ground-based systems have the highest likelihood for spreading PL, assuming they pass through infested areas. These risks would be greatest during wet soil conditions.

Almost no roadside POC sanitation (clearing to prevent infection starts) occurs on private lands within the range, while some large, private, industrial timberland owners are washing heavy logging equipment for noxious weed control. This equipment washing probably has some benefit in slowing the spread of the POC root disease. Small private landowners typically do not wash heavy equipment.

The percent of each county in the POC range that is private, and the annual volume and estimated acres harvested are shown in Table 3&4-1. Private harvest acres have been estimated using the regional average rotation age, total harvest volume, and proportion of volume coming from regeneration or partial cutting and their respective assumed volumes per acre. Table 3&4-1 includes both clear-cut and partial-cut acres.

Within the natural range of POC, the PSQ on Federal lands is 49 million board feet annually for Oregon, and 23 million board feet for California. Thus, on a yearly average basis, and assuming the Agencies cut their full PSQ, the total timber harvested within the range of POC is about 550 million board feet, with private lands representing 87 percent. The estimated acres cut and its potential contribution to the spread of PL are expected to continue at these

Table 3&4-1.—*Average yearly private harvest levels for all species within the natural range of Port-Orford-cedar, 1995–2001*

County	% private lands [1]	Volume harvested in millions of borad feet [1]	Estimated acres harvested
Oregon			
Coos	70	183	6,700
Curry	84	49	1,790
Douglas	12	42	1,550
Josephine	45	12	970
Total	39	286	11,010
California			
Del Norte	74	36	1,310
Humboldt	14	63	2,320
Siskiyou	14	21	2,080
Trinity	62	49	4,930
Shasta	20	20	2,060
Total	20	189	12,700
Total	29	475	23,710

[1] *Source:* Oregon Department of Forestry Annual Timber Harvest Report for Western Oregon by County and California State Board of Equalization Timber Harvest Tax Records from 1995 to 2001.

relative levels into the foreseeable future. The mill capacity is 700 million board feet per year for southwestern Oregon; most mills operate along the Interstate Highway 5 corridor and a few along the coast. Approximately 40 million board feet of logs (not counting POC, discussed below) from private lands are shipped annually to mills in southern Oregon from northern California. This represents about 8,000 truckloads of logs (5,000 board feet per truck). Some of these could come from PL-infested areas..

Management of POC root disease on Federal lands is affected by private land management in several ways. Equipment used to harvest on Federal lands is supplied by private contractors who also work on private lands. This includes logging equipment that moves from sale to sale, and trucks that may haul from different sales in different areas or states from one day to the next. Also, trucks transporting logs from private lands often travel roads through Federal lands, particularly in “checkerboard” ownerships and on reciprocal right-of-way agreement roads. Trucks from various areas or even states are often unloaded at the same locations, often minutes apart; although as noted in the Timber Harvest section, the possibility for spore exchange in this case is very slight. The same possibilities for transport exist from Federal to uninfested private lands, reduced by the PL management requirements implemented on those Federal activities.

Federal administrative units whose POC management practices would be affected most by this level of private timber harvest are Coos Bay, Medford, and Roseburg BLM Districts, located in Coos, Curry, Douglas, and Josephine Counties. The POC lands on these districts are primarily checkerboard, intermixed with private ownership; most of the volume hauled on roads through BLM lands in these areas is from private lands, with little Federal latitude to limit season of use or require vehicle washing. As noted in Chapter 1, many of the PL-controlling management practices the Agencies night use are not available or are less effective on these types of lands, or are not cost-effective given the relatively small gain in protection. Other Federal administrative units with more contiguous land ownership would experience less likelihood of importing PL from private land management activities.

Although harvest of any species within the range of POC (as discussed above) is indicative of a risk of transporting PL, harvest and transport of POC itself is more likely, in a single event comparison, to result in the transport of PL. However, annual harvest of POC on private lands varies widely depending upon market conditions. The harvest levels shown in Table 3&4-2 are probably unusually high, based on a peak in demand that drove the price to a high of $12,000 per thousand board feet for top quality logs in the early 1990s as compared to $2,500 per thousand board feet today.

Most POC harvested in California is transported to mills in Oregon or export facilities in Oregon or Washington. This amounts to about 840 truckloads from Humboldt and Del Norte Counties, based on 4.2 million board feet per year (Waddell and Bassett 1996).

During Fiscal Year 2000 approximately 0.8 million board feet of POC was exported from the northwest to Japan, China, Korea, and Taiwan from the ports of Longview, Coos Bay, Portland, and Seattle. There are no POC export ports in California; all POC harvested for export in California is shipped through Oregon. Recently, POC logs shipped from the Port of Coos Bay in Fiscal Year 2000 averaged 257 thousand board feet (Warren 2002). By 2002, this had dropped to 200 thousand board feet (Green 2003). Overall export trends for POC continue to decline as the overseas demand continues to drop due to economic conditions and the increased production of Hinoki cypress (*Chamaecyparis obtusa*), which is used in Japanese temples.

Several mills in Oregon saw about 4.5 million board feet of POC annually for lumber, paneling, and decking. These mills are located in Bandon, Glide, Myrtle Point, Riddle, and Roseburg. Since the overall export prices for POC have dropped, these mills have been able to purchase more POC. Sources of POC logs include both Oregon and northern California. Approximately 100 to 200 thousand board feet of California POC logs are shipped to Oregon mills annually representing 20 to 40 truckloads of logs. Mill production is limited by the supply of POC logs, as their product demand is strong.

Temporal Effects

The Pathology section predicts mortality percentages at 100 years, and various indirect effects sections address this same time period. As explained in the Pathology section, the spread rate in any one area will not be constant, but will follow an "S" curve typical of similar disease infestations and readily recognizable within POC areas exposed to the pathogen for some time (see Pathology section). Monitoring will continue to validate these assumptions.

Table 3&4-2.—*Port-Orford-cedar standing inventory and harvest volume for private lands*

Counties	Standing inventory [millions of board feet]	Annual harvest [millions of board feet]	Years
Coos, Curry, Douglas, Josephine	94	3.5	1995-97 [1]
Humboldt, Del Norte	23	4.2	1991-94 [2]

[1] Tables 8d and 10d in Azuma et al. [2002].
[2] Tables 9 and 11 in Waddell and Bassett [1996].

Past Harvest and Mortality of Port-Orford-Cedar, All Lands

As noted in the Historical Setting section, A Natural History of Western Trees (1953), cited by Peattie (1991), describes 31 percent of POC "timber" as being on FS and BLM lands, and 69 percent private. Most of the larger POC are assumed to have been harvested or killed by PL on the 69 percent private; the current vegetation survey (CVS) data described later in this chapter shows 103,000 live POC over 20 inches diameter at breast height on private lands, or about 2 POC per acre. Large POC have been harvested from significant areas of Federal lands as well. The CVS data shows approximately 800,000 trees over 20 inches diameter at breast height in Oregon, or about 3 per acre if averaged over the 272,000 POC acres in Oregon. Although original average stocking levels are not known, clearly larger or old-growth POC is a small fraction, perhaps 10 to 20 percent, of what the Oregon distribution was historically. The total acreage itself is likely little changed from historic levels because POC readily reseeds, even if only smaller trees remained after harvest.

Most POC in California is on Federal lands and has not been harvested at nearly the same rate.

Relationship of this Supplemental Environmental Impact Statement to the Northwest Forest Plan

The Northwest Forest Plan was adopted April 13, 1994, as an amendment to land and resource management plans within the range of the northern spotted owl (including the plans that would be amended by the action alternatives in this SEIS). The Northwest Forest Plan added Standards and Guidelines to existing or draft (underlying) management plans for management of habitat of late-successional forest-related species and protection of watersheds. POC was among the species evaluated by the Forest Ecosystem Management Assessment Team and considered to benefit from its provisions, but no specific Northwest Forest Plan Standards and Guidelines are directed at POC. Therefore, no amendment to the Northwest Forest Plan is proposed. Further, none of the alternatives proposed would

> . . . significantly reduce protection for late-successional or old-growth forest related species, or reduce protection for aquatic ecosystems (USDA and USDI 1994b, *p. C-29*).

Therefore, no review by the Regional Interagency Executive Committee is required. Nevertheless, an understanding of the Northwest Forest Plan land allocations is helpful to understanding this analysis.

The Northwest Forest Plan amended the land and resource management plans of the various administrative units, primarily by establishing a system of reserves (certain land allocations), and providing Standards and Guidelines limiting or directing activities within those reserves. Approximately 80 percent of Federal lands were assigned to a reserve land allocation that precludes regularly-scheduled timber harvest. This resulted in a reduction in timber harvest levels of about 80 percent, and a reduction in road construction miles of over 90 percent, when compared to levels in the 1980s. Although there have been more restoration projects, and some reserves permit habitat-improving silvicultural activities including commercial

thinning and fuels reduction treatments, there has been a substantial reduction in the level of management activity and heavy equipment use on Federal lands as a result of the Northwest Forest Plan.

A description of the Northwest Forest Plan land allocations found in the planning area is as follows:

Congressionally Reserved—In the planning area this includes designated wilderness.

Late-Successional Reserves—These areas are managed to protect and enhance conditions of late-successional and old-growth forests. Limited stand management is permitted to improve late-successional and old-growth conditions or protect the areas from wildland fire and other large-scale disturbances.

Adaptive Management Areas—These areas are identified, each with an objective to develop and test new management approaches to integrate and achieve ecological and economic health, and other social objectives. Regularly-scheduled timber harvest (those contributing to PSQ) may occur in Adaptive Management Areas.

Administratively Withdrawn Areas—These are areas where the underlying direction in existing land and resource management plans precludes regularly scheduled timber harvest. These areas include recreation and visual areas, back country, administrative sites, research natural areas, and areas of critical environmental concern.

Riparian Reserves—These provide an area along all streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. Silvicultural activities are permitted only when watershed analysis shows treatments are needed to achieve watershed objectives.

Matrix—This includes all other lands. Management of these lands is guided by some Northwest Forest Plan direction for Matrix, but primarily by the direction in the underlying land and resource management plans. Approximately 75 percent of the matrix consists of lands suitable for regularly scheduled timber harvest, the remainder being rock, brush, or forestland not suitable for forest management.

In many ways the reserve system of the Northwest Forest Plan created de facto protection areas for POC. Certainly the risk of exposure has been reduced for many POC stands as a result of these allocations. Table 3&4-3 shows gross acres and acres occupied by POC within each of the land allocations of the Northwest Forest Plan for Oregon as of 1994 when the Northwest Forest Plan was adopted. Subsequent land exchanges and corrections may have changed these, probably less than 1 percent.

The Northwest Forest Plan also includes an Aquatic Conservation Strategy. The provisions of the strategy are designed to restore the heath of watersheds and aquatic ecosystems contained within them. The Strategy includes four components: Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. The strategy also has nine objectives. In general, the Strategy requires lands within the Northwest Forest Plan areas to be managed to maintain, restore, or not prevent attainment of, the nine ACS objectives.

Table 3&4-3.—*Gross Oregon Federal and presence of Port-Orford-cedar [acres] by Northwest Forest Plan land allocation within the natural range of Port-Orford-cedar in Oregon* [1]

	Congressional/ Administrative Reserve		Late-Successional Reserve		Matrix/Riparian Reserve/Adaptive Management Areas [2]		Total	
Administrative unit/Risk region [3]	Gross [4]	POC [5]	Gross	POC	Gross	POC	Gross	POC
Coos Bay BLM	3,074	229	45,941	18,797	106,101	53,979	155,116	73,005
Powers Ranger District	18,481	1,342	85,841	44,508	20,015	7,393	124,337	53,243
North Coast Risk Region total	21,555	1,571	131,782	63,305	126,116	61,372	279,453	126,248
Roseburg BLM	635	0	45,417	2,056	39,213	2,630	85,265	4,686
Medford BLM	26,829	4,404	119,355	17,277	85,971	2,974	232,155	24,655
Inland Siskiyou Risk Region total	27,464	4,404	164,772	19,333	125,184	5,604	317,420	29,341
Siskiyou Risk Region total [Siskiyou NF, except Powers Ranger District]	256,996	19,735	485,780	71,010	182,332	25,629	925,108	116,374
Grand total	306,015	25,710	782,334	153,648	433,632	92,605	1,521,981	271,963

[1] Data is from 1994 Regional Ecosystem Office GIS mapping and does not reflect subsequent land exchanges or other minor adjustments.
[2] Riparian Reserves are lumped with Matrix because actual Riparian Reserves are mapped onsite during project planning; about 50 percent of the acres shown are Riparian Reserve, with the other 50 percent being Matrix or Adaptive Management Areas.
[3] For "risk regions" see Pathology section.
[4] Gross acres within the range of POC.
[5] Acres with POC present.

Encumbered Forest Roads

The analysis in this chapter indicates roads facilitate the primary PL spread vectors of vehicles and equipment, and suggests some of the biggest gains in reducing PL spread can be made by closing roads, limiting use, sanitizing along them, reshaping them, or otherwise managing road design, location, and use. Several of the alternatives recognize the importance of roads in PL spread and specify, for example, the closure of all discretionary nonmainline roads in POC cores, or specify management practices that include closing roads to reduce unacceptable risk at the project scale. To help understand one of the potential limits to such closures, the following section describes some of the Agencies' legal obligations relative to many forest roads, particularly within checkerboard ownerships.

Bureau of Land Management-administered lands. The BLM entered into hundreds of Reciprocal Right-of-Way Agreements in western Oregon to gain access for forest management activities on the checkerboard lands that the BLM is responsible for managing under the "O&C Act" of August 28, 1937. In the early 1950s, BLM published the O&C Logging Road Right-of-Way regulations, now codified as 43 CFR 2812, initiating the development of Reciprocal Right-of-Way Agreements with most of the private timberland owners within the O&C area of western Oregon. A Reciprocal Rights-of-Way Agreement is a legal exchange of rights between the BLM and a private landowner, called a "permittee." The major benefit and objective of these agreements is the joint use and development of a single, forest road system that serves the needs of the BLM and the intermingled private timberland owner. This arrangement eliminates a potentially duplicative road system and provides guaranteed access for prospective bidders of BLM timber sales. BLM and a permittee share costs in the construction and maintenance of the road network.

To gain access to their respective lands, BLM and the other party have Reciprocal Right-of-Way Agreements to use existing roads and construct new roads across each other's lands. Typically, these agreements are granted in perpetuity to assure long-term access for both parties. The lands that each party can cross are specifically identified in the agreement by legal description and are recorded in the counties where the lands are located. The terms of the agreement are specific and apply to both parties equally. Each party has little discretion in not approving a new road location requested on that party's lands by the other party. In most of the agreements, the only reasons why a proposed road location can be rejected is: (1) the new road location does not constitute the most reasonable direct route; (2) the new road will substantially interfere with existing facilities; (3) the proposed road will cause excessive erosion; or (4) there is already an existing road suitable for the transportation of timber to market. Mitigation measures can be required for new construction, but only if they are to mitigate one of the reasons for rejecting a construction plat in the permit. Because of the reciprocal nature of these agreements, the terms and conditions generally cannot be amended or changed without the approval of both parties.

Reciprocal Rights-of-Way Agreements are considered as legally binding interests on the lands identified in the agreement. Responsibility of the parties for compliance with the environmental laws, including the "Endangered Species Act," have been tested in court and it has been affirmed that the BLM has limited discretion when roads are planned for construction on public lands by a permittee (see Sierra Club v. Babbitt, 65 F3d 1502 [9th Circuit 1995]).

Reciprocal Rights-of-Way Agreements continue to operate as the primary means of obtaining access to intermingled BLM and private timberlands in western Oregon. Nearly 80 percent of the BLM lands in western Oregon are encumbered by one or more agreements.

Although BLM roads are available for use by the public, they are not "public roads" as defined by Oregon Revised Statutes 386.010(2). BLM roads are considered "private government roads" and the Agency retains the authority to control activities on these roads including use by the general public.

In addition to Reciprocal Right-of-Way Agreements for roads, the Bureau has issued right-of-way reservations to the Bonneville Power Administration for utility corridors, pipeline rights-of-way, and numerous rights-of-way grants to private parties for utilities or to access home sites, as well as to numerous users of communication sites located on BLM-managed lands.

Forest Service-administered lands. The FS has the same or similar obligations as the BLM. Several factors affect the level of discretion held by the FS relative to road use and control. Private road use rights are often held on NF System roads and the degree of control the Agency may exercise is dictated by the terms of the document creating the private right. Some private use rights were retained by landowners who conveyed some of their lands to the FS but needed continued road access across the lands to reach other parcels they still owned. Other rights have been granted to private landowners under such authorities as the "Federal Land Policy and Management Act" and the "National Forest Roads and Trails Act." The FS shares ownership in entire road systems where cooperative road construction and use (cost share) agreements have been entered into with large industrial timberland owners. Other authorities have authorized access, such as laws relating to mining on Federal lands. The FS has a statutory requirement to grant reasonable access across NF System lands to landowners within NF boundaries and many different types of access grants have been issued to comply with this mandate.

In general, rights possessed by non-FS entities on NF System roads allow for ingress and egress to private lands subject to traffic regulations, such as speed and weight limits, as well as responsibility for road maintenance commensurate with the use. There are many private use roads, such as private driveways, on which the FS exercises little discretion as to road standards or type of use, since they are not open to the public.

Reservations, outstanding rights, and easement grants all constitute some form of non-Federal interest in the NF road, and each road must be individually assessed to determine the extent of private and Federal rights of use and control.

Assumptions and Clarifications

The effects discussions are based on the Standards and Guidelines of each alternative and any referenced appendices. As indicated by Appendix 2, the Agencies have considerable experience with the management techniques prescribed by the Standards and Guidelines and the effects of POC mortality, and so are able to estimate the future effects of the various alternatives with some degree of certainty. That experience leads to certain underlying assumptions that are stated here for clarity for the reader, and to assure consistency within the analyses. The following assumptions or clarifications are pertinent to the analysis or to the decision to

be made. The degree to which any of these assumptions ultimately prove incorrect would be expected to have a corresponding effect on the change in environmental effects attributable to them.

- The analysis assumes the Northwest Forest Plan will be implemented as written and intended. Effects to harvest levels, for example, are based on declared PSQ levels rather than the level experienced in the past 3 years when litigation has limited activities. This potentially conservative assumption assures adequate effects analysis if activity levels return to levels anticipated in the Northwest Forest Plan.

- The analysis only considers effects to POC within its natural range. POC has been planted, both as an ornamental and as a forest tree, throughout the world. Plantations outside the range occur in many areas including (unwanted) in parts of the Redwood National Park. The alternatives are not intended to apply to those areas. The effects of the various alternatives on such plantations is inestimable. Local managers may choose to apply management practices suggested in this SEIS, but no such assumptions are made here.

- Private interest in POC will likely increase if resistant stock is available. The species provides valuable products, may be resistant to *Phytophthora ramorum*, the cause of Sudden Oak Death, may help diversify stands to reduce the effects of Swiss Needle Cast in Douglas-fir, can be grown in very wet areas, and is manageable within a wide range of ecological conditions.

- There will be adequate funding to implement the requirements of the selected alternative. If monitoring is required, for example, it will be funded. Funding is not necessarily expected where the writer provides the caveat "to the extent funding is available", or similar language, although such a case would obviously require funding to achieve the specific effect to which that author refers.

- References to Clorox bleach are to the material registered for control of PL as described in Appendix 4, and, to the extent consistent with effects described in this SEIS, to additional materials registered for such use in the future.

- The resistance breeding program in Alternatives 1, 2, 3, and 6 would be continued essentially at current levels.

- For analysis purposes, areas mapped as 75 percent or greater top-kill in the Biscuit Fire area were removed from acre and map calculations and displays of POC acres in the SEIS, even though there may be live POC on them now or in the future. The Standards and Guidelines of each alternative would apply to these acres of trees. For areas with live trees now, the provisions of Alternatives 3 and 6 for uninfested 6th or 7th field watersheds would apply.

- The ability to restrict traffic on lands in checkerboard ownerships is severely restricted by the terms of the reciprocal right-of-way agreements governing most roads. Written in the 1950s and 1960s to ensure only one set of roads was built to access both private and Federal lands, the agreements provide intermingled owners with a deeded right to use these roads. The results of court challenges to these roads based

on the "Endangered Species Act" have affirmed these rights. See the Encumbered Forest Roads section in this chapter for more detail.

- Wildland fire operations will follow the Standards and Guidelines as soon as, and to the extent possible, if they do not jeopardize life and property. This issue is specifically addressed in the Standards and Guidelines of Alternatives 2, 3, and 6, and does not apply to Alternatives 4 and 5. A detailed explanation of wildland fire operations and root disease control considerations on the Biscuit Fire is included in the Fire/ Fuels section.

- Facts, analysis, and conclusions displayed in this SEIS may be different than similar data in the Agency's 2003 "Range-Wide Assessment of Port-Orford-Cedar on Federal Lands" (USDA-FS and USDI-BLM 2003a). The Assessment is primarily an internal document that has been several years in the making. Data may be outdated, or analyses not to EIS standards. Generally, where information from the Assessment has been incorporated into this SEIS, it has been incorporated in its entirety with appropriate references, and therefore stands alone.

- Legal compliance by the public, and the effectiveness of Agency law enforcement, will be reasonable, but not absolute. Gates and other area closures will be respected most of the time. Public information efforts will continue to be successful. Firewood and other forest product collectors will stay out of closed areas most of the time, and violators will sometimes, but not always, be caught and cited. Occasional violations of area closures are specifically acknowledged in the Pathology and Botany sections.

Planting Assumption

Introduction. The Agencies' resistance breeding program is described in the Genetics section of this chapter and referred to throughout the SEIS. In particular, most indirect environmental effects are expected to be partially mitigated in the long term (but not in the short term) by the continued development and subsequent outplanting, survival, and growth of POC resistant to PL. Effects mitigations attributable to resistant stock are always identified as such. However, to provide consistency to such discussions, the following assumptions are made about the use and growth of PL-resistant stock.

Assumption. For each alternative, resistant seed is assumed to become available for each breeding zone on the dates projected in the Genetics section. Since resistant seed orchard trees bear cones annually and prolifically if stimulated and carefully managed, enough seed will be available to meet all Federal planting requests. Seedlings will be field planted, generally as part of multi-species mixes, on drier sites within its natural range, and high-risk sites where there is a low probability PL can spread to uninfected POC within, near, or downstream of the site. Planting on infested sites will generally be driven by resource needs like the replacement of stream shading on ultramafic sites where stream temperatures are adversely affecting listed fish species. Such planting would focus on areas where mortality is the most severe and replacement shading is limited. For effects discussions in this SEIS, assume planted resistant trees will eventually mitigate 50 percent of significant environmental loss resulting from PL mortality. For example, assume planting (or other ingrowth) will eventually replace at least 50 percent of shade loss along streams where PL-related mortality

is causing temperature increases that threaten listed species. Over-planting will make up for mortality from all factors including PL, and surviving trees will be tended (thinned or released as needed). POC is intermediate in growth; with even moderate stand tending, dominant and codominant trees will exceed 24 inches diameter at breast height and over 100 feet in height in 100 years. See Appendix 6 for additional detail.

Port-Orford-Cedar Background

Port-Orford-cedar (*Chamaecyparis lawsoniana* [A. Murr.] Parl.) is the largest species of its genus and the largest representative of the family Cupressaceae in North America. It is a valued timber tree and is also planted worldwide as an ornamental (USDA-FS 1965).

Species Range

POC is a regional endemic, native only to southwestern Oregon and northwestern California. The range of POC includes portions of the Oregon Coast Range, Siskiyou Mountains, California Coast Range, and Klamath Mountains. The northern limit of the species occurs on coastal dunes north of North Bend. The southern end of the species' range is in Humboldt County. Longitudinal distribution is greatest in California (see Figure 1-1). The range narrows south and north of this area. Range limits in the south and east coincide roughly with the 1,000-mm (39.4 inches) isohyet. Disjunct populations are associated with areas of locally high precipitation about 93 miles inland, near the headwaters of the Trinity and Sacramento Rivers (Hawk 1977).

Autecology

POC has moderately high shade tolerance, and is more tolerant than incense-cedar, sugar pine, Douglas-fir and western white pine, and less tolerant than Shasta red fir, Brewer spruce, white fir, Sitka spruce, grand fir, western red cedar, and western hemlock. Other studies show POC able to reproduce well in all but the darkest microsites, including late-successional stands. Zobel and Hawk (1980) found POC to survive under shade as well or better than all its competitors except western hemlock.

In addition to being shade tolerant, POC is tolerant of repeated fire (Hawk 1977). Even as pole-sized trees, POC has a good chance of surviving fires (Zobel et al. 1985). Fire resistance is less than that of Douglas-fir, but greater than that of the true firs or western hemlock. POC is often the first species to reinvade after fire.

POC occurs over a wide variety of soil types (Hawk 1977). The species outcompetes most of its competitors on ultramafic soils, but is not restricted to these soils and grows better in laboratory studies on other soil types. At low elevations, POC is frequently associated with ultramafic soils. Higher elevation sites occur on a wider array of soil types (Zobel et al. 1985).

POC is characterized as having fairly low drought resistance (Zobel et al. 1985), and its requirements for moisture during the growing season may limit its distribution. POC is considered more drought tolerant than western hemlock and Sitka spruce, but is less tolerant

than Douglas-fir, Jeffrey pine, incense cedar, sugar pine, and most other trees found in its range (Zobel et al. 1985).

Geomorphic Position

POC occurs in all physiographic locations from sea level to 6,400 feet elevation on the seaward slopes of the Coast Range and Klamath Mountains (Hayes 1958). POC forests occur most frequently on northwestern aspects; 82 percent of plots collected by Hawk (1977) were on aspects 200 to 45 degrees azimuth (Zobel et al. 1985). Most of the POC communities identified by Hawk (1977) were in midslope landscape positions.

Moisture Regime

Much of the range of POC usually has wet winters, dry summers, relatively uniform temperatures, high relative humidity, and frequent summer fog. Away from the coastal influences, in the south and east portion of its range, rainfall, relative humidity, and summer fog are decreased, while the temperature fluctuations in both the summer and winter are greater (USDA-FS 1965).

Moisture regime strongly influences plant community development within the range of POC. To most populations of POC, a consistent abundance of water seems a critical necessity (Zobel et al. 1985). Where Douglas-fir is present it outcompetes POC for water. Only in the northern part of the range does the ratio of available water to evapotranspiration compensate for this competition (Zobel et al. 1985). POC may outcompete Douglas-fir in areas with low macronutrients, or cold or saturated soils.

Summary of Limitations on Distribution

POC is restricted in geographic range, but has a wide ecological breadth, occurring in many diverse habitats (Zobel et al. 1985). Zobel et al. (1985) suggest limitations on POC distribution acting at four levels: microenvironmental, geomorphic surface, regional, and geographic scales. At the microenvironmental scale, moisture near the surface and high water potential in summer, absence of extreme shade, and mineral soils may be essential to seedling success. At the geomorphic surface-scale, POC seems generally limited to landscape positions that assure a consistent supply of groundwater. These include high water table and seep areas, streams or lakeside areas, slumped areas, and positions with significant watershed area above to maintain soil moisture.

At the regional scale, geology and climate affect distribution. For example, the importance of ultramafic substrates is clear. Higher humidity in coastal zones can compensate for low soil moisture locally. Finally, at the geographic scale, Zobel et al. (1985) suggest changes in precipitation/evapotranspiration ratios and decreases in ultramafic substrates traveling south and east, and increased competition with other conifers in the northern portions of the range.

Several factors mitigate the above-described constraints. North-facing aspects and areas experiencing summer fog also maintain microsite conditions supporting POC in upper slope positions without significant seeps. Also, lithology (bedding tilt) can frequently produce localized wetted soils within meters of local ridgelines. Thus, POC is frequently found in

positions at or above midslope, and should not be considered a riparian species, but a mesic-to-moist microclimate-dependent species.

Life History

Some trees start to bear cones within 8 years under natural conditions and earlier in greenhouse conditions. Cone bearing becomes general by 20 years, is best at about 100 years, and continues for the life of the tree. Seed crops are frequent; heavy crops are produced every 4 to 5 years and some seed is usually produced every year. Squirrels do not commonly use POC seeds as food unless other species of seed are scarce. Most seed germinates soon after falling. Seedfall begins in September, reaches a maximum in winter, and continues through spring (USDA-FS 1965).

Natural reproduction is successful if there is a bare, mineral soil seedbed and sufficient moisture. POC survives well in plantations if animal browsing and competition from other vegetation is avoided (USDA-FS 1965).

In the most abundant portion of the range, POC is common in mixed stands up to 20 to 25 years old, after which it is usually overtopped and grows slowly. Once established, the species is relatively shade tolerant and long lived. It retains to an old age the capacity to respond if released from surrounding Douglas-fir and other overstory trees. POC is capable of moderately rapid growth when not overtopped by other trees. Mature trees can reach 4 to 5 feet in diameter and 200 feet tall. Mature trees are generally older than 200 years (USDA-FS 1965).

POC is subject to windthrow. It has no taproot, and the numerous lateral roots are usually of a small diameter. The tree has a tendency to grow multiple stems at any height (USDA-FS 1965).

Historical Setting

Historically, POC was a more prominent component across its natural range. Over the last 150 years the loss of old growth POC due to fire, harvest, land use changes, and root disease has been especially pronounced on the private and county lands along the coastal shelf from Coos Bay to Port Orford. A 1953 description of POC is provided in "A Natural History of Western Trees."

> But from the first discovery of the big stands of timber in 1855, man and fire have assaulted it relentlessly. A disastrous fire in the Coos Bay region at an early date wiped out a vast but undetermined amount. Next, sawmills were at work, and schooner were anchoring off the rocky, haborless coast, to be loaded with Cedar logs carried by high line from the cliffs to the decks.
>
> The demand for Port Orford Cedar, as soon as it became known in eastern and foreign markets, grew swiftly and remained steady.
>
> Today [1953] 69 percent of this precious timber is in private ownership, which means that its destiny is the saw mill . . . while 15 per cent is held on the Oregon and California Railway revested grant lands managed by the Department of

> Interior [BLM]. Only 16 per cent is in the hands of Forest Service.
>
> The best way to see this tree of almost legendary fame is to follow U.S. Highway 101 between Reedsport and Gold Beach, Oregon (Peattie 1991).

Old growth POC that might have survived logging interests on private lands have since been lost to urbanized land use changes and the POC root disease. For the most part, old growth POC along the U.S. Highway 101 corridor does not exist today. Currently, almost all old growth POC is on Federal ownership.

Distribution Across the Range

POC can be found with a variety of species with differing ecological requirements. These species differ across the range of POC. The wide ecological range of POC is reflected in the climatic diversity of the ecoregions and subsections in which it is distributed. These ecological units are defined based on their biotic and environmental factors that directly affect ecosystem function (McNab and Avers 1994). Ecoregions and subsections are used in the Ecology and Botany sections of this SEIS because they directly apply to various POC/other plant relationships. Presence of POC in a stand (as defined in the Glossary) made the stand it was contained in a POC stand and counted as POC acres.

Another approach for conceptualizing the distribution of POC across its range is used in the Pathology section. In this section, the range has been classified into three "risk regions," North Coast, Inland Siskiyou, and Siskiyou, based on the percentage of POC that is on sites at high risk for pathogen spread. While these classifications have some general relationship to the ecoregion and subsection approach, they do not match completely. The relationship between POC acres using the two approaches is shown in Table 3&4-4. Following are basic descriptions of the existing conditions within the risk regions.

North Coast Risk Region

The North Coast Risk Region is part of the Oregon Coast Range. This is an area of low mountains with high rainfall and dense coniferous forests. It has moderately sloping, dissected mountains and sinuous streams. The most important characteristic in terms of species

Table 3&4-4.—*Port-Orford-cedar acres on BLM and FS lands grouped by ecoregion and pathology risk regions, Oregon and California*

	Pathology Risk Regions					
	Oregon			California		
Ecoregions	North Coast Region	Inland Siskiyou Region	Siskiyou Region	Siskiyou Region	Disjunct California	Totals
Northern Coast	124,070	1,543	22,464			148,077
North Inland	291	20,367	17,909	13,724		52,291
Mid-Coast	1,887	5,273	50,120			57,280
Mid-Range		2,158	25,881	16,951		44,990
Southern Range				3,001		3,001
East Disjunct California					1,142	1,142
Totals	126,178	29,341	116,374	33,676	1,142	306,781

composition is the occurrence of western hemlock as a dominant or codominant species. The Federal administrative units that basically cover this region are the Siuslaw NF, Oregon Dunes National Recreation Area; Coos Bay BLM District; and the Siskiyou NF, Powers Ranger District.

Oregon Dunes National Recreation Area (FS)

The natural range of POC extends into the southern end of the Coos Bay dune sheet and the Oregon Dunes National Recreational Area of the Siuslaw NF.

Approximately 50 acres of old-growth POC are isolated by dunes and are managed to maintain, restore, or enhance its condition. These stands are 150 to 350 years old and appear to be healthy and free of PL infection. Off-highway vehicle use and a number of other activities within and adjacent to these POC stands is prohibited.

Approximately 40 additional acres of POC are found on the Oregon Dunes National Recreational Area as generally scattered individual trees or small pockets of younger trees with PL infection known or suspected within the area. Most are adjacent to roads, railroad tracks, or private lands, and about half are in areas open to off-highway vehicle use.

Coos Bay BLM District

Land ownership patterns within the Coos Bay District are checkerboard and scattered parcels of public domain lands interspersed with both private industrial forestlands and private individual landowners. All drainages on the Coos Bay District consist of mixed ownerships.

PL has been present within the Coos Bay BLM District boundary for over 50 years with the first POC trees exhibiting symptoms of PL in 1944 at the Oregon Marine Biological Station in Charleston, Oregon. The first confirmed sites were identified in Coos Bay, Oregon, near Mingus Park, just north of the North Bend McCullough Bridge, and in Charleston, Oregon (Roth et al. 1957).

According to the District's GIS database, there are 82,410 acres of POC on the Coos Bay BLM District with 319 acres of non-roadside PL infestations and 2,391 acres of roadside considered infested. These acres do not include infestations on the private lands intermingled and west of the Coos Bay District lands.

POC grows throughout the forest landscape and is only a minor component of local riparian habitats. Most of the PL infestations within the area occur on private lands from Lakeside, Oregon, to Gold Beach, Oregon, along the coast. Healthy POC is found throughout the landscape away from roads and streams. The vast majority of POC and PL on Coos Bay BLM District lands is in the south half of the district, south of the North Fork Coquille and Coos River drainages. Nearly all drainages within the Coos Bay District are infested with PL. A few uninfested 7th field watersheds are at the northern most end of the natural range. These areas have small scattered populations of POC intermixed with stands of Douglas-fir, western hemlock, and western red cedar.

Planting of nonresistant POC seedlings as part of the species mix has occurred on all regen-

eration harvest units within the range of POC since Fiscal Year 2000. Planting, annual maintenance, and precommercial thinning of plantations preserve minor species, including POC, in areas away from roads and streams.

Siskiyou National Forest, Powers Ranger District

The Powers Ranger District has the greatest concentration of POC in the world, from the South Fork of Coquille River to Iron Mountain. This district is also unique in having stands with compositions of POC up to 70 to 80 percent. Included within the district are the Port-Orford-cedar Research Natural Area, Big Tree Viewing Area, which includes the largest POC in the world at nearly 12 feet in diameter, and the Coquille River Falls Research Natural Area. The research natural areas are infested with POC root disease.

The district has been active in the inventory of POC through district-wide road surveys in 1964, 1972, 1983, 1992, and 1999. Since 1999, individual road segments connected to project proposals have been surveyed. These surveys, combined with extensive aerial photo and ground verification surveys in 1997, have identified a total of 61,014 acres of POC present on the district, of which 8,138 acres are infested with the PL root disease. Based on survey information and observations, there are few acres of new infestation appearing with each new survey. Most of the roads on the district have been open to the public since their construction and have already become infested.

Coquille Indian Forest

In 1997, Congress granted the Coquille Tribe in Oregon 5,400 acres of public land that had previously been managed by Coos Bay BLM. The lands are generally situated in sections (640 acres) and partial sections northeast of the towns of Myrtle Point and Powers, and are immediately surrounded by private lands although BLM lands are often no more than 1 mile away. The Act (Public Law 104-208) creating the Coquille Indian Forest requires that these Indian lands be managed subject to the Standards and Guidelines of Federal forest plans on adjacent and nearby Federal lands, and consequently the Tribe has been following all elements of the 1994 Northwest Forest Plan. The applicability of the selected alternative from this (POC) SEIS, and the appropriate strategy for POC management on Coquille Forest lands, will be determined by separate action of the Bureau of Indian Affairs and the Coquille Indian Tribe. Analysis in this SEIS assumes the Standards and Guidelines for the selected alternative will not apply.

The annual allowable sale quantity for these lands is about 2 million board feet. Harvest and other activities on these lands have a possibility of spreading PL to Federal lands, with the risk lower than the risk of PL coming from private lands (because of Northwest Forest Plan land allocations). This risk would become equivalent to risk from other Federal lands if the Tribe adopts the Standards and Guidelines of the selected alternative.

Private Lands in the Region

With the prolific seed production of the species and excellent POC growing conditions along the coast, the corridor of lands along U.S. Highway 101 from Lakeside in the north to Port-Orford, Oregon, in the south, is a rich environment for PL infestations. There are approximately 880,000 acres of non-Federal lands within the Coos Bay BLM District boundary

within the POC range (see Map 4), with an estimated 50,000 of these acres containing POC. Aerial photography interpretation indicates there are approximately 8,500 acres of non-roadside PL infestations on these lands. The low coastal terraces and abundant standing water in this area result in a high percentage of POC being on sites at high risk for PL infection. The mortality rate calculated from forest inventory plots is consistent with aerial photo disease mapping done by the Coos Bay BLM District.

Inland Siskiyou Risk Region

This risk region has a high diversity of conditions, which is reflected in the vegetation. POC in this region is often associated with ultramafic soils, and codominates the timber stands on these soils with Jeffery pine and incense cedar. The vegetation on other soil types is dominated by the Douglas-fir with scattered POC. POC grows on Federal lands intermingled with private landholdings. It exists as occasional large trees with many seedlings growing underneath. The Federal administrative units that basically cover this region are the Roseburg and Medford BLM Districts.

Roseburg BLM District

Overlapping the northeastern-most portion of the native range of POC, the Roseburg BLM District has approximately 5,000 acres of forestland occupied by this species. The POC on the district grow in the Coast Range west of the Umpqua River, south to the southern area of Camas Valley, then crossing State Highway 42 into the Twelve-Mile drainage. POC grows sporadically along Buck Springs Ridge and Cow Creek and its tributaries, and also in the south fork of Middle Creek.

Less than 100 acres have some level of the root disease, primarily adjacent to highly visible roads. Infestations occur on interspersed private lands as well.

About 63 percent of the trees are less than 80 years of age. POC makes up generally less than 5 percent of the overstory of the stands in which it is found.

PL has probably been present on Roseburg BLM District since the early 1960s. Extensive road construction on both Federal and private lands probably facilitated the introduction of the disease during this period.

Medford BLM District

The natural range of POC extends into the western part of the Medford District. Of the four resource areas on the district, POC is native in the Grants Pass Resource Area and the Glendale Resource Area. The Grants Pass Resource Area contains the majority of POC. Most of the POC on the Medford District is contained in the Williams Creek, Rogue River/Horseshoe Bend, Silver Creek, Rogue River/Hellgate and Deer Creek Watersheds. Surveys in these and other 5th field watersheds show 25,485 acres of healthy POC and 2,340 acres of infested stands.

The habitats in which POC is found are very diverse. POC on the district is often associated with riparian areas, but does occur in the uplands and on ridges. There are inclusions of

coastal plant communities associated with POC as well as a high elevation association with Shasta red fir and Alaska yellow cedar. POC can be found on serpentine-influenced (ultramafic) soils that include western white and Jeffrey pine series.

Siskiyou Risk Region

This risk region includes the Coastal Siskiyous, Siskiyou Mountains, and Gasquet Mountain ultramafics located in Oregon and California. In the northwest part of the region, the Coastal Siskiyous have highly dissected mountains and high gradient streams, as well as a few, small, alpine glacial lakes. The climate is wetter with more maritime influence than the Siskiyou and Klamath Mountains to the south. The Coastal Siskiyou area has tanoak, Douglas-fir, and some POC. Western hemlock is present, but not a dominant overstory species. This region has a high diversity of ecological conditions, which is reflected in the vegetation.

In the middle of the region, the Siskiyou Mountains are higher and steeper than the other portions of the cedar's range in Oregon. The vegetation is dominated by Douglas-fir at low elevations, Jeffrey pine on ultramafic soils, and white fir and red fir series at higher elevations.

In the south portion of this region, populations of POC are highly scattered across the landscape and within many vegetation types. Marine air moderates temperatures in the western portion of this area, creating a temperate-to-humid climate near the coast. Douglas-fir and tanoak are the predominate trees in this part of the region. The southern extreme of this region stretches to the southwest edge the Klamath Mountains and into the northern California Coast Range. Many of the isolated populations of POC in this part of the region are often found on ultramafic soils.

The Federal administrative units that basically cover this region within the Siskiyou NF are the Illinois Valley, Galice, Gold Beach, and Brookings Ranger Districts; Six Rivers NF; Klamath NF; Shasta-Trinity NF; Oregon Caves National Monument (FS); and Redwood National Park.

Siskiyou National Forest, Illinois Valley, and Galice Ranger Districts

Many of the POC within the Illinois Valley and Galice Ranger Districts range in age from 200 to 400 years and are 20 to 60 inches in diameter. POC root disease has been present along the Oregon side of the Grayback Road going toward Happy Camp, California, since about 1960. Sanitation removals were implemented on the California side to reduce the potential for further disease introduction. So far, the root disease has not been found on the California side of the Grayback Road. In contrast, there has been considerable spread along this route and subsequent downstream movement in the years following introduction. The disease has spread to many stands, mostly along roads and down streams, east of Highway 199 on the Illinois Valley Ranger District. PL has infested the Grayback/Sucker Creek drainage near the Oregon Caves National Monument. The Wild and Scenic Illinois River and Briggs Valley area have a 6 to 40 percent stand composition of POC and are uninfested. Other major drainages in the Illinois Valley have scattered distributions of uninfected POC amidst steep topography.

POC is most often found in riparian areas within the Illinois Valley and Galice Districts. Generally, POC is within 100 feet of the stream; however, small groves of POC can be found on alluvial fans and benches along these streams. Crown closure in the streamside areas are from 10 to 50 percent.

There are upland populations on the many different soil types, including serpentine. POC is mixed with Douglas-fir, true firs, pines, and incense cedar up to approximately 4,500 feet elevation. In these mixed conifer stands, POC crown closure is generally 5 to 20 percent. Before the Biscuit Fire, POC on serpentine soils could be found from Josephine Mountain south to the Oregon boarder, where POC was scattered with white, knobcone, and lodge pole pines. In other serpentine areas, POC can be found with incense cedar and Douglas-fir. In these areas, POC crown closures are less than 2 percent.

Siskiyou National Forest, Chetco and Gold Beach Ranger Districts

POC can be found from Iron Mountain on the northern boundary of the Gold Beach District south to Mineral Hill. From there south, it is sparsely distributed and found only on the east side of the Chetco Ranger District. POC grows from near sea level up to approximately 4,700 feet at Chetco Peak in the Kalmiopsis Wilderness.

POC is mostly found within 100 feet of the streams, but is also present in upland areas on many different soil types, including serpentine. POC is mixed with Douglas-fir, true firs, pines, and incense cedar. In the mixed conifer stands, POC crown closure is generally 5 to 20 percent, but can be up to 80 percent in small isolated areas. Many of the POC within these districts are 200 to 400 years old and 20 to 60 inches in diameter.

PL has occurred along forest roads since about 1960. The disease has spread to many stands, mostly along roads and streams, and including locations in the Kalmiopsis Wilderness following introduction.

Six Rivers National Forest

The Six Rivers NF includes the greatest extent of POC on Federal and State lands in California. These acres are spread over the northern portion of the forest and decrease in extent toward the south. The Gasquet Ranger District has about 67 percent of the POC on the Forest, primarily in the Smith River drainage. The Orleans Ranger District has about 30 percent of the POC on the forest, all in the Klamath River drainage. The southern-most POC in the natural range is on the Lower Trinity Ranger District. About 77 percent of the POC on the Six Rivers NF is found in riparian landscape positions.

POC root disease was noted on the Gasquet Ranger District by 1980 and has slowly spread to over 2,800 acres. The Orleans Ranger District has 157 infested acres and the Lower Trinity Ranger District has no recorded infestation to date. Most infestations are found in riparian habitats.

Klamath National Forest

There are no known PL infested stands or infected trees on the Klamath NF.

The distribution of POC on the Klamath NF is mostly limited to the Dillon, Clear, and Indian Creek Watersheds within the Siskiyou Mountains. On the Klamath NF, POC stands usually consist of small, isolated pockets or narrow stringers and are nearly always confined to riparian areas. Most acres fall within the Riparian Reserve land allocation. The majority of POC acres are located within the Siskiyou Wilderness. Many of the POC stands in Matrix lands are generally in more accessible areas, but with limited direct road access to stands due to steep topography and riparian position.

Currently, the closest known infested sites are on the Illinois Valley Ranger District of Siskiyou NF and Orleans Ranger District of Six Rivers NF. The Illinois Valley site is close, via the popular Grayback Road, to uninfested sites within the Indian Creek Watershed of Klamath NF.

The 100-acre Sutcliffe Creek Botanical Area, which contains a stand of old POC, is located in the upper Indian Creek drainage of the Happy Camp Ranger District. Many stands of POC on the Klamath NF are greater than 300 years in age, with some individuals reaching ages of over 700 years. There are three locales within the Siskiyou Wilderness where POC and Alaska yellow cedar are found in very close proximity.

Oregon Caves National Monument (FS)

POC is the dominant tree on approximately 40 acres of the 480-acre Monument, and occurs in stands in about half the Monument. There is no PL in the Monument, but it is surrounded by it, even upslope. There are foot trails coming to the Monument from adjacent infested FS lands that are used by people and, illegally, by horses.

Redwood National and State Parks

Of the 110,000 acres in the Park, naturally-occurring POC occupies only about 200 acres at the north end of the Park in the Smith River drainage near Jedediah Smith State Park. POC is found in various pockets, generally as a component of stands, but also within a few POC-dominated stands. There are a few infestations of PL, with one infestation notably along a main trail. There is no formal public access to other infestations, and generally little access to uninfested stands, except at Jedediah Smith State Park Campground.

Biscuit Fire

The Biscuit Fire, located primarily within this region, began on July 13, 2002 and reached 499,965 acres (471,130 acres in Oregon and 28,835 acres in California). One of Oregon's largest fires in recorded history, the Biscuit Fire encompassed most of the Kalmiopsis Wilderness. The boundary of the Biscuit Fire stretches from 10 miles east of the coastal community of Brookings, Oregon, south into northern California, east to the Illinois Valley, and north to within a few miles of the Rogue River. The fire impacted approximately 29 percent of Federal acres with POC and partially occurred on the Medford District BLM, and Six Rivers and Siskiyou NFs.

Private Lands

There are 2,000 to 5,000 acres of non-Federal POC in California (see discussion of California early in this chapter). This includes lands in both the Siskiyou and Disjunct California Risk Regions.

Disjunct California Risk Region

Scattered populations of POC grow in this risk region in the southeastern corner of the Klamath Mountains and Scott Mountains. The primary trees in this part of the region are Jeffrey pine, ponderosa pine, white fir, and Douglas-fir. The Federal administrative unit that covers this region is the Shasta-Trinity NF.

Shasta-Trinity National Forest

Approximately 1,150 acres of POC occur on lands managed by the Shasta-Trinity NF. These are located within portions of the disjunct southeast interior POC population. Occurring as small discontinuous groupings of trees, the POC populations on the Shasta-Trinity NF are almost entirely limited to the riparian zones of the Upper Sacramento and Trinity River drainages. Much of this POC occurs in areas under checkerboard land ownership. There are additional sites with POC on privately-owned land, as well as at Castle Crags State Park. The 1,160-acre Cedar Basin Research Natural Area has isolated patches of large POC as a distinguishing feature.

Although there are several areas of POC root disease infestation along the upper Sacramento River from Shasta Retreat (just north of Dunsmuir) to the mouth of Shotgun Creek, only one infestation is present on the Shasta-Trinity NF. This small infestation was discovered in September, 2001 at Scott Camp Creek, approximately 3 miles upstream from Lake Siskiyou.

Port-Orford-Cedar Acreage Data

Geographic Information System

The geographic information system (GIS)-mapped data for POC and PL infestation was developed over the last decade by the various administrative units (Table 3&4-5). On the Siskiyou NF, roadside survey observations, for both healthy and diseased POC locations, were collected and put into GIS in 1992. Intermittent updates have been made since. The GIS map is composed of aerial photography interpretation, timber cruise data, stand exams, and estimated locations as seen from roads for the presence of any healthy or diseased POC.

On the BLM districts, the FS standards for roadside surveys and aerial photo interpretation with on-the-ground verification sampling were utilized for mapping the presence of POC and the PL infestations. This data was entered into GIS on the three BLM districts in 1998. In 1999, POC and infestation maps for both agencies were consolidated into a common GIS layer covering the range of POC.

On the Roseburg and Medford BLM Districts, only the federally-administered lands were

Table 3&4-5.—*Geographic information system-mapped Port-Orford-cedar and* Phytophthora lateralis *infestation acreage on BLM and FS, post-Biscuit Fire*

	Congressional Reserves/Administratively Withdrawn		Late-Successional Reserves		Matrix/Riparian Reserves/Adaptive Management Areas		Total		
Risk Regions	Uninfested	Infested	Uninfested	Infested	Uninfested	Infested	Uninfested	Infested	% Infested
Oregon									
North Coast	1,351	220	57,128	6,177	60,209	1,163	118,688	7,560	6
Inland Siskiyou	4,317	87	18,182	1,151	5,060	544	27,559	1,782	6
Siskiyou	18,829	906	62,474	8,536	22,617	3,012	103,920	12,454	11
Total	24,497	1,213	137,784	15,864	87,886	4,719	250,167	21,796	8
California									
Siskiyou	17,188	1,782	10,641	741	3,013	311	30,842	2,834	8
Disjunct California	371		173		598		1,142		0
Total	17,559	1,782	10,814	741	3,611	311	31,984	2,834	8
Total	42,056	2,995	148,598	16,605	91,497	5,030	282,151	24,630	8

generally mapped for PL infestations. At Coos Bay District BLM, Federal and private lands within the boundary of the district were mapped for PL infestations. However, the PL infestations mapped on private lands do not include roadside surveys and were not field-verified. The private lands are not included on Table 3&4-5. Coos Bay completed an extensive revision of the GIS map for POC presence data in early 2003. A 2002 remapping of PL infestations on the Roseburg BLM District has not yet been incorporated into the common GIS layer used by all administrative units. A SEIS Team-initiated comparison of that data with the GIS data, however, shows only an 18-acre difference, or 0.06 percent of the PL in the Inland Siskiyou Risk Region.

On the Klamath, Shasta-Trinity, and Six Rivers NFs in California, the healthy POC and PL infestations were estimated using detailed ecological mapping and plant association plot information. Some non-Federal lands have also been mapped.

Biscuit Fire Acres. According to canopy fire effects mapping done by the Agencies shortly after the Biscuit Fire, the fire significantly changes the vegetative landscape. Substantial areas of POC were killed in the fire. From this mapping, it is estimated that two-thirds of the fire area had more dead conifers than live. While riparian areas often did not burn as hot as surrounding upland areas, periods of extreme fire behavior also impacted riparian areas, killing many POC trees. Based on overlaying the 75 percent top-kill burn intensity map with the prefire POC GIS maps, it is estimated that 55,400 acres of uninfested POC stands, and 1,400 acres of infested POC stands, were killed out of 95,000 acres within the perimeter of the fire. To provide a description of current conditions, it is assumed these acres experienced complete POC mortality, and hence removed from acres displayed in this analysis.

If POC actually survived, or is reseeded or replanted in burned areas, the Standards and Guidelines of the selected alternative (including those defining uninfested watersheds, if PL was not previously present) would apply. Indeed, 30,000 disease-resistant POC seedlings have been sown for outplanting within the burn. Planting, began in November 2003, is expected to begin restoring the total acres of POC back toward prefire levels.

After the POC SEIS was under way, the Biscuit Fire recovery team remapped burn intensities within the fire area using a vegetation change index, to more accurately display within-stand diversity of fire effects. The earlier canopy fire effects (used in this SEIS) were mapped at the stand scale using stands of 1 to thousands of acres. The vegetation change data used in the Biscuit Fire draft EIS was measured at the 0.222 acre scale. A comparison table in the Biscuit Fire draft EIS shows the landscape-scale differences between the two methods to be small. For example, the portion of the fire area experiencing greater than 75 percent mortality was estimated at 49 percent using canopy fire effects, and 44 percent using the vegetation change approach (USDA-FS 2003d, *p. D-3*) This difference is not considered significant for the programmatic analysis in this SEIS and, if anything, indicates this SEIS is conservative in its estimate of surviving POC. POC acres displayed throughout this SEIS continue to be based on the original canopy fire effects mapping.

The heat from the Biscuit Fire and resultant altered microclimate may have removed PL from some burned areas. Hansen and Hamm (1996) found that after one week, bags of soil and organic matter that had reached temperatures of 104 degrees F for 4 hours each day no longer supported the pathogen. High intensity, stand-destroying fires reach maximum ground temperature of 200 to 300 degrees C (392 to 552 degrees F) at the surface (DeBano et al.

1998). There is good potential for this amount of heat to have negative impacts on PL populations. Questions remain about how deep into the soil profile PL goes (depth of roots) and how deep the pulse of heat extends into the soil.

Port-Orford-cedar Map. Map 3 compiles the GIS maps of POC and PL with the Northwest Forest Plan land allocations. PL infestations are shown in red; POC presence is depicted by all other colors—the colors themselves indicate the underlying Northwest Forest Plan land allocation. Areas not colored do not have POC. The map also shows the FS inventoried roadless areas (cross-hatched) and the Biscuit Fire perimeter (heavy dashed line).

Current Vegetation Survey

The FS maintains a National System of Current Vegetation Survey (CVS) sample plots to acquire basic vegetative resource information triannually at the regional scale. This information allows resource specialists and others to assess the current vegetation condition and assess changes in the ecosystem, spatially and temporally. BLM in western Oregon maintains inventory plots to the same establishment and remeasurement standard as the FS, in order to be able to combine data sets for landscape, provincial, and regional analysis.

In general, the acquired dataset represents a collection of basic, statistically-designed, and quality-assured vegetation resource measurements. The strength of the survey includes: the ability to set a benchmark of the vegetative condition on NF and BLM lands, providing a basis for change estimation (trend analysis, for analysis), and accommodating monitoring through remeasurement.

Data is collected on nested subplot radii within a one hectare (2.47 acres) plot. The plots are located on a 1.7 mile statewide grid and each plot represents approximately 1,750 acres. The plots are divided into 0.2 hectare areas that contain concentric fixed area subplots that vary for each diameter class being sampled. The intensity of 1.7 miles is not usually useful for evaluating minor species such as POC within limited landscapes. In Table 3&4-6, data is compiled only for larger geographic areas. Other survey methods can be used to assess presence of minor species or incidence of forest diseases, and the results of those surveys could be different based on their intensity when compared to CVS.

Similar inventory plots, forest inventory, and analysis (FIA) are maintained on private lands by the research branch of the FS. Forest inventory and analysis inventory data estimates that there are a total of 54,550 acres (standard error 14 percent) of POC on Oregon's private lands with 9,820 acres (standard error 59 percent) of those lands containing dead POC. This estimate is not considered as reliable as the mapping method used for determining infested acreage on Federal lands and shown in Table 3&4-5, but is the only available estimate of Oregon private lands with POC. The inventory plots are considered accurate for displaying individual tree mortality percentages for both Federal and private lands.

Table 3&4-6 provides tree numbers and mortality information from the most current CVS and forest inventory and analysis data in the range of POC. CVS data shows an additional 40 million POC less than 1 inch diameter at breast height on Federal lands in Oregon that are not shown on the table.

Table 3&4-6.—*Current Vegetation Survey: Summary from Forest Inventory Plots of live and dead POC trees*

Area [1]	Diameter group dbh [inches]	Live trees	Dead trees	% live	% dead
Oregon					
Federal:	1-7	7,826,100	1,074,600	88	12
Coos Bay	7-20	1,618,300	436,100	79	21
BLM/Powers	>20	361,600	159,600	69	31
Ranger District [2]					
Federal:	1-7	5,863,900	239,100	96	4
other than above [3]	7-20	1,428,500	417,300	77	23
	>20	435,100	138,200	76	24
Total Federal [4]	1-7	13,690,000	1,313,700	91	9
	7-20	3,046,800	853,400	78	22
	>20	796,700	297,800	73	27
Private [5]	1-7	11,767,200	8,722,200	57	43
	7-20	2,134,400	1,631,000	57	43
	>20	102,900	263,200	28	72
California					
Federal [6]	1-7	4,677,000	23,400	99	1
	7-20	1,096,000	4,800	99	1
	>20	379,600	5,600	99	1

[1] Oregon Federal lands were grouped to match "risk regions" described in the Pathology section and lumped to provide statistically significant results.
[2] Standard error 19-33%.
[3] Standard error 18-41%.
[4] Standard error 13-24%.
[5] Standard error 7-115%; these are from FIA plots [see text].
[6] Standard error not calculated.

Aerial Mortality and Defoliation Surveys — Oregon

The State of Oregon, Department of Forestry, and USDA-FS have been jointly conducting aerial sketch mapping of forest insects and disease pathogens for more than 50 years. The survey protocol identifies clumps of at least five dead trees that have been killed within last year and assigns a causal agent. In 2001, the survey system began using real-time global positioning to digitally construct its electronic maps (USDA-FS and Oregon Department of Forestry 2002). The aerial survey observations for southwestern Oregon contain POC root disease as one of the causal agents in its report. Table 3&4-7 summarizes POC root disease results for 2000 through 2002.

Table 3&4-7.—*Summary of aerial mortality and defoliation survey results for Port-Orford-cedar in Oregon, 2000–2002*

	2000		2001		2002	
Land ownership	Acres	Dead trees	Acres	Dead trees	Acres	Dead trees
Bureau of Land Management	87	64	123	89	169	70
Forest Service	480	239	257	182	213	74
Private	4,615	4,779	5,835	4,882	5,522	6,963
State of Oregon	1	1	64	58	43	43
Wilderness/National Monuments	68	28	0	0	24	5
Total	5,251	5,111	6,279	5,211	5,971	7,155

Resource Elements That Address Issues

Introduction

With the identification of the Purpose and Need in Chapter 1, and following scoping, a list of issues was developed upon which a decision to select one of the alternatives would be based. These issues are addressed in the various resource topic discussions in this chapter. These discussions cover the ecological, Tribal, and product uses or functions potentially affected by POC management, and provide the basis for the Comparison of Alternatives in Chapter 2.

The issues are primarily affected by two distinct kinds of effects. First, to the extent the Standards and Guidelines themselves have a direct effect on access or use of the forest and the harvest of forest products, there is a direct effect. Direct effects include potential reductions in non-POC timber harvest because of direct prohibitions in certain areas or stands; reductions in POC bough harvest because of direct prohibitions, and reductions in recreation opportunities because of road closures or prohibitions on off-highway vehicle use.

Second, to the extent that application of the standards and guideline maintains POC, there is a secondary effect on related resources. Such effects include the degree to which stream shading is maintained or lost, thereby changing temperature, wildlife habitat changes related to the loss of future snags, genetic resources retained, or visual resources affected. Both of these kinds of effects are described in the specific resource Effects of the Alternatives sections.

The keystone for the secondary effects analyses is the Pathology section. The available science and experience has been summarized and synthesized, and brought to bear on the various elements of each alternative. The result is a 100-year infection percentage estimate for each of the alternatives. These percentages, which vary for different "risk regions" within the planning area depending upon various risk factors, are converted to acres and used to predict secondary effects.

Pathology

Introduction

POC root disease is caused by the pathogen *Phytophthora lateralis* (abbreviated in this document as PL). PL is an oomycete belonging to the family Pythiaceae. Formerly considered to be true fungi, it is now generally accepted that oomycetes constitute a separate kingdom from the fungi (Cavalier-Smith 1986; Dick 1995; Erwin and Ribeiro 1996; Parker 1982).

All *Phytophthoras* exist primarily as hyphae, or thin threads of fungus-like material adjacent to and within their host. Aggregations of hyphae are known as mycelia. Mycelia, if fragmented or transported along with pieces of the host plant, can serve to move the pathogen to new locations. Mycelia are somewhat fragile and die when exposed to drying conditions. Several spore types form as specialized structures attached to *Phytophthora* mycelia. Although there are four spore types identified for PL, two are important enough in disease spread to be discussed here.

When PL is mature, and generally in the presence of free water, zoospores are released. Zoospores lack cell walls, are very delicate, and have two flagella. They can swim for several hours before forming cysts, but can only travel an inch or two in standing water (Carlile 1983). Zoospores also have the ability to detect compounds released by a host and swim in the direction of the host. Upon contact with a host rootlet, the zoospore will attach itself and germinate. If a host rootlet is not found, other surfaces are contacted or agitation occurs, and a zoospore will form a cyst. When encysted, it can be carried considerable distances in running water. In contact with a host, the cyst can germinate and form a mycelium that infects the host, or it can form a sporangium and release more zoospores.

Chlamydospores are thick-walled vegetative spores. Chlamydospores are somewhat resistant to drying and temperature extremes. They can germinate directly and form infective mycelia or, in the presence of water, they can form sporangia and release zoospores. Ostrofsky et al. (1977) showed that, under laboratory conditions, PL populations detected by baiting decreased substantially when unfavorably warm, dry conditions typical of summer months in the range of POC occurred. However, the pathogen survived at a reduced level as chlamydospores in organic matter, especially in small roots on infected trees and fragments of roots in the surrounding soil. Hansen and Hamm (1996) have demonstrated that PL can survive in infected POC roots and root fragments for at least 7 years under favorable conditions. PL chlamydospores are incapable of direct movement, but their structure provides protection during passive movement in infected roots or organic material in soil and mud.

Affected Environment

How the Pathogen Spreads

PL spreads in several ways (Hansen et al. 2000; Zobel et al. 1985):

1) Over long distances via resting spores transported in infested plant material or soil;
2) locally via waterborne spores moving in ditches, streams, or overland flow; or
3) via mycelia growing across root contacts and grafts between infected and uninfected POC.

Initiation of infestation into new areas involves 1, above, and is most commonly associated with deposition of infested soil along a road or trail. Vehicles, equipment, animals, or humans on foot transport inoculum from previously infested areas (Hansen et al. 2000; Jules et al. 2002; Kliejunas 1994; Ritts 2003, Roth et al. 1972). A susceptible POC fairly close to the actual site where inoculum is deposited is needed—this is usually a POC growing close to the road (within 10 feet) or a cedar with its roots in the water close to the road-crossing in a case where the introduction involves deposition of inoculum directly in water. Jules et al. (2002) found indications that spores from an introduction into water at a road-crossing can spread to a tree as far downstream as 160 meters, but probability of any single introduction reaching such a distant tree is low. Probability decreases with distance from the point of introduction into the water. In addition to POC, Pacific yew is infected by PL on infrequent occasions (Kliejunas 1994). Observations and laboratory trials show that Pacific yew is much less susceptible than POC. Where it has been found infected, Pacific yew was growing in close association with many previously infected POC (Murray and Hansen 1997).

Once PL is successfully established, subsequent spread mostly involves number 2 listed previously. Under proper environmental conditions for the pathogen, spores produced on the initially infected POC are released and move downslope in overland water flow or streams, infecting additional trees whose roots are within the sphere of influence of the infested water (Hansen et al. 2000; Jules et al. 2002).

Root-to-root spread, number 3 listed previously, occurs in some cases (Gordon and Roth 1976), but is thought to be of much less significance in the epidemiology of the pathogen than spore spread in soil or water. It occurs in heavily-stocked stands with substantial POC components (many POC quite close together).

Infection by PL is greatly favored by cool conditions and requires the presence of water around POC roots for at least several hours (Zobel et al. 1985). Optimal temperatures for infection are between 50 degrees and 68 degrees F (Trione 1974). Most POC are infected by the pathogen in the cool, wet parts of the year. Very little infection occurs in the dry, warm summer months.

Certain kinds of sites and microsites foster conditions especially favorable for spread and infection by PL (Goheen et al. 2000a; Hansen et al. 2000; Roth et al. 1987). These high-risk sites are low-lying wet areas (infested or not) that are located downslope from already infested areas or below likely sites for future introductions, especially roads. They include streams, drainage ditches, gullies, swamps, seeps, ponds, lakes, and concave low-lying areas where water collects during rainy weather. Areas not influenced by the wet conditions or periodic water flow that occurs in high-risk sites are low-risk sites. Cedars near streams or bodies of water whose roots do not extend below the high watermark for flooding are at low risk of infection. Riparian Reserve widths along a stream (as defined in the Northwest Forest Plan by site tree heights) often extend well beyond the high-risk widths for POC.

Probability of Long-Distance Spread and Establishment of *P. lateralis* in New, Previously Uninfested Areas

As already mentioned, long-distance spread of PL involves movement of resting spores. These spores can survive in infected POC roots and root fragments in the soil for at least 7 years after the host POC's death under ideal conditions (Hansen and Hamm 1996). Movement of spores with transport of nursery stock in infested soil was probably how PL was originally introduced into the natural range of POC (Roth et al. 1957). Long-distance spread in the forest today primarily involves movement of resting spores in soil adhering to vehicles or clinging to the feet of humans or animals.

When evaluating the likelihood of long-distance spread to and establishment of PL into a new area, consideration needs to be given to the probabilities that: (1) viable inoculum will be picked up at an infested source; (2) the inoculum will be carried to a particular uninfested area; (3) the inoculum will remain viable during transit; (4) the inoculum will be deposited in the new site; and (5) the inoculum deposited will infect a POC and disease establishment will result. A number of factors influence inoculum accession, spread, and establishment of PL, especially:

- Character of site of origin;
- type of carrier;
- time of year of transport event;
- distance traveled and associated time elapsed;
- effectiveness of management techniques applied to slow or prevent spread or prevent establishment of PL in new areas;
- character of site and stand conditions where the potential introduction occurs; and
- number of potential transport and introduction events.

Exact figures for determining the influence of each factor on the probability of long-distance spread and establishment are available in very few cases. However, relative probabilities between 1 (very low) and 10 (very high) have been determined for each factor. Based on the literature, and the professional judgments of forest pathologists with substantial amounts of experience evaluating PL in the laboratory and the field, it is suggested that probabilities of an event having the result under consideration are as follows.

1 = 0 to 2 percent	6 = 10.1 to 20 percent
2 = 2.1 to 4 percent	7 = 20.1 to 30 percent
3 = 4.1 to 6 percent	8 = 30.1 to 40 percent
4 = 6.1 to 8 percent	9 = 40.1 to 50 percent
5 = 8.1 to 10 percent	10 = 50.1 to 100 percent

The following is a discussion of each of the factors.

Character of site of origin. Potential carriers of PL entering a possible inoculum source area are more likely to pick up soil that contains viable inoculum in some kinds of sites than others. Inoculum clearly will not be available on a site with no infection while areas with obvious infection of POC where certain kinds of wet conditions prevail are the most likely places for inoculum to be acquired. Suggested probability figures for the likelihood of potential carriers picking up viable inoculum on different kinds of sites are:

Site with no evidence of root disease within the local drainage = 1;

site with no evidence of root disease in the area entered by the potential carrier, but evidence of root disease nearby (within 300 feet) in the same drainage = 2;

site with local evidence of root disease where the potential carrier does not enter water = 5;

site with local evidence of root disease where the potential carrier enters flowing water = 7; and

site with local evidence of root disease where the potential carrier enters a swamp, seep, or any-sized body of standing water = 10.

Type of carrier. Vehicles (both motorized and nonmotorized), equipment, humans on foot, and animals (especially cows, horses, and elk) have been implicated in carrying PL. Probability of successful spread is greater with the larger carriers, those that transport greater amounts of soil, those most likely to access infested areas, and those that can rapidly travel to new sites. Suggested figures for the probabilities that different kinds of carriers could pick up and transport infested soil are:

Earth moving equipment = 10;
large transport equipment = 9;
all-terrain vehicles = 8;
passenger vehicles = 7;
humans on foot or using nonmotorized vehicles = 5; and
large animals = 5.

Time of year of transport event. Likelihood of acquiring inoculum, successfully transporting it, and establishing disease at a new site are greatly favored by cool temperatures, and probability of infection is much greater during wet periods than dry ones. Also, inoculum is most likely to be picked up from an infested site during a wet period when infested soil is muddy and prone to adhere to the carrier. Probability of spread and establishment of new infections is greater with soil movement in late fall, winter, and early spring than summer, and is greater in rainy rather than dry weather. Suggested probability figures are:

Movement between October 1 and May 31 during wet weather = 10;

movement between June 1 and September 30 during dry weather = 1;

movement between October 1 and May 31 during a dry period that lasts at least a week before and continues during the time of the movement = 3; and

movement between June 1 and September 30 during a rainy period of sufficient intensity to form puddles on a road or cause roadside ditches to flow = 6.

Distance traveled by carrier. Probability of successful delivery of viable inoculum from one site to another decreases with distance traveled and associated time elapsed since inoculum was picked up. Suggested probability figures are:

For vehicles, less than 0.5 mile = 10;
0.5 to 1 mile = 9;
1 to 5 miles = 8;
5 to 10 miles = 5;
10 to 20 miles = 3;
20 to 50 miles = 2;
greater than 50 miles = 1.

For animals and human foot traffic, less than 0.5 mile = 4;
0.5 to 1 mile = 2;
greater than 1 mile = 1.

Effectiveness of management techniques applied to prevent spread or prevent establishment of *P. lateralis* in new areas. A number of management techniques are recommended for preventing spread of PL or protecting uninfested areas (Betlejewski 1994; Goheen et al. 1997; Goheen et al. 2000a; Hadfield et al. 1986; Hansen et al. 2000; Hansen and Lewis 1997; Kliejunas 1994; Roth et al. 1987). Techniques considered for use in the EIS for managing POC root disease include:

a) Limiting activities to the dry season;
b) ceasing operations during significant rain events that happen during the dry season;
c) planning activities so that uninfested sites are accessed before infested sites;
d) using uninfested or treated water;
e) road management measures, especially improving road surfaces and drainage;

f) featuring POC on low-risk sites;
g) public information efforts;
h) prohibiting or regulating bough collecting and other special forest product harvests;
i) use of lowest risk logging systems in harvest operations;
j) vehicle washing;
k) roadside sanitation treatments;
l) seasonal road closures; and
m) permanent road closures or refraining from building roads into uninfested areas at all.

Virtually all of these techniques were originally suggested by Roth et al. (1957, 1972, 1987). Long-term observations (over 40 years in the case of Roth, a very active Oregon State University professor and PL researcher) suggested that no technique completely eliminated all possibility of PL spread, but that the ones listed did reduce probability of spread to varying degrees depending on how they were applied and what conditions prevailed at the time. It was suggested that most of the techniques should be used with others in integrated disease management strategies for best results. Unfortunately, PL is quite difficult to work with and definitive studies showing exactly how treatments effect actual PL inoculum loads have rarely been done.

Two types of effectiveness monitoring have been conducted with POC root disease: (1) field observations in and around treatment areas, and (2) use of POC seedling baits to determine occurrence and location of PL inoculum.

1) *Field observation over time on sites in and around project areas where treatments have been conducted:* A professional forester or forest technician visits the site several times to determine (a) if the prescription has been correctly implemented and (b) whether or not any evidence of POC mortality/PL infection has developed in or near the project area. Each project is given a rating of 1 to 5 for correct implementation after the project is complete. Each disease management technique is given a rating of 1 to 3 for effectiveness (1= not effective, 2= partially effective, 3= effective) based on combined results of root disease observations for all visits. The data below summarizes the average results for 70 multifaceted projects done on a variety of sites on the Siskiyou NF between 1994 and 1999.

Activity	Average Implementation Rating	Average Effectiveness Rating
Temporary road closures	4.4	2.5
Roadside sanitation	4.7	2.9
Vehicle washing	4.9	2.9
Dry season operations	4.3	2.9
Access avoiding infested areas	4.6	2.9
Entering units in priority	4.4	2.9
Minimizing risk by road location	4.6	2.4
Improving road surfaces	3.9	2.4
Directing water off roads	5.0	2.5
Preventing deposit of soil waste in uninfested areas	4.5	2.3
Dry season road maintenance and construction	4.5	2.9
Avoiding use of infested water sources	3.8	2.4

Results suggest that POC management activities in these prescriptions were usually implemented as planned and were perceived to be effective in many cases based on apparent lack of new infections observed in and around the project areas. Limiting project activities to dry seasons, planning access to avoid infested areas, entering uninfested areas before infested areas, vehicle washing, roadside sanitation, and limiting road construction and maintenance to dry seasons were deemed most effective of the kinds of activities evaluated. In most of the projects, several management techniques were used together. Apparent effectiveness may have been due more to the combined effects of several than to the individual treatments.

2) *More intensive evaluations that monitor actual PL occurrence by use of POC seedling baits to determine presence of the pathogen:* Unfortunately, in spite of considerable research, no accurate, easy, and quick soil assay technique for PL has been devised that can be used in the field. A baiting technique using POC seedlings has been developed and used by the Southwest Oregon Forest Insect and Disease Service Center. The baiting technique is fairly laborious. It takes about a month and a half for each reading and requires access to a laboratory for culturing to confirm presence of the pathogen. The baiting technique is being used to investigate effectiveness of two commonly employed but controversial POC management techniques: washing and roadside sanitation.

Goheen et al. (2000) compared PL inoculum levels on a large piece of equipment, a pickup truck, and a person's boots before and after an operational washing treatment. A road grader, a pickup, and a person wearing boots passed through a muddy PL infested area, were washed, proceeded further up the road, and were washed again. Water from each washing was collected in tubs and was baited with POC seedlings. After 6 weeks exposure, seedlings with their roots in the water from the first wash of the road grader exhibited an average infection level of 27.8 percent, those from the pickup, 41.2 percent, and those from the boots, 65.0 per cent. Seedlings with their roots in the water from the second wash exhibited average infection levels of 2.2 percent for the road grader, 3.7 percent for the pickup, and 2.5 percent for the boots. Decreases in the percent of infected bait seedlings observed in the second wash were attributed to removal of inoculum by the first wash. Based on the results, the investigators suggested that: (a) washing did have the potential to decrease inoculum on contaminated vehicles or boots, (b) washing did not necessarily eliminate all inoculum, suggesting that the treatment should be combined with other treatments in a comprehensive disease management strategy, (c) contrary to a generally held belief at the time, washing boots as well as vehicles might be an important disease management technique in some situations, and (d) the logistics of vehicle washing need to be carefully considered (though potentially effective in reducing inoculum, washing needs to be done in the right places and in the right kind of washing stations, for example). In addition to showing differences associated with washing, this case study demonstrated through actual sampling and pathogen reisolation that PL inoculum can indeed be picked up on vehicles and feet and carried from an infested site to another location. Though this has long been assumed to be true based on numerous observations, it had not been demonstrated conclusively in the past.

Goheen and Marshall (Goheen, D.J., *personal communicaation*) have an evaluation in progress to monitor the effects of operational roadside sanitation treatments on inoculum levels in already infested areas. The evaluation has not yet been completed; it is planned to be continued until all sample units are followed for 10 years, but results so far are

illustrative. Twelve PL infested roadside strips that have received sanitation treatments have been monitored by planting 100 POC seedlings in 10 transects as baits at each site. Each spring, seedlings have been planted in the same locations along transects, collected after 6 weeks, and assayed for infection. Preliminary results show the following average percentages of infected bait trees for the 12 sample areas:

Year	0	1	2	3	4	5	6	7	8
% infested	20	13	12	11	6	5	1	3	3

Based on these preliminary results, the investigators suggest that: (a) sanitation treatments in infested areas do cause decreases in roadside inoculum; (b) amount of inoculum decline increases with time after treatment, declining substantially after 4 years; (c) sanitation treatments should be used in integrated strategies with other kinds of disease management techniques; (d) use of roadside sanitation (at least in the case of treatments in already infested areas) should be done strategically. Sanitizing a road into a project area (in already infested stands) where activities are occurring at the same time or immediately after the sanitation treatment are not likely to be valuable. The best approach will involve sanitation treatments on major roads that have the potential to be used in many projects over substantial time periods and that also are frequently traveled by other forest users besides those actually involved in the agency projects, and (e) sanitation treatments need to be kept track of and repeated when new POC regeneration becomes established.

Some estimated probabilities of successful PL spread and establishment when certain management activities have been used include:

Exclusion — This involves protecting uninfested areas by excluding vehicle entry. It can be done by permanently closing existing roads and/or by not building roads into uninfested drainages or upper portions of drainages. Cross-country travel or trail use by animals or humans on foot or in off-highway vehicles can still result in introductions, but probability is low, especially if the distance to the closest infested area is greater than 1 mile. This is believed to be the single most effective treatment, and suggested probability figure if this management approach is used is 1.

Temporary road closure — This involves closing roads with gates or barriers to regulate timing and amount of use. Roads are closed when weather conditions are favorable for PL spread and may be open during other seasons of the year. Gates can be driven around, forced open, or destroyed by vandals, but many remain intact and prevent road use. In a sampling of gated closures done by the Southwest Oregon Forest Insect and Disease Service Center in November of 2000, 90 percent were intact and apparently effective in preventing entry. The suggested probability that a currently uninfested area will be protected if this management approach is used is 2.

Washing — This involves washing vehicles used in projects to remove infested soil before they are moved out of an infested area or before they are moved into an uninfested area. In some instances, tools and boots are also washed. Limitations on washing include the possibility of picking up new inoculum on an infested road after washing, and the inability of the Agencies to require vehicle washing of numerous vehicles that use the roads, but are not controlled by the Agencies. The suggested

probability figure if this management approach is used by itself is 4.

Roadside sanitation — This treatment involves removing POC in buffer zones along both sides of roads. Objectives are either to (1) eliminate or minimize the amount of inoculum readily available for vehicle transport from already-infested roadsides, or (2) prevent/reduce new infections along roadsides in currently uninfested areas. The basis for this kind of treatment is the fact that PL only infects living POC roots (Zobel et al. 1985). PL can survive for a time in already infected roots after a POC dies, but it cannot colonize the roots of already dead POC. The objective of the treatment is to create a zone along roads where live POC roots are absent. The suggested probability figure to decrease inoculum if this management approach alone is used on already infested roads is initially 8, dropping to 5 in 4 years after the treatment. Probability can increase again if roadsides are not monitored and treated again when/if POC regenerates on the site. However, if POC exclusion is successfully carried out, the probability drops to 1 after 7 years.

Integrated management — Employing a planned combination of treatments can reduce probability of long-distance spread more than single kinds of treatment. An integrated treatment program that uses a combination of sanitation treatments, vehicle washing treatments, road drainage improvements, timing of activities during dry seasons, using certified clean or Clorox bleach-treated water, scheduling treatments in uninfested before infested areas, regulation of special use activities such as cedar bough collecting, and public education efforts has a suggested probability of 2. If such treatments are combined with road closures, the suggested probability is 1. If combined with permanent road closure, probability by this system is 1, but protection is more effective than if only the closure by itself was used. Probabilities with an integrated management approach would be slightly higher in situations where some of the management techniques could not be used (for example, in a situation where a large wildfire was burning and safety and suppression success considerations prevented use of some of the techniques that might normally be used).

Character of site and stand conditions where the potential introduction event occurs. Introduction of inoculum and establishment of disease in a new, previously uninfested site is influenced by site characteristics as well as occurrence, numbers, and distribution of POC. If carriers deposit viable inoculum on a wet site with POC nearby, and when there are numerous additional cedars downslope in high-risk sites, probability of disease establishment is high. Clearly, depositing inoculum in sites with no POC and no mechanism for moving the inoculum to any POC is low (1). When inoculum is deposited along a road, probability is highest when there are wet conditions and at least some POC within 10 feet (8). When cedars occur more than 10 feet from the road, but less than 50 feet away, predicted probability drops to 4. When inoculum is introduced directly into water at a stream crossing or ditch, probability of establishment is high (8) if there are POC with their roots in water downstream within 50 feet. For similarly situated POC between 50 and 100 feet from the road, probability would be 4. Jules et al. (2002), in their dendrocronological study, indicated that there was evidence of initial infections as far as 525 feet down a stream; however, by the nature of their study, they were unable to evaluate small trees that had died many years before and were no longer detectable on the sites. It is possible that what they viewed as a single spore infection event actually was a several-stage event initially involving small trees closer to the road. Nevertheless, this suggests a probability of 2 for potential introductions in stream crossings if there are

no POC in the first 100 feet, but cedars do occur in the subsequent 500 feet.

Number of potential transport and introduction events. The probability figures provided above can be used together to evaluate the relative likelihood of various long-distance PL spread/establishment scenarios involving individual potential carriers. The number of potential transporting events should also be taken into account when evaluating possibility of new introductions. Very low probability events become more likely to occur when they are repeated, and especially so if they are repeated many times.

No formula is suggested here for ranking activities or projects, although the general relationships and relative risks could be used to help guide future site-specific analyses, including use of the POC Risk Key that is a part of Alternatives 2, 3, and 6 in this SEIS. The concepts described above, coupled with known levels of activity (see Background and various Affected Environment sections), conditions on surrounding lands, and other factors described in the SEIS and its references, were designed to serve as part of the analysis needed to make predictions about disease spread for the alternatives considered in this SEIS.

Disease Progression Once the Pathogen is Introduced

Figure 3&4-1 shows the progression of POC root disease within a drainage after PL is introduced and becomes established.

The curve is a disease epidemic curve similar to those of many other plant diseases (Van der Plank 1975). PL is introduced at time 0. At least one POC is infected as a result of the introduction which involves infested soil falling off a vehicle or the feet of an animal or human.

Rate of disease increase is low at first (area *a* on diagram); there are relatively few spores produced because only one or a very few POC close to the site of introduction are infected. Inoculum production increases as more POC are infected (area *b* in diagram). Spore levels in water flowing downslope in drainages during the wet season and in streams increase to high levels. POC trees on high-risk sites downslope from the source of introduction are exposed to this inoculum, are infected, and produce more inoculum in turn. This leads to rapid spread and high levels of mortality of a large proportion of POC growing in the high-risk sites.

Eventually, amount of new mortality and rate of spread within the drainage decreases substantially (area *c* on diagram). Most original POC on the sites with characteristics favorable for the pathogen have been infected and killed by this time. Spread to POC growing on unfavorable sites is very slow and sporadic if it occurs at all (when it does happen it typically involves animals or humans moving infested soil directly onto the roots of individual POC trees during cool, rainy weather). Inoculum levels often remain high on the high-risk sites due to reseeding of POC and chronic infection of small trees.

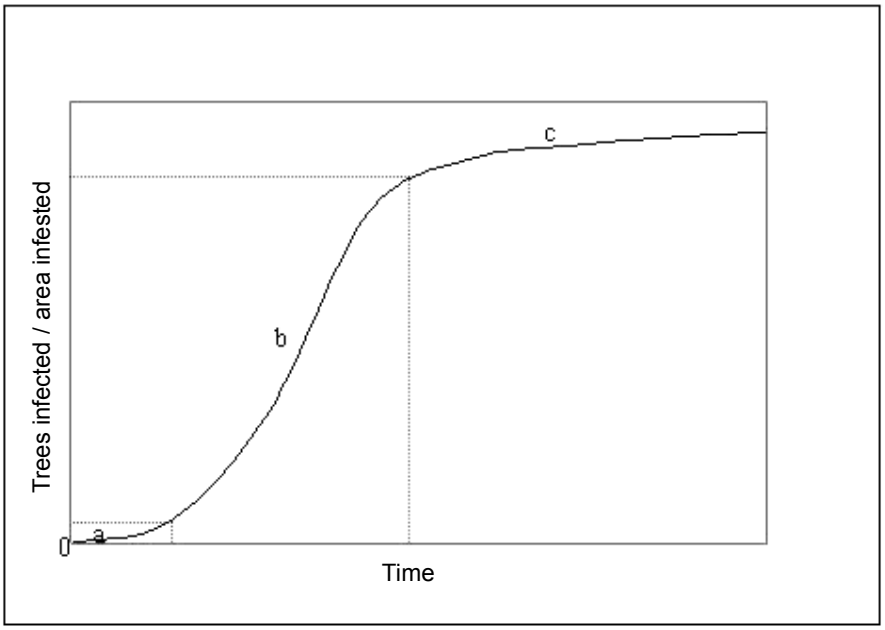

Figure 3&4-1.—*Progression of Port-Orford-cedar root disease within a drainage after* Phytophthera latralis *is introduced and becomes established*

Percent of trees infected at various points in Figure 3&4-1 are:

Stage	Time	% trees infected
a	2–10 years	<0.1
b	5–20 years	90 (high-risk sites)/0.1 per year (low-risk sites)
c	>20 years	Chronic infection/regeneration (high-risk sites)/0.1 per year (low-risk sites)

There are substantial differences in PL spread and impacts within infested drainages in different parts of the range of POC. These mainly reflect (1) different distributions of POC across the landscape in different areas; (2) different proportions of sites in different areas that have conditions favorable for spread and infection by PL (high-risk sites); (3) different histories of PL occurrence; and (4) different positions on the disease progression curve in different areas. Differences by major area or "risk regions" are discussed as follows.

North Coast Risk Region (Northern/Coastal Portion of Range: Siskiyou NF Powers Ranger District, and Coos Bay BLM District). POC is distributed widely across the landscape. On average 20 percent of the area is comprised of high-risk sites. The pathogen has been present in this area for considerable time. Mapping and forest inventories indicate that about 15 percent of the area (or 75 percent of the 20 percent in high-risk sites) is infested, and most drainages are at level *c* on the disease progression curve. Most originally-occurring cedars in infested high-risk sites have been killed (general estimate is 90 percent). There is chronic mortality of small cedars regenerating on high-risk sites that are infested. Low-risk sites (80 percent of the area) are little impacted. Non-Federal lands near Coos Bay contain thousands of roadside infections and approximately 8,500 acres of non-roadside infestation and represent a chronic source of PL for export to Federal and other lands here and throughout the range.

Siskiyou and Disjunct California Risk Regions (Southern Portion of Range on NFs: other districts on Siskiyou NF and districts on the Six Rivers, Klamath, and Shasta-Trinity NFs). POC occurrence is much more tied to riparian zones and wet areas here than is the case in the northern part of the range. On average, about 40 percent of the area is in high-risk sites. PL has not been present in this part of the range for as long as it has been further north. Mapping and forest inventories indicate that about 11 percent of the area (or nearly 28 percent of the 40 percent in high-risk sites) is infested. A substantial number of drainages, or the upper parts of drainages, have not had introductions of the pathogen. Some infested drainages, including major ones in the south, are still at level *b* on the disease progression curve and exhibit high levels of current infection. Ultimately, the amount of mortality in infested high-risk sites is predicted to reach the same levels observed in the northern part of the range. Some drainages are even at area *a* on the disease curve, such as the Lower Sacramento River and Scott Camp Creek drainages where PL infection has only been recently observed. These too will suffer high levels of mortality in high-risk sites unless eradication treatments prove successful.

Inland Siskiyou Risk Region (inland portion of range in Oregon, Medford, and Roseburg BLM Districts). The discussion for this area is similar to that for the southern part of the range on FS land, except that on average about 60 percent of this area is in high-risk sites (the larger number reflects contribution of higher road density to risk, coupled with the occurrence of POC here being mostly tied to creeks and wet areas). Mapping and forest inventories indicate about 9 percent of this area is infested. Position of infested drainages on the disease progress curve are divided between *b* and *c*.

Effects of Alternatives

Introduction

PL does not threaten POC with extirpation. Considerable areas within the range of POC are on low-risk sites or in drainages that presently remain uninfested. Some estimates of current proportion of area within the range of the POC on Federal lands where uninfected POC occur include 91 percent from the mapping exercise done by the FS and BLM for the recent POC range-wide assessment, 89 percent for FS lands in California based on plant association mapping (Jimerson, T.M., *unpublished data*), and the same figure for CVS data, and 76 percent for large trees based on inventory data for Federal lands in Oregon (from Table 3&4-6). Projections later in this section begin with a possibly conservative 87 percent uninfested for Federal POC stands in Oregon.

There is little spread of PL on low-risk sites even when the pathogen is already established nearby. It is estimated that on average, 0.1 percent of the cedars on low-risk sites are infested per year in infested drainages, with much of this likely being offset by regeneration and growth, at least in the smaller size classes. The low level of new infestations on low-risk sites even in the North Coast Risk Region supports this conclusion. About 80 percent of the area in the northern coastal portion of POC range, 60 percent in the southern part of the range, and 40 percent in the inland portion of the range are in low-risk sites.

PL primarily affects high-risk sites, especially in streams and riparian areas. Within these areas that are especially favorable for spread and infestation by PL, it is estimated that on average 90 percent of the POC present before introduction are killed by the pathogen, usually

in only a few years after the pathogen is established (5 to 20 years; usually closer to the shorter end of this range). About 20 percent of the area in the northern coastal portion of POC range, 40 percent in the southern part of the range, and 60 percent in the inland portion of the range are in high-risk sites. Large cedars are especially prone to infection and mortality on these sites. Natural reseeding maintains POC at some level on many of these sites, but chronic infestation insures that few if any of the cedars regenerating on an infested high-risk site attain large size.

To maintain POC in high-risk sites requires either:

1) Excluding PL from being introduced into the area in the first place;

2) deployment of disease resistant POC planting stock (assuming that durable resistance can be developed, it will still take many years to replace large trees); or

3) reestablishing cedar after eradicating PL from infested sites (a difficult and problematic approach that also results in the loss of the large cedars at the time of treatment).

Port-Orford-Cedar Root Disease and the Alternatives Considered in the SEIS

Low-risk sites. Low-risk sites are defined for the EIS as those sites that do not fit the criteria for high-risk sites. They are upland sites, sites on convex slopes, sites above the high watermarks of streams, and areas away from roads where topography provides a high degree of protection from a soil- and water-borne pathogen like PL. Many observers have reported that amount of mortality attributed to PL on low-risk sites is very low indeed or sometimes appears to be absent (Goheen et al. 2000a; Hansen et al. 2000; Harvey et al. 1985; Kliejunas 1994; Roth et al. 1987; Zobel et al. 1985). Unfortunately, there are no published studies that have evaluated the amount of POC mortality on low-risk sites. The infestation figure of 0.1 percent per year is based on personal observations of the Agency pathologists, and it is meant to be an average.

There is variation in amount of mortality on low-risk sites. Higher levels of infection occur in the portions of low-risk sites that are close to infested high-risk sites than in low-risk areas at considerable distances from infested areas. SEIS Alternatives 1, 2, 3, and 6 would reduce roadside inoculum to varying degrees and would regulate or curtail human activity associated with bough collecting and harvest of other forest products. Probability of PL-caused mortality in low-risk sites would be slightly less under these alternatives than under Alternatives 4 and 5. Under all alternatives, however, infection levels on low-risk sites would be very low, especially so in comparison with levels on high-risk areas.

High-risk sites. Establishment, spread, and effects of the root disease on the existing POC in high-risk sites that have not yet been infested is likely to differ substantially with the alternative chosen. When PL is established in a formerly uninfested drainage or portion of a drainage, rapid disease spread and 90 percent mortality of the existing POC growing in downslope high-risk sites can be expected in the subsequent 5 to 20 years.

The percentages used in the SEIS to represent impacts over 100 years under the different alternatives (Table 3&4-8) are professional estimates made by FS pathologists with considerable experience with PL and input from forest pathologists from the Oregon Department of

Table 3&4-8.—*Percent of currently healthy drainages [uninfested high-risk areas] predicted to become infested within 100 years by alternative*

Alternative	% uninfested high-risk areas to become infested
1	40
2	30
3	20
4	80
5	80
6	18

Forestry and Oregon State University. As 100-year projections involving consideration of many highly variable factors, no claim is made that they are absolutely precise. They provide, however, a reasonable estimate of the impacts associated with each of the alternatives in terms of ranking and magnitude, and provide a realistic framework for comparing alternatives.

The following assumptions were made in arriving at these estimates:

1) PL will continue to act as it has in the first 50 years of its presence in the range of POC.

2) The same kinds of spread scenarios and the same kinds of associated transport and establishment probabilities will exist in the next 100 years.

3) Overall activity levels in the forest by humans and animals will remain similar to the levels of today. (Though there will probably be offsetting shifts in the relative levels associated with different kinds of activities. Some argue that harvest and other management activities will never begin to match the levels of the 1980s, while others argue that off-highway vehicle technology and other uses will reach levels and areas far beyond previous levels.)

4) The Federal agencies will continue to be involved in a variety of management activities on the lands they administer (though the proportions of Federal projects in different categories may change).

5) The de facto protection provided by reserve and other land allocations on Federal lands will remain in place.

6) Private forest lands within the range of POC will continue to be managed primarily for forest products.

7) Few significant attempts will be made to limit spread and intensification of PL on private lands.

Cumulative Effects

It is important to note that other sections of this chapter describe the nature and extent of forest activities known to contribute to the spread of PL. The Timber Harvest section specifically addresses the general number and origin of log trucks and other equipment, and the movement of logs within the range. Recreation uses, the collection of forest products, and

other uses are also described. These and other uses involve people who move from place to place, sometimes over long distances and in a single day. These activities are taken into account in the pathologists' predictions of spread, both spatially and over time. The projections of disease spread for each alternative are the cumulative effect on PL of all expected management activities both on the Agencies' lands and off, as affected by the Standards and Guidelines of the various alternatives.

The individual resource areas discussed in Chapter 3&4 came directly from the Issues identified in Chapter 1, from suggestions received during scoping, and received during the public comment period, and attempt to cover all major forest management activities potentially having a significant influence on the spread of PL. To complete this coverage, a discussion of the potential effects (to POC) of Grazing and of Mining has been added to the final SEIS in response to public comment. The Affected Environment discussions included in the SEIS for various management activities like Timber Harvest, Special Forest Products, and Recreation help provide the setting upon which the 100-year PL spread predictions are based. A multitude of other activities also occur on the federally administered lands within the range of POC that do not rise to the level of individual discussion, but these activities were nonetheless considered in the calculation of 100 year PL spread. These activities would be also subject to the Standards and Guidelines of the selected alternative. Rationale for 100-year infestation predictions made for each alternative follow.

Alternative 1

Alternative 1 retains the current, pre-SEIS management direction for POC. Project-specific analyses are used to determine appropriate treatments or mixes of treatments. Evaluation of this alternative considers: (1) kinds and numbers of projects that are likely to be done within the analysis area in the next 100 years, (2) kinds of POC management treatments and combinations of treatments that would likely be used, (3) how effective these treatments and combinations of treatments are likely to be at decreasing probability of PL spread, and (4) variability in project design and implementation. It is assumed the agencies would continue to carry out projects through the next 100 years (though there probably would be more restoration and forest health projects and fewer and less intensive timber extraction projects) and that the overall level of vehicle use would be about the same as it has been in the first 50 years of PL's occurrence in the native range (though a greater proportion of it would involve vehicles of recreationists and small forest product entrepreneurs rather than timber harvest equipment). Predictions here consider experience working with projects in the last 15 years during which this same POC management direction has been in place. POC management under Alternative 1 would continue to involve use of a number of techniques separately or more often in combinations. Techniques used would be:

a) Limiting activities to the dry season;
b) ceasing operations during significant rain events during the dry season;
c) planning activities so that uninfested sites are accessed before infested sites;
d) using uninfested or treated water;
e) road management measures, especially improving road surfaces and drainage;
f) featuring POC on low-risk sites;
g) public information efforts;
h) prohibiting or regulating bough collecting and other special forest product operations;
i) use of lowest-risk logging systems;

j) vehicle washing;
k) roadside sanitation treatments;
l) seasonal road closures; and
m) permanent road closures or decisions not to build roads at all into uninfested areas.

Though not as consistently effective as total exclusion of vehicles over entire areas, strategies involving the treatments described are effective in decreasing likelihood of spread of PL and are particularly likely to be effective in reducing inoculum and likelihood of spread when used in appropriate combinations. A weak point of Alternative 1 is its lack of a systematic way to evaluate risk and determine where to use mitigation treatments. There is wide variation in how managers approach risk assessment and POC management design in their local projects today, and this would be expected to continue in the future under this alternative. Considering all of the above, Alternative 1 is predicted to result in much better protection for uninfested high-risk sites than if either Alternatives 4 or 5 were in effect, but less protection than would be afforded by Alternatives 2, 3, or 6. It is predicted that under Alternative 1, 40 percent of the currently uninfested high-risk areas would likely be infested in the next 100 years.

Alternative 2

Alternative 2 provides a POC Risk Key for managers to use in determining where risk reduction or mitigation treatments should be applied. Managers are required to go directly to step 2 in the key when planning projects in any of the 162 currently unifested 7th field watersheds with more than 100 acres of POC on Federal land (the same areas with POC cores and buffers identified in Alternative 6). The array of POC management techniques available for use under this alternative is the same as that considered under Alternative 1. The main differences are that under Alternative 2, risk determination would be done in a systematic way by all Federal managers in all areas using the key, and risk reduction in the 162 uninfested 7th field watersheds would receive special emphasis. Use of the key requires the managers to develop a strategy for each project that addresses risk of infection to uninfected POC that are within, near, or downstream from the project area and have important ecological, Tribal, or product use or function, or that if they became infected could spread inoculum to other POC that have important ecological, Tribal, or product use or function. Use of the key would improve protection over that provided under Alternative 1 by providing greater consistency in risk rating and planning and would result in POC management strategies that would include more consistently effective combinations of treatments. It would not provide as effective protection as Alternatives 3 or 6. It is predicted that under Alternative 2, 30 percent of the currently uninfested high-risk areas would likely be infested in the next 100 years.

Alternatives 1, 2, 3, 6, and 4 to a greater degree, and Alternative 5 to a lesser degree, have provisions for deployment of PL-resistant POC planting stock. The first four alternatives also emphasize resistance breeding to varying degrees with Alternative 4, especially stressing an accelerated breeding effort. If POC stock with durable, long-term resistance becomes available, high-risk sites where most of the cedar has been killed in the past, as well as high-risk sites that become infested in the future, can be replanted with resistant trees. Development and deployment of genetically resistant stock has proven successful for maintaining hosts on sites favorable for infestation in cases involving other *Phytophthora*-caused plant diseases (Erwin and Ribeiro 1996; Umaerus et al. 1983). Differences in effects of selecting

each of the six alternatives on development and deployment of resistant POC are addressed in the Genetics section of this document.

Alternatives 3 and 6

Selection of either Alternative 3 or 6 would lead to low probability of introduction of PL in a high percentage of large uninfested areas in the next 100 years. The rules for POC core areas identified in these two alternatives (road closures, no vehicles, no timber harvest) would provide effective protection to most of the uninfested areas where they are applied. Furthermore, POC core areas would be surrounded by buffer areas that would have limitations on vehicle entry as well. Among all POC management approaches, the most complete protection of yet uninfested high-risk areas results from exclusion of vehicle entry. Alternatives 3 and 6 would also each have a risk key that would guide management of POC outside of the POC core and buffer areas. This would result in systematic use of combinations of management activities that would reduce the amount of inoculum and probability of spread in these areas. The main difference between the two alternatives is that Alternative 3 has POC cores and buffers in 31 uninfested 6th field watersheds while alternative 6 has POC cores and buffers in 162 uninfested 7th field watersheds. The POC cores represent all POC in watersheds having at least 100 uninfested acres of POC in 6th and 7th field watersheds, respectively, in the overall area covered by the SEIS, except (in Alternative 6) for a very small number that are less than 50 percent on Federal land. Alternative 6 focuses on more and smaller uninfested watersheds than Alternative 3, and has the greatest area in POC core areas. The POC core areas under this alternative have a wider distribution across the range (thus probably incorporating more ecological and genetic diversity). Alternative 3 has a larger acreage of buffer area. Alternative 6 provides more protection for yet uninfested high-risk areas than any of the other alternatives under consideration, but it exceeds Alternative 3 only slightly. Although both of these alternatives would be very effective, no kind of treatment would be 100 percent effective in excluding all introductions of PL into high-risk areas over 100 years. In the past 50 years, there have been cases of PL introductions into remote, apparently unlikely areas. Also, under Alternatives 3 and 6, uninfested high-risk areas that have fewer than 100 acres of POC would not necessarily receive the same level of protection as those with 100 acres or greater. The risk key would be used to determine the management to be used in projects in these areas. Management would involve use of a variety of techniques aimed at decreasing probability of spread. Road closures and exclusion may be used, but would not always be mandated in these areas. Considering all of the above, it is predicted that 20 percent of currently uninfested high-risk areas would likely be infested in the next 100 years under Alternative 3, and 18 percent under Alternative 6.

Alternatives 4 and 5

The lack of protection provided in Alternatives 4 and 5 assures that if either is selected, a very large percentage of the remaining currently uninfested high-risk areas would become infested in the next 100 years. Alternatives 4 and 5 have no provisions for preventing spread of PL into uninfested areas. In the first 50 years of PL's presence in the natural range of POC, the pathogen was introduced into numerous high-risk sites, and all spread was from only one or a very few initial introduction points. In fact, during those first 50 years, PL impacted about 75 percent of the high-risk sites in the North Coast Risk Region, the area closest to where the original introduction or introductions occurred. During the next 100 years, PL would potentially spread from numerous existing infested areas that are now widely

distributed through the range of POC in Oregon. A high percentage of the remaining uninfested high-risk sites are predicted to become infested under either Alternative 4 or 5, due to a substantial amount of vehicle activity, no attempts to manage spread, and a timeframe that is twice as long as that for which there is experience. Not all uninfested high-risk areas are predicted to become infested, however, because some are in very remote areas and/or in land allocations that allow little or no vehicle entry. There is, for example, indirect protection provided to uninfested high-risk sites as a result of being remote and in wilderness areas, research natural areas, or roadless Late-Successional Reserves. It is estimated this applies to about 20 percent of the uninfested high-risk areas. Considering all of the above, it is estimated that 80 percent of the currently uninfested high-risk areas in the range of POC in Oregon would likely be infested over the next 100 years under either Alternatives 4 or 5.

Risk of Long-Distance Spread

Even though probabilities are low and it was very unlikely to happen, there is evidence that PL has indeed been transported on occasion over particularly long distances (even over 50 road miles) and into areas that were thought to be unlikely candidates for infestation because of their remoteness. Disease establishment in the Little Chetco River in the Kalmiopsis Wilderness, along the Smith River Drainage, Lower Sacramento River Drainage, Potato Patch Creek, and Fish Lake are known examples. The latter three of these occurrences probably involved inoculum carried on vehicles driving or being transported on roads (in the Lower Sacramento River case, a piece of equipment that had been used in Oregon may have been responsible). The Smith River occurrence is believed to have involved travel by vehicle and on foot by cedar bough collectors, and the Chetco River case remains a mystery though it is next to a mining road and may have been associated with the mining activity (dredging).

There is a possibility that a small number of currently uninfested high-risk sites in California may be infested in the future as the result of inoculum transport from Federal lands in Oregon, even though the probability is much lower than the probability that new infestations in California could result from inoculum transport within California. The probability of spread from Oregon to California would be low under any of the alternatives considered in the SEIS. It would be higher under Alternatives 4 and 5 than under Alternatives 1, 2, 3, and 6. It is impossible to provide exact figures. However, given the fact that there have been four documented cases of long-distance transmission in California in the last 25 years (Smith River, Potato Patch Creek, Fish Lake Creek, and the lower Sacramento River), additional long-distance spreads are likely to happen under any alternative, and each would have the potential to open the disease to a large, currently uninfested area. The Disease Export provision of Alternatives 2, 3, and 6, among others, reduces this likelihood.

Long-Term Mortality

Using the percent mortality predictions shown in Table 3&4-8, and the mortality information in Tables 3&4-5 and 3&4-6 for current POC, the acres and overall percentage of POC expected to survive at the landscape scale can be calculated for each alternative. While the effects of long-term mortality are not evenly distributed over the landscape, and may impact some habitats more than others, it is a useful consideration for some impacted resources. How the calculations are derived from those tables necessitates some explanation. The calculations just include Oregon, since that is the area directly affected by the alternatives.

For comparison of data and further discussion, portions of Table 3&4-5 and Table 3&4-6 have been combined into Table 3&4-9.

In this case, the CVS numbers for trees are considered a more accurate statistical measure of the POC tree population and mortality than GIS. GIS is primarily designed to give spatial representations of data, while CVS is, by design, a population sampling scheme. The GIS maps may have two sources of bias: Smaller (less than 7 inches diameter at breast height) infected trees are difficult to detect on aerial photos in the dense forests on the North Coast; and, mapping in the southeast part of the range is done at stand levels, while POC may be confined to wet areas within the stands. Given some of the inherent overestimates and underestimates of the GIS mapping data, the CVS percent mortality calculation is considered more useful for projecting the long-term POC mortality in each region for each alternative. Using 15 percent mortality for the North Coast Risk Region, 11 percent for the Siskiyou Risk Region, and 9 percent for the Inland Siskiyou Risk Region, assuming this mortality is virtually all on high-risk sites, and applying the pathology predictions contained in Table 3&4-8 to remaining uninfested sites, long-term (100 year) POC infestation rates can be projected for Oregon (Table 3&4-10).

The total area predicted to be infested at 100 years varies between 16 and 30 percent (from 13 percent today) depending upon alternative (Table 3&4-10, shaded column). The percent of high-risk areas predicted to be infested in 100 years is also displayed on Table 3&4-10 because some effects, such as water temperature, are dependent more on the percent of PL infestation near streams than on the percent infestation for the entire landscape. The percent of high-risk areas predicted to be infested in 100 years varies between 50 and 90 percent (from 38 percent today), depending upon the alternative (Table 3&4-10, last column). In both cases, the 100-year infestation percentage varies by risk region.

Ultramafic Soils

Affected Environment

POC in southwest Oregon and northern California is found on soils developed in weathered materials from serpentinite and peridotite, both ultramafic igneous rocks (ultramafic igneous rocks are composed of dark, ferromagnesian minerals and often contain less than 45 percent silica) (Whittaker 1960). Soils of these landscapes are characterized by an abundance of iron, magnesium, chromium, nickel, cobalt, and manganese, relatively low silica and aluminum, and very low calcium that have been weathered from the dark, ferromagnesian minerals of serpentinite and peridotite (serpentinite is a rock consisting almost wholly of serpentine group minerals) (Burt et al. 2001; Proctor and Woodell 1975). Many forest species cannot

Table 3&4-9.—*Infested and infection estimates, Oregon*

	Geographic information system [acres]			Current vegetation survey
Risk regions	Uninfested	Infested	% infested	% infected
North Coast	118,825	7,560	6	15
Inland Siskiyou	27,555	1,782	6	9
Siskiyou	103,787	12,454	11	11
Total	250,167	21,796	8	13

Table 3&4-10.—*100-year infestation prediction for Oregon by alternative*[1]

Alternative	% of risk region high risk	Currently infested high-risk area [as % of risk region] [1]	Uninfested high-risk area [as % of risk region]	% of uninfested high-risk areas predicted to become infested [new] in 100 years [2]	Uninfested high-risk areas predicted to become infested [as % of risk region] [3]	Total [new and current] area to be infested in 100 years [as % of risk region]	Total [new and current] area to be infested in 100 years [in acres] [4]	Total [new and current] area to be infested in 100 years [as % of high-risk areas only]
North Coast Risk Region *[126,248 acres]*								
1	20	15	5	40	2	17	21,500	85
2	20	15	5	30	2	17	20,800	82
3	20	15	5	20	1	16	20,200	80
4 & 5	20	15	5	80	4	19	24,000	95
6	20	15	5	18	1	16	20,100	79
						[Current]	[18,900]	[75]
Siskiyou Risk Region *[116,374 acres]*								
1	40	11	31	40	12	23	27,200	58
2	40	11	31	30	9	20	23,600	51
3	40	11	31	20	6	17	20,000	43
4 & 5	40	11	31	80	25	36	41,700	89
6	40	11	31	18	6	17	19,300	41
						[Current]	[12,800]	[27]
Inland Siskiyou Risk Region *[29,341 acres]*								
1	60	9	51	40	20	29	8,600	49
2	60	9	51	30	15	24	7,100	40
3	60	9	51	20	10	19	5,600	32
4 & 5	60	9	51	80	41	50	14,600	83
6	60	9	51	18	9	18	5,300	30
						[Current]	[2,600]	[15]
Totals *[271,963 acres]*								
1	33	13	21	40	8	21	57,300	64
2	33	13	21	30	6	19	51,600	58
3	33	13	21	20	4	17	45,800	51
4 & 5	33	13	21	80	17	30	80,300	90
6	33	13	21	18	4	16	44,700	50
						[Current]	[34,400]	[38]

[1] Projected infestation is assumed to be within the high-risk areas; does not include estimated 0.1% per year on low-risk sites, much of which is offset by regeneration and growth.
[2] From Table 3&4-6.
[3] Previous two columns multiplied together.
[4] Mortality in infested areas is expected to be about 90%; table does not include replacement with resistant stock.

tolerate the mix of chemicals and clays presented by these soils. Calcium to magnesium ratios that are often less than 1 eliminate or reduce the growth of many plants. Low amounts of phosphorus, potassium and nitrogen are difficult for other species to tolerate. Finally, high amounts of plant-available iron, chromium, nickel, cobalt and manganese have been shown to be toxic to many plants (Kruckeberg 1984; Alexander et al. 1990; Whittaker 1960). Interestingly, there is a suite of endemic and uncommon plants that can grow, some thriving, on the ultramafic mix of soil chemicals (Proctor and Woodell 1975). POC is one of these plants.

While POC tolerates and sometimes thrives on ultramafic soils, it grows far better and larger on adjacent soils, and grows best on soils of sandstones, siltstones, metasediments, and granitics. On the ultramafic soils of southwest Oregon and northwestern California POC is found in riparian areas, near seeps and springs, and on north slopes. On drier sites it is commonly found in the company of Jeffrey pine, western white pine, Brewer's spruce, diminutive tanoak, diminutive Oregon myrtle (California laurel), huckleberry oak, western azalea, California coffeeberry, Saddler's oak, and red huckleberry to name a few trees and shrubs. POC trees larger than 15 to 16 inches diameter are often several hundred years old. While abundant near many seeps, springs, and streams, it is not found everywhere on the ultramafic landscapes.

Soil tests of ultramafic soils often reveal proportionately high calcium and magnesium in the organic (O) horizons. This has led some to speculate that POC has a unique relationship with calcium and in some way enriches the calcium content of the soil (Zobel et al. 1985). Others believe the effect of POC is small (Powers, R., *personal communication*). Data from the Curry County, Oregon, Soil Survey (Burt et al. 2001) suggest that exchangeable calcium and magnesium are high in the organic (O) layers of soils on ultramafic landscapes irrespective of the vegetation cover. Procter and Woodell (1975) have shown the complexities of the exchangeable calcium to magnesium ratio and the need for more research to show if POC and perhaps other plants possess a unique relationship with calcium and magnesium when grown on the ultramafic soils.

Effects of the Alternatives

There would be no known difference between the alternatives upon the status of the ultramafic soils or soil productivity. The range of mortality levels across the range of alternatives is expected to have a small effect on unstable soils, largely mitigated by ingrowth of brushy species and, to some degree, other tree species (see Ecology section). The indirect impact of POC mortality on streambank stability is discussed in the Water and Fisheries section.

Ecology and Plant Associations

Affected Environment

Introduction

POC is found from southwestern Oregon to northwestern California, primarily in the Coast Ranges and Siskiyou and Klamath Mountains, with a small disjunct population in the Scott Mountains of California (Figure 1-1).

The following discussion of the affected environment is organized at two scales: the local scale of plant associations (grouped here for clarity), and the broad landscapes of ecosystems. Organizing affected environments at multiple scales has proven a useful analysis tool, because it more fully captures the range of environmental diversity and ecosystem functions.

Local Scale

Although POC has a narrow geographic range, it occupies many different environments. The species is found at elevations from sea level to 6,400 feet, in glacial basins, along streams, on terraces, and on mountain side-slopes from lower to upper one-third slope positions. POC shows adaptability to a wide range of summer evapotranspiration stress, from very high humidities along the coast to very low summer humidities inland. Soils where POC is found are derived from many parent materials, including sandstone, schist, phyllite, granite, diorite, gabbro, serpentine, peridotite, and volcanics.

Of these, serpentine- and peridotite-generated soils form a distinct group known as ultramafics. Ultramafics are generally droughty environments distinguished by a soil imbalance of the magnesium-to-calcium ratio—an environment associated with rare plant species. POC is among the few tree species that can grow on these soils; in some cases it is the only

tree species tolerating this peculiar environment.

POC plant associations, therefore, characterize the broad range of habitats in which POC is found. These plant communities display some of the richest plant species diversity of all forest types in the region (Jimerson and Creasy 1991).

POC can be found among a variety of species with differing ecological requirements. These species differ across the range of POC. For instance, in the northwestern portion of the range, POC is found in association with western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), in the southwest with coastal redwood (*Sequoia sempervirens* (D. Don) Endl.) and tanoak (*Lithocarpus densiflora* (H. & A.) Rehd.), in the central portion with Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco.), and at higher elevations in the eastern portion of its range with white fir (*Abies concolor* (Gord. & Glend.) Lindl.), western white pine (*Pinus monticola* Dougl.), Shasta red fir (*Abies magnifica* var. *shastensis*) and mountain hemlock (*Tsuga mertensiana* (Bong.) Carr.). POC has been noted as a major or prominent component of 90 plant associations in Oregon and California (Atzet et al. 1996; Jimerson and Daniel 1994; Jimerson et al. 1995; Jimerson et al. 1996; Jimerson and Creasy 1997).

The estimate of 306,781 acres of POC occurring throughout its range was derived using GIS mapping of all stands containing POC regardless of stocking level. This section of the SEIS, however, focuses on the 64 plant associations where POC is prominent (*prominent* in this sense means occurring in the name of the plant association) in the overstory (Atzet et al. 1996; Jimerson and Daniel 1994; Jimerson et al. 1995; Jimerson et al. 1996; Jimerson and Creasy 1997; Jimerson 2003). This includes all 59 POC plant associations (those with POC in their name), and as well as five others where POC is common (not occurring in the plant association name, but occurring in the overstory data for a plant association at least 20 percent of the time). The area covered by these plant associations is approximately 104,200 acres, or about 34 percent of the total mapped POC acres. Unless otherwise noted, discussion in this section covers only those acres, a subset of the total range of POC.

Ecoregions/Subsections

The wide ecological amplitude of POC is also reflected in the broad ecoregions and subsections in which it is distributed. At this scale, climate and geomorphology, rather than vegetation or soils, are the primary environmental variables used to delineate ecological units (McNab and Avers 1994; Jimerson 2003; Winthers et al. 2003).

Two types of ecological units were used to describe the distribution of POC, level IV ecoregions in Oregon (USEPA 1998) and subsections in California (USDA 1997). These are the lowest division of regional ecosystems mapped in the two states. Ecoregions and subsections are configured and delineated differently because they are based on two different methods of mapping ecosystems. Land use or human disturbance is used as a factor in separating ecoregions (USEPA 1998), while subsections are separated by differences in attributes of the environment (Winthers et al. 2003). The ecoregions and subsections are shown on Map 4 and characterized in the following section. ***Note:*** In the discussion that follows, the ecoregions/subsections section have been grouped into six larger geographic areas. In the tables used in this section, the North Inland and Mid-Range areas are split into their Oregon and California portions in order to clarify the areas that would be affected by implementation of the alternatives. In these tables, there are therefore eight columns (or

rows) for the areas, rather than six.

Northern Coast Geographic Area

Mid-Coastal Sedimentary and Southern Oregon Coastal Mountains Ecoregions. The Northern Coast Geographic Area is composed of the Mid-Coastal Sedimentary and Southern Oregon Coastal Mountains Ecoregions. Part of the Oregon Coast Range, these ecoregions are in low elevation mountains with high rainfall and dense coniferous forests. The area has moderately sloping, dissected mountains and sinuous streams. The most important characteristic in terms of species composition is the occurrence of western hemlock as a dominant or codominant species. Ten plant associations with POC were identified in these ecoregions, and five were found only in these ecoregions.

North Inland Geographic Area

Inland Siskiyous and Siskiyou Mountains Ecoregions. The Inland Siskiyous and Siskiyou Mountains Ecoregions form this geographic area. This area has higher, steeper terrain than the others. The North Inland has a high diversity of conditions, which is reflected in the vegetation. The vegetation is dominated by the Douglas-fir Series at low elevations, Jeffrey Pine Series on ultramafic soils, and White Fir and Shasta Red Fir Series at higher elevations. Sixty-two plant associations with POC were identified in this ecoregion and subsection, and many are exclusive or have their greatest extent here.

Mid-Coast Geographic Area

Coastal Siskiyous Ecoregion. This geographic area is located in Oregon and features highly dissected mountains and high gradient streams, as well as a few, small, alpine glacial lakes. The climate is wetter with more maritime influence than elsewhere in the Klamath Mountains Bioregion, but drier than the Northern Coast. This area has tanoak, Douglas-fir, and some POC. Western hemlock is less well represented here than in the Northern Coast. Nine plant associations that contain POC were identified in this ecoregion, with a high frequency of plant associations on serpentine soils.

Mid-Range Geographic Area

The Serpentine Siskiyous/Gasquet Mountain Ultramafics Ecoregion. This ecoregion is dominated by the Tanoak-Port-Orford-cedar Subseries (POC is codominant with tanoak). In Oregon, the White Fir Series and the Port-Orford-cedar-White Fir Subseries are fairly common and occur at relatively high elevations (up to 4,800 feet) and a long distance inland (up to 45 miles). The Port-Orford-cedar-Douglas-fir and Port-Orford-cedar-Western White Pine Subseries are more common in California, the latter being correlated with ultramafic rock. This ecoregion is highly diverse.

The Western Jurassic Subsection. Marine air moderates temperatures in the western portion of this subsection creating a temperate to humid climate. The Douglas-fir and Tanoak Series dominate this subsection. Twenty-two plant associations with POC are described in this subsection, none are found only here. This subsection has the second highest amount of POC of all subsections in Northern California.

Note: In the discussion and tables presented in this document, the Mid-Range and North Inland Geographic Areas are separated into Oregon and California components so that the effects of the alternatives are more clearly presented.

East Disjunct California Geographic Area

Some of the POC plant associations in East Disjunct California are found nowhere else.

Eastern Klamath Mountains. This subsection is located on the farthest southeastern corner of the Klamath Mountains. It has two plant associations with POC; neither is unique to this subsection.

Lower Scott Mountains. This subsection comprises the low elevation portion of the Eastern Klamath geologic belt of the Klamath Mountains. Ultramafic rocks of the Trinity Terrane and intrusions of granitic rocks dominate the geology of this area. The Jeffrey Pine, Ponderosa Pine, White Fir, and Douglas-fir Series are the dominant vegetation in this subsection. Five POC plant associations are present.

Upper Scott Mountains. This subsection comprises the high elevation portion of the Eastern Klamath geologic belt of the Klamath Mountains. The geology is the same as the Lower Scott Mountains Subsection. Thirteen plant associations with POC are found here, seven are unique to this subsection, and three additional POC plant associations are predominantly found here.

Southern Range Geographic Area

POC occurs only along the border of these subsections with the Mid-Range and North Inland Geographic Areas.

The Eastern Franciscan. The Eastern Franciscan Subsection represents the high elevation portion of the northern California Coast Ranges. There are 16 POC plant associations in this subsection. None of the plant associations are unique to the subsection, and most are extensions of what is found in the Gasquet Mountain Ultramafics, Western Jurassic, and Siskiyou Mountain Ecoregions and Subsections.

Pelletreau Ridge. This subsection is a narrow, arcuate strip of land along the southwest edge of the Klamath Mountains. POC stands here are 20 miles south and 50 miles west of the nearest other stands of POC, although there are no unique plant associations here. The vegetation in this region is dominated by Douglas-fir and Tanoak Series, with White Fir Series at higher elevations (Miles and Goudey 1997).

Rattlesnake Creek. This is an arcuate subsection within the Western Paleozoic and Triassic Belts of the Klamath Mountains. The Douglas-fir, White Fir, and Ponderosa Pine Series dominate this subsection, with Jeffrey Pine Series on serpentinized peridotite (Miles and Goudey 1997). This subsection has a very small amount of POC. There are no POC plant associations that are unique or reach their greatest extent here.

Ecosystem Functions of Port-Orford-Cedar

Biodiversity is the variety of life and its processes. This section discusses these processes; the next section focuses on the diversity of POC ecosystems.

The 64 documented plant associations with POC as a major component can be grouped by key ecosystem processes (Table 3&4-11). The first useful division is ultramafic versus nonultramafic soils. These can be further divided into riparian (adjacent to watercourses, including ephemeral streams) sites and upland sites. A summary of these plant association groups can be found in Table 3&4-11, and their estimated acreages in Table 3&4-12. Note that *plant association group* here is defined somewhat differently than in conventional plant association group maps. In the latter, plant association groups are grouped more as a unit of vegetation classification, and less by landforms/geology. Acreages were estimated overlaying the GIS map of POC locations with the ecoregions/subsections (Map 4), and then subtracting the areas where POC is not prominent in the overstory. The proportion of riparian versus upland plant association areas uses estimates developed by Don Goheen (see Relation of Environmental Processes to *Phytophthora lateralis* Infection section that follows), and the acreage of plant associations for ultramafic versus nonultramafic is based on the number of plant associations tallied.

POC comprises on average 35 to 50 percent of the overstory cover in plant associations where it is prominent in the overstory (Table 3&4-13). Usual cohorts on nonultramafic sites are Douglas-fir and tanoak, although red fir, incense cedar, western hemlock, or other species are also possible. On ultramafic sites, cohorts are usually limited to Jeffrey pine, tanoak, or western white pine. POC trees are very long lived. Jimerson and Daniel (1994) found an average age of 352 years on study plots, with most trees in the 326-to-425-year age-group. Disturbance (other than from PL) is from infrequent fire events, because of the continually wet environment.

Tree understory abundance of POC is generally low in northwestern California (averages 4 percent cover) and greater in southwestern Oregon (averages 31 percent cover). Abundance varies with available moisture, with greater cover in moister environments.

Ultramafic Functions

Ultramafic POC ecosystems make up varying portions of the seven geographic areas, ranging from 10 percent of the major POC plant associations in the Northern Coast Geographic Area to 75 percent of the Mid-Range Geographic Area (the primary ultramafic region) in both Oregon and California; and 76 percent of the Southern Range in California (Table 3&4-12).

Table 3&4-11.—*Average abundance [as indicated by percent cover] of Port-Orford-ceder in plant association groups where POC is prominent in the overstory*

Plant association group	% POC overstory cover	% total overstory cover	POC as % of total overstory cover	% POC understory cover	% total understory cover	POC as % of understory cover
Upland	27	78	27	15	27	56
Ultramafic upland	30	80	38	3	16	19
Riparian	37	87	43	4	14	29
Ultramafic riparian	37	74	50	6	15	40

Table 3&4-12.—*Estimated acreages of stands with Port-Orford-cedar prominent in the overstory and infested acres [in brackets] by geographic area and plant association group*[1]

	Geographic area							
	Oregon				California			
Plant association group	Northern Coast	Mid-Coast	Mid-Range	North Inland	North Inland	Mid-Range	Southern Range	Disjunct California
Upland [2]	26,400 [0]	6,000 [0]	2,300 [0]	6,500 [400]	800 [50]	600 [0]	100 [0]	200 [0]
Ultramafic upland [2]	3,000 [0]	7,300 [0]	7,100 [0]	3,200 [200]	2,500 [200]	2,700 [0]	900 [0]	0 [0]
High-risk riparian	6,600 [5,000]	4,000 [1,100]	1,600 [300]	4,800 [800]	1,150 [200]	1,150 [300]	350 [100]	140 [25]
High-risk ultramafic riparian	700 [500]	4,800 [1,300]	4,700 [1,400]	1,900 [400]	1,150 [150]	1,150 [300]	350 [100]	60 [25]
Total area infected [% infected]	5,500 15	2,400 11	1,700 11	1,800 11	600 11	600 11	200 9	50 9
Areas at high risk [3] [% high risk]	7,300 20	8,800 40	6,300 40	9,900 60	3,400 60	2,300 40	700 40	200 40
Area totals	36,700	22,100	15,700	16,400	5,600	5,600	1,700	400
Grand total								104,200

[1] See text for discussion of how acreages were estimated; grand total estimated area is 104,200 acres [34% of total acres with at least one POC]. Estimated total area at high risk is 38,900 acres [or 13% of the total area with at least one POC].
[2] Includes 4,400 acres high-risk upland in North Inland Geographic area.
[3] Includes infected area.

Table 3&4-13.—*Average abundance [as indicated by percent cover] of Port-Orford-cedar in plant association groups where Port-Orford-cedar is prominent in the ovestory*

Plant association group	% POC overstory cover	% total overstory cover	POC as % of total overstory cover	% POC understory cover	% total understory cover	POC as % of understory cover
Upland	27	78	35	15	27	56
Ultramafic upland	30	80	38	3	16	19
Riparian	37	87	43	4	14	29
Ultramafic riparian	37	74	50	6	15	40

POC on average makes up 38 percent of the overstory on ultramafic upland sites and 50 percent of ultramafic riparian sites (Table 3&4-13).

POC is associated with rare plants of ultramafic systems. Because it is often one of the few, or only tree species that can tolerate these sites, POC probably has a key role in maintaining their function through shading and stabilizing soils. At least one author reports that POC recycles calcium on these sites, making it more available to other species (Zobel et al. 1985).

POC lost to PL in riparian zones would gradually be replaced by those of other conifer species in some riparian areas, and not in others. Down wood recruitment of POC into streams would increase as areas become infested, because tree mortality would accelerate, but eventually be reduced in infested areas because large POC trees would eventually die out. Other species and POC above the high watermark would continue to contribute, however.

Riparian Functions

POC has a keystone role in many riparian ecosystems. Where present, it plays a role in maintenance of water quality. In some cases (particularly on ultramafic sites) it is the only tree species contributing to woody structure in streams; in others it occurs in a mix of species. Large conifer downed wood in the Smith River was found to provide much of the habitat complexity for amphibians and other organisms (Ollivier, L., *personal communication*). Presumably this is also true throughout the range of POC, where the species provides shade (and thereby lowers stream temperatures), and also provides bank stability, and when it dies and falls into the stream, aquatic structure. These factors are key elements of habitat for fish, amphibians, aquatic insects, and other organisms. Since POC is highly resistant to decay, it may be expected to have a longer residence time in streams than other associated conifers. This may be especially important on serpentine soils where POC may be the only, or most abundant, tree species growing on a site.

Fire and Port-Orford-Cedar

Most POC occur in a mixed-severity, moderate-frequency fire regime (USDA-FS 2003c). Over time fire will kill fair amounts of POC trees, such as in the Biscuit Fire of 2002. Although even as a pole-sized tree POC has fire-resistant bark; and Zobel et al. (1985) documented the fire resistance of the tree, recent fuels build-up places this (and other trees) at high risk to mortality from wildfire. Even though POC is often concentrated along streams, POC mortality in Biscuit mirrors the intense fire percentage for the fire area overall. Following fire, POC regenerates well near the coast, but is out-competed by Douglas-fir inland. Post-fire monitoring of the Biscuit Fire area is underway, including investigation of whether fire can sterilize soil sufficiently to kill PL.

Terrestrial Woody Material

In additional to its role in aquatic ecosystems, woody material also has a terrestrial role: it provides habitat for scores of animal species, notably insects; facilitates mycorrhizal development; and serves as a long-term nutrient source for soil development. Standing woody material (snags) provides habitat for some bird and mammal species. Woody material, both standing and down, also moderates the immediate microclimate by serving as a moisture source in warm, dry environments. This is important for the establishment of some species.

Natural (not infected with PL) snag and down wood levels for all species are presented in Table 3&4-14. Ultramafic sites showed the lowest density of snags. Upland nonultramafic sites had the greatest density of down wood. California sites (all associations combined) had the least amount of down wood, but the greatest amount of snags, perhaps because of their recent death from PL infection.

In California, the down wood was composed primarily of Douglas-fir and POC, with 13 additional species represented at low percentages. Oregon species composition is probably similar, except in the Coast Range, where western hemlock snags are prevalent.

Because of their resistance to decay, dead POC would be expected to remain in an ecosystem for a longer period of time than most other conifers when the frequency and extent of wildland fires are controlled. Because the wood is decay-resistant, woody material is expected to

Table 3&4-14.—*Snags and downed woody material by plant association group*[1]

	Woody material		
Plant association group	Snags per acre	Down wood [tons/acre]	Downed wood [pieces/acre >20" diameter]
Ultramafic upland	6	3	1
Upland cool, dry	26	42	27
Upland moist	23	57	18
California (all associations)	31	40	17

[1] Data are for Oregon unless other noted; data for riparian associations are not available; values are means.
Source: [USDA-FS and USDI-BLM 2003b]

persist longer than that of softer species. This makes their value in riparian zones persist over time, but also means they are less valuable than softer species for wildlife snags, because the harder wood means fewer wildlife cavity excavations.

Relation of Environmental Processes to *Phytophthora lateralis* Infection

Although POC occurs in a wide range of environments, the highest risk of infection is associated with wetlands and riparian zones. PL moves through water easily; on dry sites or in droughty conditions its spores lay dormant. The zone of high risk, however, is restricted to a narrow strip along streams affected by water level in the soil profile. Typically this is 10 to 25 feet on either side of the stream channel (see Pathology section for further discussion) POC growing in upland situations usually escapes infection even when the pathogen is established in nearby drainages or wetlands. In some cases, however, upland sites, when they are in lower or concave slope positions that collect water, can be considered high risk. This has been reflected in the description of effects that follows.

The Pathology section earlier in this chapter describes the percent of POC at high risk, and the 100-year infestation prediction by "risk region." The relationship of the geographic areas and ecoregions used in this section (Table 3&4-12) to the risk regions used in the Pathology section (Table 3&4-5) is shown in Table 3&4-15, by acres. The risk levels can be generally equated to the geographic areas and ecoregions as follows.

Northern Coast: POC is distributed widely across the landscape. High-risk portions of riparian zones comprise 20 percent of the area where POC is prominent. This area was infested beginning about 50 years ago; the pathogen is widespread, and the infestation rate has nearly stabilized. There are pockets of uninfected POC on high-risk sites (Betlejewski, F., *personal communication*; White, D.E., *personal communication*), but it seems only a matter of time before most are infected. Most original cedars in infested high-risk sites have been killed (general estimate is 90 percent). The rest of POC on this landscape (80 percent) can be considered upland, and at low risk.

Mid-Coast, Mid-Range in Oregon and California, Southern Range, and East Disjunct California. PL has not been here as long as in the North/Mid-Coast. Many POC areas, particularly those in the upper part of drainages, have not yet been infested. POC is more closely associated with riparian zones than in the northern part of its range.

North Inland (Siskiyou Mountains). Riparian areas cover about 44 percent of the POC area where POC is prominent in the overstory. A higher portion of this landscape is at risk,

Table 3&4-15.—*Relationship of Port-Orford-cedar geographic areas/ecoregions to risk regions [in acres] where Port-Orford-cedar is prominent in the overstory*

	Risk Regions [1]					
	Oregon			California		
Geographic area/ecoregion	North Coast	Siskiyou	Inland Siskiyou	Siskiyou	Disjunct California	Totals
Northern Coast						
Mid-Coastal Sedimentary	19,700	1,100	400			21,200
Southern Oregon Coastal Mountains	11,100	4,400				15,500
Total	30,800	5,500	400			36,700
North Inland						
Inland Siskiyous	100	4,700	7,400			12,300
Siskiyou Mountains		1,600	200	5,500		7,450
Umpqua Interior Foothills			200			200
Rogue/Illinois Valleys		50	100			200
Red Butte		1,000	800			1,700
Other	50	100		50		250
Total	200	7,450	8,700	5,600		22,000
Mid-Coast						
Coastal Siskiyous	900	18,500	2,700			22,100
Total	900	18,500	2,700			22,100
Mid-Range						
Serpentine Siskiyous		13,500	1,200			14,700
Gasquet Mountain Ultramafic				2,400		2,400
Western Jurassic		1,000		3,200		4,200
Total		14,500	1,200	5,600		21,300
Southern Range						
Eastern Franciscan				1,300		1,300
Pelletreau Ridge				300		300
Rattlesnake Creek				50		50
Total				1,700		1,700
Disjunct California						
Eastern Klamath Mountains						
Lower Scott Mountains					100	100
Upper Scott Mountains					300	300
Total					400	400
Grand totals	31,900	45,950	13,000	12,900	400	104,200

[1] See the Pathology section.
[2] Percent high risk is from the Pathology section.

when compared to other areas. The additional risk comes from the relatively dense road network of this ecoregion. Roads facilitate spread of PL by mud adhering to vehicles, horses, and wildlife.

Diversity

Plant species diversity. As with the classification and mapping of ecosystems, diversity can also be organized at multiple scales. When POC plant association data for the entire range are considered, species diversity within POC stands is exemplified by the high number of species found per layer.

In the overstory tree layer alone, 29 species are identified. The shrub layer included 93 species, and the forb layer 446 species. The total of 568 is considered the rangewide species richness (number of species) in the 90 plant associations in which POC is prominent. Members of the tree and shrub layers are considered indicator species (meaning that they are closely and consistently associated with environmental thresholds where factors such as moisture and elevation changed and were associated with different ecosystems). Species found in the shrub and forb layers help define the major and minor environmental gradients (changes in environmental variables over space) and are used in the plant association classifications.

This high species diversity is typified by the wide ecological gradients in which POC and its associated species are found. Data analysis has shown elevation, ultramafic soils, microposition, moisture, temperature, and solar radiation to all have correlations with distribution of POC.

The wide environmental gradient included within the POC communities is indicated by the work of Millar et al. (1991) (see Genetics section) using allozyme research to represent genetic diversity. The wide range of associated species help to define the major environmental gradients used to describe vegetation series and subseries.

Plant series and plant association diversity. POC has a wide ecological amplitude (that is, it occurs over a wide range of environments). The species overlaps with portions of the ranges of Douglas-fir, White Fir, Jeffrey Pine, and Western White Pine Series and in portions of the environmental range of the Tanoak, Western Hemlock, and Shasta Red Fir Series.

Multivariate statistical analyses of data from plots in Oregon and California from the Port-Orford-cedar Series have resulted in a classification with 64 plant associations with POC as a major overstory species (Atzet et al. 1996; Jimerson and Daniel 1994; Jimerson, et al. 2000).

Vascular plant species richness (number of species) is presented by plant association group and geographic area in Table 3&4-16. The table also shows the within-plant association-group richness as a percentage of regional species richness.

POC plant associations occur in environments where POC is better adapted to survival than other tree species. The overall range of POC, however, includes plant associations from other plant series: Western Hemlock, Douglas-fir, Jeffrey Pine, Tanoak, and White Fir. The species itself is more widely distributed than would be suggested by examining only the series distribution.

Table 3&4-16.—*Species richness of plant associations containing Port-Orford-cedar by geographic area and plant association group [in average number of plant species]*

Plant association group	Geographic Areas [1]						
	Northern Coast	Mid-Coast	Mid-Range Oregon	North Inland	Mid-Range California	Southern Range	Disjunct California
Upland	26.7 [101]	23 [210]	21 [88]	32.0 [480]	22.5 [67]	No data	24.7 [14]
Ultramafic upland	No data	29.0 [93]	22.6 [308]	24.6 [382]	23.4 [248]	23.9 [284]	No data
Riparian	No data	No data	No data	No data	30.7 [17]	24.2 [31]	25.5 [15]
Ultramafic riparian	No data	No data	No data	23.0 [30]	15.3 [169]	20.0 [51]	21.6 [24]

[1] The first four geographic areas listed are in, or partly in, Oregon; the remaining are in California. Riparian zones were not specifically sampled to develop the plant association classification in Oregon; hence, the lack of data for these groups. Brackets show number of samples.

Port-Orford-Cedar Plant Associations with Unique Species and Regional Endemic, Rare, or Sensitive Plants

POC plant associations contain unique species and regional endemic, rare, or sensitive plants. At least 30 plant species considered sensitive in FS Regions 5 and 6, of special status to the BLM, or rare by the California Native Plant Society (Skinner and Pavlik 1994) and the Oregon Natural Heritage Program (2001), are found in plant associations that contain POC. (In addition to the discussion below, sensitive, listed, and other rare species are discussed in the Botany section in this chapter, or in the draft biological evaluations in Appendix 7.) Eleven of these rare or unique plant species are found only within POC plant associations, predominantly on wetland/seep or riparian areas. Plant associations with the highest diversity of rare plants are those that capture microhabitat extremes, from continually wet soils to dry soils in exposed sites. The plant association with the highest number of rare plants is Port-Orford-cedar-California Bay/ Evergreen Huckleberry.

A majority of rare or sensitive plants in POC associations occupy habitats with surface (perennial or intermittent) or subsurface water in the form of spring or seep flow. The unique California pitcher plant (*Darlingtonia californica*) is the most commonly noted hydrophytic species, followed by California lady's slipper (*Cypripedium californicum*). These species are endemic to serpentine wetlands (fens, riparian areas, seeps) and are represented in various associations across the range of POC.

In comparison to the California pitcher plant and California lady's slipper, there are other wetland species associated with POC that are more localized in their distribution. For example, the narrow endemic western bog violet (*Viola primulifolia* var. *occidentalis*) occurs in fens and other serpentine wetland habitats in the Gasquet Mountain Ultramafic Subsection in California and Oregon. The large-flowered rush lily (*Hastingsia bracteosa*) is a narrow endemic found in the Eight Dollar Mountain area of the Siskiyou Mountain Ecoregion of Oregon. It occurs in riparian and wetland settings along with Oregon willow herb (*Epilobium oreganum*) (Kagan 1990a, 1996). Waldo gentian (*Gentiana setigera*) is found in the gently-sloping serpentine wetlands across the Gasquet Mountain Ultramafic Subsection, Coastal Siskiyou Ecoregion of Oregon, and the Siskiyou Mountain Ecoregion of Oregon. Waldo gentian is also found in two, high elevation associations: Port-Orford-cedar-Shasta-Red Fir-Brewer's Spruce/Sadler Oak-Huckleberry Oak and Port-Orford-cedar-Shasta Red Fir/Sitka

Alder-Sadler Oak. This occurrence of Waldo gentian in montane habitats has been noted by Kagan (1990b) in his management guide for this species. POC plant associations in the Lower and Upper Scott Mountain Subsections of eastern California support rare plants distinctive to this area including Scott Mountain phacelia (*Phacelia dalesiana*), showy raillardella (*Raillardella pringlei*), and crested potentilla (*Potentilla cristae*).

Effects of the Alternatives

Because infection with PL eventually leads to death of POC, the reduction of this species will have effects on ecosystems. Overstory trees will be killed in infested areas. Jimerson and Daniel (1994) found the average age of most overstory trees to be 326 to 425 years, so replacement of "in kind" dead overstory will take a long time. Understory POC trees are likely to persist over time, but it is unlikely they will grow into the overstory in infested areas unless they are resistant to PL.

Table 3&4-17 begins with the current estimated acres of POC shown on Table 3&4-12, and illustrates the anticipated infestation, in acres, of POC from ecosystems in each of the six geographic areas for each of the alternatives. Estimates are further segregated by plant association group to illustrate the effects on ultramafic and riparian areas. The acres shown are only for those plant associations where POC is prominent in the overstory. Additional infestation acres (see Pathology section) are not included here.

In this section, the projected acreage losses by alternative are presented, followed by their effects on key ecosystem functions.

Note: Regarding riparian zones—PL has a higher rate of infestation in riparian zones than in other areas. The zone of high risk, however, is restricted to a narrow strip along streams affected by water level in the soil profile. Typically this is 10 to 25 feet on either side of the stream. For all purposes in this effects section, this is the riparian zone referred to, not broader zones as in Northwest Forest Plan documentation. Areas in Table 3&4-17 are also based on this definition. See the Pathology section for further discussion.

Riparian zone acres in Table 3&4-17 are proportional to the estimate of the relative abundance of riparian plant associations in the geographic areas, based on sample sizes of the plant associations in Atzet et al. (1996) and Jimerson and Daniel (1994).

Effects Common to All Alternatives

Because implementation of this SEIS would not directly affect areas in California, for these areas all alternatives are expected to show the same effects as for Alternative 1 (the current course of action). As discussed in the Cumulative Effects section earlier in this chapter, slight increases or decreases from these numbers could be expected if the Oregon units select an alternative substantially different than the current direction in California. Those differences are too small to be reflected in this analysis.

Alternative 1

This alternative is the current course of action under existing Standards and Guidelines. Based on the assumption that 15 percent of the Coos Bay/Powers administrative areas are

Table 3&4-17.—*Predicted infestation acres in 100 years by plant association groups where Port-Orford-cedar is prominent in the overstory* [1]

	Geographic area								
	Oregon				California				
Plant association group	Northern Coast	Mid-Coast	Mid-Range	North Inland	North Inland	Mid-range	South-ern Range	Disjunct California	Totals
Current conditions [2]									
Upland [3]	26,400	6,000	2,300	6,500	800	600	100	200	42,900
Ultramafic upland [3]	3,000	7,300	7,100	3,200	2,500	2,700	900	0	26,700
Riparian	6,600	4,000	1,600	4,800	1,150	1,150	350	140	19,790
Ultramafic riparian	700	4,800	4,700	1,900	1,150	1,150	350	60	14,810
Area infested	5,500	2,400	1,700	1,800	600	600	200	50	12,850
[% of area]	[15]	[11]	[11]	[11]	[11]	[11]	[9]	[9]	
Total high risk	7,300	8,800	6,300	9,800	3,400	2,300	700	200	38,800
High risk as % of total	20	40	40	60	60	40	40	40	
Area totals	36,700	22,100	15,700	16,400	5,600	5,600	1,700	400	104,200
Infestation at 100 years									
Alternative 1									
Upland	0	0	0	800	150	0	0	0	950
Ultramafic upland	0	0	0	600	400	0	0	0	1,000
Riparian	5,600	2,300	1,700	1,800	500	400	200	50	12,550
Ultramafic riparian	600	2,700	1,800	1,000	450	900	200	50	7,700
Total infested	6,200	5,000	3,500	4,200	1,500	1,300	400	100	22,200
% of total infested	17	23	22	30	30	23	24	25	21
Alternative 2									
Upland	0	0	0	700	150	0	0	0	850
Ultramafic upland	0	0	0	600	400	0	0	0	1,000
Riparian	5,400	2,000	1,300	1,400	500	400	200	50	11,250
Ultramafic riparian	600	2,300	1,800	1,000	450	900	200	50	7,300
Total infested	6,000	4,300	3,100	3,700	1,500	1,300	400	100	20,400
% of total infested	16	19	20	26	30	23	24	25	20
Alternative 3									
Upland	0	0	0	500	150	0	0	0	650
Ultramafic upland	0	0	0	400	400	0	0	0	800
Riparian	5,300	1,700	1,000	1,400	500	400	200	50	10,550
Ultramafic riparian	600	2,000	1,600	700	450	900	200	50	6,500
Total infested	5,900	3,700	2,600	3,000	1,500	1,300	400	100	18,500
% of total infested	16	15	17	21	30	23	24	25	18
Alternatives 4 & 5									
Upland	0	0	0	1,000	150	0	0	0	1,150
Ultramafic upland	0	0	0	1,300	400	0	0	0	1,700
Riparian	6,300	3,500	3,200	3,100	500	400	200	50	17,250
Ultramafic riparian	600	4,000	2,200	1,500	450	900	200	50	9,900
Total infested	6,900	7,500	5,400	6,900	1,500	1,300	400	100	30,000
% of total infested	19	34	34	51	30	23	24	25	29
Alternative 6									
Upland	0	0	0	500	150	0	0	0	650
Ultramafic upland	0	0	0	400	400	0	0	0	800
Riparian	5,200	1,600	900	1,300	500	400	200	50	10,150
Ultramafic riparian	600	2,000	1,600	700	450	900	200	50	6,500
Total infested	5,800	3,600	2,500	2,900	1,500	1,300	400	100	18,100
% of total infested	16	16	16	20	30	23	24	25	17

[1] Does not include acres restored with resistant stock.
[2] Current condition high risk totals are from Table 3&4-12.
[3] Includes 4,400 acres high-risk upland in North Inland Geographic Area.

currently infested, 9 percent of the Southern Range and East Disjunct areas of California are infested, and 11 percent of all other areas are infested, it is estimated 12,850 acres of stands where POC is prominent are infested within the range of POC. Under Alternative 1, the estimated area infested in 100 years would be 22,200 acres, or 21 percent of the acres where POC is prominent. The estimated acreage for each geographic area under Alternative 1 (as well as the other alternatives) is displayed in Table 3&4-17. Acreage estimates are based on the assumption of moderate to heavy (depending on geographic area) percent of area affected in riparian zones, versus little or no infestation on upland areas (see Pathology section). Infestation estimates are primarily based on the density of streams and roads, and in California, by the closer relationship of POC to riparian zones. The North Coast and Mid-Coast areas have relatively high rainfall and stream densities compared to the other areas. The Mid-Coast, Mid-Range, and North Inland (in Oregon) areas were assumed to have high road densities, and hence, more areas affected by PL.

Alternative 2

This alternative would add a risk key to add more consistency to the application of prescribed mitigation measures, and places emphasis on the 162 uninfested 7th field watersheds. The projection of the infested acres 100 years from now is 20,400 acres, or 20 percent of the acres where POC is prominent, similar to the 21 percent estimated infestation for Alternative 1. Projected acres vary by geographic area, however, with the greatest spread of infestation in the Mid-Range and North Inland areas.

Alternative 3

This alternative includes the Standards and Guidelines from Alternative 2 (except the emphasis on 162 7th field watersheds) and adds additional direction for activities in 31 currently uninfested 6th field watersheds, primarily in the North Inland Geographic Area. The projection of the infested acres 100 years from now is 18,500 acres, or 18 percent of the acres where POC is prominent. This alternative is second only to Alternative 6 in maintaining the diversity and abundance of plant associations of the alternatives considered. Alternative 3 will provide a higher probability of retaining intact POC ecosystems with all ages of trees represented than Alternative 1, 2, 4, or 5.

In Oregon, this alternative would have little additional effect on the Northern Coast Geographic Area (when compared with Alternative 2), because there are no uninfested 6th field watersheds in this area. Throughout the other Oregon geographic areas, reductions in infested areas averaging 3 to 5 percent would be effected (when compared with Alternative 2) if this alternative is adopted.

Alternatives 4 and 5

Alternatives 4 and 5 would remove active POC management measures, and variously rely on the use of genetically-resistant POC stock for restoration planting. These alternatives are projected to lead to the greatest infestation of POC—30,000 acres at 100 years, or 29 percent of the acres where POC is prominent. As with other alternatives, the least effect would be on the Northern Coast, projected to receive a 2 percent decrease in POC, relative to Alternative 1. Effects on the Mid-Coast, Mid-Range, and North Inland would be larger: 11 percent, 12 percent, and 21 percent, respectively, above the amount projected with Alternative 1.

Alternative 6

Alternative 6 is similar to Alternative 3, but extends the POC core area concept to include 162 uninfested 7th field watersheds. Total acres predicted to be infested are virtually the same with either alternative (about 18,000 acres in each, assumed to be whole or predominantly outside of the currently uninfested watersheds), but this alternative has the advantage of protection for additional watersheds.

In general, Alternatives 3 and 6 would lead to the least reduction of POC from ecosystems, Alternatives 4 and 5 the most, and Alternatives 1 and 2 would be in between. This pattern follows for all the effects on ecosystem functions that follow. Some of these effects could be mitigated over time to the extent POC is replaced with resistant stock (see Planting Assumption under the Assumptions and Clarifications section of this chapter).

Effects on Ultramafic Ecosystems

Ultramafic POC ecosystems make up varying portions of the six geographic areas, ranging from 10 percent of the Northern Coast to 77 percent of the plant associations where POC is prominent in the Mid-Range Oregon Geographic Area (the primary ultramafic region). POC on average makes up 38 percent of the overstory on ultramafic upland sites and 50 percent of ultramafic riparian sites (see Table 3&4-13). Alternative 3 and 6 would lead to the most conservation of these areas, Alternatives 4 and 5 the least, and Alternatives 1 and 2 somewhere in between.

Reduction of POC, particularly in riparian zones, would change ecosystems. On ultramafic sites, POC is much less likely to be replaced by other tree species (White, D.E., *personal communication*; Ollivier, L., *personal communication*). Remaining trees of other species could increase, and the shrub layer would be expected to increase. The POC roles of providing shade for understory plants and providing downed wood for a long-term source stream structure would be reduced. Because the species is very long-lived, replacing old trees with seedlings could require hundreds of years to achieve the same level of forest structure where POC is lost from the ecosystem.

Riparian Effects

Loss of POC would affect downed wood structure in streams. As stated in the previous section, other species are not likely to replace all POC, particularly on ultramafic sites, and those that might would be less valuable as riparian downed wood.

Replacement of POC snags and logs by other species depends on the particular POC ecosystem. Long-term effects on large woody debris recruitment (to POC communities that become POC-vacant) would vary according to community tree species diversity. The more predominant the role of POC is in a given vegetation community, the more the potential there is that POC mortality would decrease wood to streams from that community (or site) (described below [McCain, M., *personal communication*]) in the mid and long terms. Loss of POC in the aquatic ecosystem would be greatest in the Mid-Coast, Mid-Range Oregon, and North Inland Oregon Geographic Areas where the highest proportion of riparian areas feature POC. These areas also have a high proportion of ultramafic areas where POC is particularly important because other tree species are often less abundant. Some POC communities in the

ultramafic riparian group do not feature other conifer species and may become dominated by shrubs if the POC component is lost, at least along the "high risk" strip. Therefore, the contribution of these communities of wood to streams would be reduced over the long term. Most other POC communities include Douglas-fir, white fir, Jeffrey pine, or other overstory conifers. Where they occur (in the larger size classes), these species could be expected to provide wood to streams, although their wood will not last as long as that of POC.

To better understand these relationships, ultramafic and nonultramafic plant association groups in the southeast portion of the Oregon POC range were analyzed to identify impacts of the loss of POC on stream shade, and to identify the capability of other species to replace the role of POC in providing wood. Data presented in Atzet et al. (1996) were used to develop the summaries that follow. It should be noted however, that the occurrence of plant associations with POC in this landscape is often patchy and discontinuous. It should not be assumed, for example, that stream miles of POC are contiguous. Recovery times listed are rough estimates based on the patchiness and other features of the landscape.

The north to south boundary between the western Coastal Siskiyous Ecoregion and the Serpentine Siskiyous and Inland Siskiyous Ecoregions to the east was used as a divider to separate the southeast portion of the Oregon POC range. West of this line, high rainfall is typical, and POC is widely distributed across the landscape. East of this line, average rainfall is lower, and POC distribution is more restricted to riparian zones.

Recovery of canopy in this analysis area would be affected by rainfall, and in the ultramafic areas, by soil chemistry and the lack of replacement species. A total of 897 stream miles were associated with the ultramafic plant association group. Out of these, 192 miles would be affected by the loss of POC. In the plant associations contained in this plant association group, POC contributes 38 to 50 percent of the overstory cover (ultramafic groups in Table 3&4-11). After loss of the POC component, it would take 40 to 100 years for other species to colonize the canopy gaps or planted resistant stock to make effective contributions.

The nonultramafic group was analyzed as a single group and as three subgroups, in order to contrast ecosystems characterized by POC and those where POC occurs, but is not abundant. Accordingly, the nonultramafic group was further divided into Port-Orford-cedar, Tanoak-Canyon liveoak, Tanoak/Salal, and Tanoak/Evergreen Huckleberry subgroups. In only the Port-Orford-cedar group is POC consistently abundant.

If all nonultramafic associations are analyzed as a group, 37 of 1,474 miles would be affected. Of the nonultramafic subgroups, only the Port-Orford-cedar group has a large proportion of stream miles. An estimated 12 of the 39 stream miles associated with the Port-Orford-cedar Plant Association Group would be affected by loss of POC. In the plant associations contained in this plant association group, POC is the primary component of both the overstory and the understory. After loss of the POC component, it would take less than 30 years for other species to colonize the canopy gaps.

In the Tanoak-Golden Chinquapin Plant Association Group, 19 of 1,333 miles would be affected by the loss of POC. In the plant associations contained in this plant association group, POC contributes 20 percent of the overstory when it is present (in only 14 percent of plots sampled). After loss of the POC component, it would take less than 5 years for other species to colonize the canopy gaps. In two remaining plant association groups, the Tanoak-

Port-Orford-cedar/Salal, and the Tanoak/Evergreen Huckleberry, the miles of stream affected by POC loss were low (5 miles out of 86 miles, and less than 1 mile out of 16 miles, respectively). The POC contribution to overstory was 14 percent and 1 percent, respectively, and colonization by other species was expected to be less than 3 years. All other plant association groups in the analysis either had little or no POC, or had very few potential impacted stream miles.

Based on research and monitoring data, dead POC trees cannot be expected to fall over quickly. Jules et al. (2002) documented uninfected POC snags still standing up to 200 years since their death. Monitoring data from the Agua-Stimpy project area (Medford BLM District, Grants Pass Resource Area) shows no infected POC falling over. This area has been infested since the mid-1970s (Betlejewski, F., *personal communication*).

Snags and Downed Wood

Downed wood has largely been detailed in the previous Riparian Effects section. The value of POC snags for terrestrial wildlife is probably less than other conifer species, because of the hard nature of the wood. Its primary value is in providing downed wood for aquatic systems.

Plant Diversity

Effects on plant diversity are detailed in the Botany section. One note, however, is the presence of the Port-Orford-cedar/Shasta-Red-fir/Brewer's Spruce/Sadler Oak-Huckleberry Oak association in the North Inland Geographic Area. Preliminary tests (stem dip method) have shown the POC in a variant of this association (also including yellow cedar) to have the highest percentage of resistant trees among the communities sampled (Betlejewski, F., *personal communcation*). Conservation of this association, which is known to occur on only a few high elevation sites, would have value as a potential source of material for producing disease-resistant seedlings.

Structural and Landscape Diversity

Species loss is driven by habitat loss. Reduction of POC in high-risk areas across the landscape would reduce diversity at both local and broad scales, leading to a more homogeneous landscape. Such a landscape would be less resilient (if POC were greatly reduced on the landscape, species or ecosystems may be less resilient to change) (Lindenmayer and Franklin 2002). For example, if another conifer species were to replace POC on some sites, and that species itself one day becomes vulnerable to a pathogen, the ecosystem would be more affected than if POC were still present.

Cumulative Effects

The effects of PL-caused mortality on plant associations and their function (described above) also need to be considered in context with other reasonably foreseeable actions or events that could affect these same functions. As noted above, negative effects on the ecological role of POC are most pronounced within riparian areas and on ultramafic soils. Timber harvest or other non-PL related effects to POC in these two areas is expected to be insignificant, particularly in view of the known importance of POC on such sites. The Northwest Forest Plan

Riparian Reserves preclude removal of POC or other species unless they are dead (in which case that removal must be neutral to aquatic objectives) or unless they need thinning in order to improve aquatic conditions. Overall riparian conditions are improving on Federal lands as a result of such measures, and no events other than future fires (discussed under Affected Environment in the Fire and Fuels section and noted under the Cumulative Effects summary earlier in this chapter) is expected to contribute to the adverse effects described above.

Similarly, timber harvest and other management disturbances on ultramafic soils are limited. The ultramafic sites where POC is most important tend to be those whose productivity (fertility) precludes them from being managed for regularly scheduled timber harvest. The maintenance of the existing forests on such landscapes is a primary management objective, and management actions purposely removing POC from these sites are unusual and unquantifiable. Where proposed at all, efforts will be made to avoid or minimize the types of effects described above for PL-related POC mortality.

Timber harvest could temporarily reduce the functional acres in POC plant associations within the Matrix land allocation, but the likelihood of those being the significantly rare associations simultaneously jeopardized by PL is small, either because of the above riparian or ultramafic considerations, or because the site-specific analysis for the timber sale would recognize their uniqueness. Timber sale-related removal of any other, non-rare POC associations would only be done subsequent to analysis indicating such openings, even combined with the mortality described in this SEIS (since those analyses would tier or incorporate this SEIS), were acceptable.

The potential for Sudden Oak Death to cumulatively contribute to the effects above is unknown because its occurrence in the POC range is limited so far, and there is no evidence yet that it affects POC.

Botany

Affected Environment

POC is found from southwestern Oregon to northern California, primarily in the Coast Range, Siskiyou and Klamath Mountains. There is a small disjunct population in the Scott Mountains of California (see Figure 1-1). The following discussion is organized by the same geographic grouping of plant associations as the Ecology section, to capture the range of threatened and endangered species, plant diversity, and ecosystem functions. POC has a narrow geographic range, and occupies variable and different habitats.

Northern Coast comprises the mid-Coastal Sedimentary and Southern Oregon Coastal Mountains Ecoregions. This area has lower elevation, higher rainfall, and dense coniferous forests. *Lilium occidentale* (western lily) is found in openings within stands of POC (Brian 2003; Segotta 2003).

Note: See accompanying biological evaluation for identification of species that are state or federally listed as threatened or endangered (Appendix 7).

North Inland includes the Inland Siskiyou and Siskiyou Mountains Ecoregions. Conditions

here are highly varied, and the area has high species diversity. Many rare plants are endemic or have their greatest extension here, such as *Castilleja miniata* ssp. *elata*, *Epilobium oreganum, Darlingtonia californica, Cypripedium californicum, Gentiana setigera, Hastingsia bracteosa* var. *atropurpurea, Hastingsia bracteosa* var. *bracteosa, Viola primulifolia* var. *occidentalis,* and *Smilax jamesii* occur from Smith River to Eight Dollar Mountain with the highest number of rare species along Josephine Creek and Eight Dollar Mountain. ***Note**:* Rare in this context includes unique, locally endemic, narrow ecological amplitude, Agency sensitive, and state or federally listed as threatened or endangered. These sensitive species share *Darlingtonia* fens or streams in ultramafic soils with POC.

Mid-Coast comprises the Coastal Siskiyou located in Oregon; it is an area with rugged mountains and high gradient streams, and a few alpine glacial lakes. This area has higher precipitation rates, with *Darlingtonia californica, Cypripedium californicum,* and *Gentiana setigera* associated with serpentine wetlands from Gasquet Mountain Ultramafics, Serpentine Siskiyous to Coastal Siskiyous.

Mid-Range includes the Serpentine Siskiyou/Gasquet Mountain Ultramafics of California Ecoregions and the Western Jurassic subsection. POC is found at higher elevation in this highly diverse ecoregion. POC here is also found in drier peridotite soils, which is also the preferred habitat of *Arabis macdonaldiana* (Vorobik 2002), endangered rock cress. *Arabis macdonaldiana* grows in the barest unoccupied peridotite rock, at the most sharing these microsites with Roemer's fescue, and sedums. Jeffrey pine does well in this habitat type, and could increase its presence in the absence of POC (Brian 2003). These ecoregions have extensive fens, from very small seeps to hanging fens that run for more than a mile on the side of the mountain, especially on Oregon Mountain and Rough and Ready Creek.

The Western Jurassic subsection is moderated by marine air creating a temperate to humid environment, making this subsection the second highest in POC abundance. *Arabis macdonaldiana* occurs on peridotite in openings within POC stands.

East Disjunct California includes the Eastern Klamath Mountains and Lower Scott Mountains subsections where sensitive species like *Balzamorhiza sericea*, *Chaenactis suffrutescens, Epilobium oreganum, Erythronium citrinum* var. *rodereckii, Ivesia pickeringii, Penstemon filiformis, Phacelia leonis,* and *Smilax jamesii* occur*;* and the Upper Scott Mountains subsection which is home to *Arctostaphylos klamathensis, Epilobium siskiyouensis*, *Minuartia stolonifera, Phacelia dalesiana*, *Phacelia greenei, Potentilla cristae, Raillardella pringlei,* and *Smilax jamesii* (Nelson 2003). The three areas share the same geologic pattern.

Southern Range includes the Eastern Franciscan, the Pelletreau Ridge, and Rattlesnake Creek subsections. The first represents the higher elevation coastal, the second stands alone, and the third is on peridotite with a small population of POC. The Rattlesnake Creek Terrane is home to *Epilobium oreganum* which here occupies stream areas, meadows, and seeps without *Darlingtonia californica* as an associate species.

There are no federally- or state-listed threatened or endangered plants that occur in the riparian zone. The BLM special status and FS sensitive and other rare plants that occupy and share habitats with POC are generally in good overall condition. Some of them are inadvertently affected by other activities such as mining, recreation (especially off-highway vehicles), wildland fire, noxious weeds, timber harvesting, roads, and wildland fire suppression (Frost 2002).

Because of fire exclusion, open fens and some of the riparian areas have been encroached upon by shrubs and trees that compete with rare vascular plants for space and moisture. This is most evident on the Oregon Mountain and Rough and Ready Creek fens. The upper reaches of Josephine Creek were burned in 1994 by the Mendenhall Fire and back-fired during the 2002 Biscuit Fire. POC's highest benefit to rare vascular plants appears to be providing soil stability and shade. The Days Gulch fen, for example, was affected by the Biscuit Fire and had been burned under prescription twice previously. Erosion was evident because the grass, pitcher plant, and shrubs had been burned without enough time to allow for regrowth between the last prescribed fire, the Mendenhall Fire, and the Biscuit Fire back-firing. Sediment was deposited within the fen, burying a small population of *Epilobium oreganum* where a road culvert slowed runoff.

POC is a prolific seed producer with an estimated 40 million seedlings within the range in both states (Goheen 2003). However, large old POC trees have a higher value than seedlings to the environment in general, and rare plants in particular. Large trees are essential for soil stabilization and microclimate moderation (Nelson 2003). In some areas, POC is a barrier between the recreating public and rare plants, especially off-highway vehicle users. The growth form of POC creates a fence-like barrier with boughs that prevents the public from seeing vulnerable ecosystems like fens or seeps in some areas.

POC forms endomycorrhizae with some fungi (Zobel et al. 1985); most herbaceous plants are endomycorrhizal, but the relationship between POC and vascular plants has not been studied (thus a connection has not been established).

Arabis macdonaldiana occupies peridotite openings in the Gasquet Mountains/Serpentine Siskiyou Ecoregion, sharing similar soil conditions, but separate habitats than POC. A dependent relationship has not yet been studied or established (Hoover 2003).

Effects of the Alternatives

Potential effects to species listed under the "Endangered Species Act" are also discussed in the biological evaluation in Appendix 7.

Alternative 1

This alternative is the current management direction for BLM districts and the Siskiyou NF. It seeks to reduce or prevent introduction of the pathogen into disease-free areas by closing roads into these areas during the rainy season to prevent carrying the spores from infested to uninfested areas, analyzing the risk of introduction to disease-free areas, developing mitigation measures at the project level, informing the public about the reason for these measures (see Appendix 2), and other provisions.

The effects of Alternative 1 to the botanical environment are varied. The areas with the highest presence of rare plants appear to be free of infestation, with the exception of Whiskey Creek, narrow bands on lower Josephine Creek, and Middle Illinois River. Seasonal road closures prevent the introduction of noxious weeds to rare plant areas when soil conditions are optimal for seed germination. Another positive effect from this alternative to rare plant habitats is vehicle and equipment washing. Washing substantially reduces the probability of introducing noxious weeds. Gates help prevent off-highway vehicle recreation, which has a

positive effect on rare plants by decreasing soil disturbance at a time when soil moisture is high and vulnerable to erosion and compaction.

Alternative 2

This alternative is similar to Alternative 1, except that practices currently implemented or recently developed are better described, a risk key is included for clarification of the environmental conditions that would trigger additional control or mitigation measures, and the 162 uninfested 7th field watersheds are emphasized. Implementation of disease-mitigating practices is expected to be more consistent because of the key.

The effects of Alternative 2 are similar to Alternative 1. Implementation would reduce the rate of spread of the disease when compared to Alternative 1. Continued development of resistant stock would make stock available for timely replacement in important habitats. Emphasis on 7th field watersheds means 71 sensitive or special status species sites will more likely be protected. Alternative 2 would help maintain a lasting presence of POC in unique plant communities, which seem to be more abundant in high-risk areas.

Alternative 3

Alternative 3 adds additional protection measures to 31 uninfested 6th field watersheds that have at least 100 acres occupied by POC. It divides these watersheds into POC cores and buffers and applies additional Standards and Guidelines to each to lessen introduction of infection to the POC core areas.

The effects of Alternative 3 are the same as Alternative 2, with the exception of effects within the 31 uninfested watersheds. In these watersheds, the prohibition of harvest and discretionary uses in POC cores would increase the probability of a lasting presence of POC in unique plant communities in these areas. Unique plant communities seem to be more abundant in high-risk areas. Alternative 3 has 20 known special status species on BLM lands within 4 POC core areas and 35 known sensitive species on FS lands within 18 POC core areas. Closing roads and lessening off-highway vehicles and other disturbances to rare plant communities would provide other benefits to rare plants through decreased disturbance and decreased weed introductions throughout the watersheds.

Alternatives 4 and 5

Alternative 4 would remove all preventive measures that are currently in place and would speed up the resistance-breeding program to more quickly replace POC killed by the disease with resistant seedlings. Alternative 5 would remove all preventive measures and discontinue development of the resistant-breeding program. Existing resistant seed orchard trees would continue to be used to reforest areas of mortality in breeding zones for which resistant stock is already developed.

The effects of Alternatives 4 and 5 are similar, differing only in the mid and long term where Alternative 4 would deter advancement of the disease by increasing the introduction of resistant stock. Alternative 5 would rely primarily on the natural evolutionary processes involving the very low frequency of resistant POC that are widely scattered in forests.

These alternatives would allow for faster advancement of the disease compared to the current direction in high-risk areas (see Pathology section). The effect of this high mortality on rare plants is unpredictable. POC is a large component of riparian habitats in areas where it is the largest tree species. It would be logical to infer that the loss of shade and stream bank stability that would result from the loss of POC would have a negative effect on the sensitive and rare plants that are adapted to stream microsites.

Alternative 6

Alternative 6 contains all the management elements of Alternative 2, and seeks to slow the spread of PL even more by adding additional protection for 162 currently uninfested 7th field watersheds having at least 100 acres of stands containing POC. This alternative would the most beneficial to unique plant communities. There are 15 known special status species on BLM lands within 4 POC core areas; and 56 known sensitive species on FS lands within 42 POC core areas. Closing roads to most activities at the most critical time would decrease disturbance and possible impacts to Darlingtonia fens, other wetlands, and unique habitats. It would provide indirect benefits to unique species by reducing impacts to highly erodable ultramafic soils and helping prevent the introduction of noxious weeds.

Although there are negative effects to plant communities if POC is killed by PL, negative effects of the loss of POC to threatened, endangered, and Forest Service sensitive and BLM special status plants cannot be determined from the known information.

Cumulative Effects

As noted above, the effect of POC mortality on rare and unique plants is general, and the effect on particular species or sites is unquantifiable and unpredicatable. No listed plants are uniquely linked to POC. Those potentially affected by the alternatives are ones with limited known populations that appear likely to be affected by the loss of shade or physical protection. Even this effect is limited because potentially affected species are generally in good shape. However, such effects would be in addition to those from mining, off-highway vehicles, wildland fire and its suppression, noxious weed encroachment, timber harvesting, road construction, and other activities. Effects of those activities are both so localized, and the subjects of their own analyses and applicable mitigations measures, that cumulative effects predictions would need to be made on a case-by-case basis associated with those activities. That is not possible here because the future PL mortality sites are unknown.

Standards and Guidelines intended to reduce the spread of PL, however, have some direct benefit to rare and unique plants. These are specific to alternatives and are thus described above. They include POC-related road closures preventing foot and off-highway vehicle access to rare plants, thereby reducing injury and soil compaction, and vehicle washing reducing the import of noxious weed seeds which are compete with local endemics.

Water and Fisheries

Affected Environment

The POC range includes southern Oregon coastal watersheds, northern California coastal watersheds, and upper portions of the Umpqua Basin, Rogue Basin, and Klamath Basin.

High-Risk Sites

High-risk sites for transmission of PL infestation include water flowing in linear channel features and direct water influence zones, including connected off-channel areas and flood-plains. Included are road ditches that link with the stream network and gullies formed from cross-drain runoff that continues downslope until a drainageway is met. There are approximately 11,843 stream miles in the Oregon POC range, with 1,510 miles showing presence of POC near streams, and 295 miles infested. The ultramafic geomorphological area has 591 stream miles of POC presence near streams, of which 129 miles are infested. Current POC mapping (Map 4), overlayed with streams, reveals that POC is adjacent to 13 percent of the stream mileage, and current infestation is estimated at 2.5 percent of the mileage. Standing water such as lakes, fens, bogs, and topographic depressions with soils exhibiting persistent high-water tables, may have lower transmission rates, but are in the category as high risk. The high-risk sites are directly associated with water and are almost always much narrower than the Northwest Forest Plan Riparian Reserves.

POC is not normally infected more than 40 feet downslope from roads or trails, except where streams, culverts, wet areas, or other roads are present to facilitate further movement (Goheen et al. 1986b). As was stated in the previous section on Pathology, the probability of infection downstream is highest when PL inoculum is introduced directly into water at a stream crossing or a ditch and POC with their roots in the water are present immediately downstream. Although a recent dendrochronological study provides evidence of infection beyond 160 meters (Jules and Kauffman 1999), limitations to the study make it impossible to ascertain if the transmission was actually over this distance or resulted from several small tree infections between the initial source of inoculum and the large tree that was studied. In any case, the probability of infection at distances greater than 100 feet is very low (2 to 4 percent).

Streams and Flow Paths

Stream densities vary by physiographic provinces. The Coast Range Physiographic Province has total stream densities varying from 5.31 to 12.80 miles per mile square, Franciscan Formation has 6.27 to 9.04 miles per mile square, and Klamath has from 4.63 to 9.76 miles per mile square (USDA-FS et al. 1993). At a planning level, ephemeral and intermittent streams are in headwaters positions and can be classified as 1st and 2nd Order (Strahler 1957). Perennial streams are normally 3rd Order or greater where enough drainage area, soils, relief, and other landscape features interact to form a drainage that can support a year-round flow. Ephemeral/intermittent streams vary from 65 to 80 percent of the stream network, and perennial 20 to 35 percent (USDA-FS et al. 1993).

Stream uppermost surface origin or pourpoints expand further up the drainage with the onset

of maritime winter storms. As soils become saturated, further precipitation would runoff into ephemeral/intermittent stream channels, which are above the water table. Overland flow may also appear on compacted areas, including road surfaces, landings, quarries, or soils with high surface rock contents. Although infrequent, rapid melt of shallow snowpacks in the intermittent snow accumulation zone (above 2,000 to 2,500 feet) can lead to overland or concentrated flow in certain areas, increasing stream flow paths. Road-stream connections from roadside ditches, and gullies from ditch relief culverts entering a channel, can substantially boost the drainage density. In one study in the Cascades (Wemple et. al 1996) stream density increased from 21 to 57 percent, depending on dynamic expansion with increasing levels of stormflow.

Assessment of Salmonid Stocks

The assessment by Oregon Department of Fish and Wildlife and California Department of Fish and Game of the status of steelhead in southwest Oregon in 1997 found that the Winchuck River had healthy stocks, but others had depressed winter and/or summer runs (Illinois, Pistol, Chetco, and Rogue Rivers). Oregon Department of Fish and Wildlife determined that trends in the Rogue River were positive and that the steelhead population was stable and not threatened. Winter steelhead spawners roam and will migrate to other areas if conditions to spawn are not good in one stream. As a result, production can vary dramatically from stream-to-stream annually (Rogue Valley Council of Governments 1997). The National Marine Fisheries Service had ruled by 2001 that Klamath Mountain Province steelhead were not warranted for listing as threatened ([online]URL:http://www.nwr.noaa.gov/).

Steelhead habitat is contiguous with that of coho salmon, and 90 percent of the limiting factors for coho salmon are also limiting for steelhead. Similar habitat problems exist for the two species in the Rogue and South Coast Basins. One important distinction is that coho salmon require deeper pools and more side-channel habitat than steelhead for optimal rearing (Rogue Valley Council of Governments 1997).

The wild Southern Oregon/Northern California coho salmon was listed as threatened in May 1997, and the Oregon Coast coho salmon was listed as threatened in August 1998. Southern Oregon Coast/California Coast chinook salmon were not warranted for listing as threatened in September 1999 ([online]URL:http://www.nwr.noaa.gov/).

Current BLM Manual 6840 provides policy and guidance for the conservation of special status species of plants and animals. Oregon/Washington BLM uses three categories for special status species besides endangered, threatened, and candidate designations: Bureau sensitive; Bureau assessment; and Bureau tracking. Classification is dependent upon the different State of Oregon or Oregon Natural Heritage Program designations.

Fall chinook salmon (Bureau sensitive) and spring chinook salmon (Bureau assessment) in the Southern Oregon and Northern California Coastal Evolutionary Significant Unit are on the Oregon/Washington BLM special status species list. Bureau 6840 policy requires that any Bureau action not contribute to the need to list (under the Federal "Endangered Species Act") any species with Bureau sensitive designation (IB-OR-2000-092). The BLM Manual at 6840.01 ([online] URL:http://www.blm.gov/nhp/efoia/wo/manual/6840.pdf) directs the conservation of special status species by the use of all methods and procedures which are

necessary to improve the condition of special status species and their habitats to a point where their special status recognition is no longer warranted. A similar FS policy directs the conservation of sensitive species (refer to the Fisheries biological evaluation in Appendix 7).

Salmonid Limiting Factors

Salmonids are frequently used as indicators of watershed health and the impacts of human activities because they have complex life histories and specific environmental requirements. All salmonid species in the project area have similar freshwater requirements. For optimum production, all species require cool flowing waters; free passage through migratory routes; clean gravel substrate for reproduction; water with low turbidity during the growing season for sight feeding; high levels of dissolved oxygen content in streams and within gravel; sufficient instream hiding-cover; and invertebrate organisms for food (USDA-FS and USDI-BLM 1985).

Steelhead, in particular, serve as an indicator species for the fish and aquatic habitats affected by the proposed action because their freshwater requirements are similar to other salmonids and nonsalmonid coldwater species (such as sculpins [*Cottus* spp.] and Pacific lamprey [*Lampetra tridentata*]). In addition, steelhead habitat extends further upstream than that of most fish species within the planning area. In the Rogue and South Coast Basins, which correspond to the Oregon portion of the region and south to the Klamath River in California, there are approximately 6,913 total stream miles of steelhead spawning and rearing habitat. About 1,489 miles, involving 61 total stream miles (about 50 percent Federal ownership), are designated as high-value winter steelhead spawning areas. There is a total of 245 miles (about 27 percent Federal ownership) of summer steelhead streams (Rogue Valley Council of Governments 1997).

Further GIS analysis of the planning area indicates that within the Oregon POC range, there are approximately 2,235 miles of winter and summer steelhead habitat. Steelhead distribution is often used as a conservative estimate of designated Coho critical habitat because the habitat is overlapping and steelhead use extends upstream as far as or further than coho use. This may result in overestimating the effect to coho habitat somewhat, but for the current analysis, it is a useful method. Approximately 301 miles of steelhead habitat within the Oregon POC range have POC present; 168 miles (7.5 percent of the total habitat miles) are in nonultramafic soils, and 133 miles (6.0 percent of the total habitat miles) are in ultramafic soils.

The Southwest Oregon Salmon Restoration Initiative (Rogue Valley Council of Governments 1997) identified the representative priority limiting factors for steelhead streams in the Rogue and South Coast Basins, corresponding to most of the Oregon portions of the Region and south to the Klamath River in California. Low stream flows limit summer rearing habitat, increase water temperatures, and increase competition and the risk of predation. High water temperatures foster disease and diminish food supply. Inadequate riparian habitat was identified because stream canopy over side channels and alcoves provides shade which helps reduce stream temperatures, stabilizes streambanks, serves as holding areas for fry and smolts, and provides a food source for aquatic life. Inadequate levels of instream large woody debris were identified, because large woody debris provides shelter for steelhead, creates pools, collects spawning gravel, helps reduce water velocity, and provides hiding habitat. Sediment and erosion were limiting factors, as they affect spawning areas, fishery

health, and water quality. Fish passage at road crossings was identified as needing improvement.

Aquatic Interactions

Habitat characteristics such as channel form, pool riffle sequence, water temperature, water chemistry, water flow depth, velocity, substrate, and cover are linked to the stream adjacent to riparian areas, including large woody debris availability, shading, bank stability, litterfall, and nutrient cycling. Five classes of factors affect aquatic biota; food (energy source), water quality, habitat structure, flow regime, and biotic interactions (Spence et al. 1996).

Soils Limiting Forest Growth

POC in the Inland Siskiyou Region is often associated with dark-colored igneous ultramafic rocks. Ultramafic rocks and soils have higher iron and magnesium nutrient availability that limits tree growth of many species. However, POC tolerates these soils and is sometimes the only tree species supported. The Gasquet Mountain Ultramafics Ecoregion roughly corresponds to this soils area (USDA-FS and USDI-BLM 2003b). There are approximately 10,600 acres of riparian plant associations with a prominence of POC on these soils (Table 3&4-12).

Ultramafic rocks were derived from sections of the seafloor which were produced at spreading centers and then lifted up onto the continental shelf, instead of being subducted. Less than 1 percent of the United States is underlain by ultramafic material ([online] URL: http://jersey.uoregon.edu/~mstrick/AskGeoMan/geoQuerry23.html). These rocks have a relatively low concentration of silica and oxygen, and are enriched in iron and magnesium. They are not stable at surface temperatures and metamorphose into other forms including serpentine ([online] URL:http://jersey.uoregon.edu/~mstrick/GeoTours/Josephine%20Ophiolite/JoOphiolite.html). Because soils produced from ultramafic rocks are rare, plants occurring on them can also be rare.

Headwater Confined Stream Channels

Channel morphology. Headwater confined stream channels in the POC range would be classified as A, or Aa+ (more than 10 percent gradient on bedrock) channels (Rosgen 1996). Characteristics include steep gradients (generally greater than 4 percent), vertically contained, width/depth ratios less than 12, relatively straight, and do not spread on floodplains with incremental increases in winter flow. These channels are generally 1st and 2nd Order, and usually have steep stream-adjacent hillslopes. Substrates vary from bedrock, boulder, and gravels to fine sediments. These channels are above the water table, and based on duration of flow, are either ephemeral (stormflow only when soils are saturated) or intermittent (longer duration, but less than all year). Headwater channels collect from small catchments (normally less than 1 mile per mile square) that feed into drainages.

PL inoculum present in these headwater streams may affect POC on streambanks, but not in upslope positions (Goheen, D.J., *personal communication*).

Bank stability. Bank erosion is caused by stream power from flow and sediment in the channel that can erode channel margins. Bare banks are more susceptible to erosion (soil

grain size and ease of detachability become important). Riparian vegetation acts as hydraulic resistance and binds soil particles. Herbaceous vegetation and trees with a matrix of fine and coarse roots that tend to interlock soils counter erosive forces. In headwater channels, banks can be undercut and cause trees to slide into the channel, but this is less frequent because many channels are laterally confined by bedrock. Some sections of the channel are prone to downslope soil creep and delivery of whole trees, debris, and soils. Although tree mortality causes fine roots to decay in a few years, the larger roots last considerably longer (Burroughs and Thomas 1977).

Large woody debris. Large wood accumulates in confined channels to form reservoirs for sediment accumulation and a step-pool system that dissipates stream energies. Many low-order streams accumulate large woody debris and sediment for long periods of time that are removed downstream by episodic transport as debris flows (May and Gresswell 2003).

Stream temperature. These channels do not contribute to stream heating because they are dry during the summer months.

Mid-Drainage-to-Valley Moderately Confined to Unconfined Stream Channels

Channel morphology. Moderately confined to unconfined stream channels in the POC range would be classified as B, C, and D streams (Rosgen 1996). Stream characteristics include gradients less than 4 percent and generally less than 2 percent, width/depth ratios greater than 12, and meandering on a variety of substrates moved and deposited by the river (alluvium). Higher winter flows cause spreading within the floodplain, at least on one side of the stream. The streams have active channel widths of 15 to 30 feet for B streamtypes and greater than 30 feet for C and D streamtypes. Floodprone areas can be narrow to hundreds of feet wide. The F channel type, common in the northern part of the POC range, is a larger stream on a flat gradient that does not have a floodplain. These streams to rivers are 3rd Order and greater and are mostly perennial. Watershed drainage areas would generally be less than 15 miles per mile square for the mid-drainage B channel types, and greater than 15 miles per mile square for the C and D channel type valley streams corresponding to the 7th, 6th, and 5th field hydrologic unit boundaries ([online] URL:http://wwwga.usgs.gov/gis/iag.html).

Aspects of fish habitat that are influenced by channel morphology in these streams include pool frequency, residual pool depth, pool complexity, and the presence of side channels and alcoves.

Stream hydrology. Analysis of stream channel gauging data for southern Oregon shows an approximate 1.5 year bankfull flow would just fill the active channel and not spread laterally, while a 100-year recurrence interval flood would have a depth of 2.0 to 2.2 times the mean depth at bankfull (Fogg, J., *personnel communication*). The actual flooding width during large storms would depend on the runoff and channel geometry, slope, and roughness.

Inoculum present in the water column may affect POC on streambanks, and laterally away from the active channel to the depth of runoff for a particular event. Extensive floods in southwestern Oregon and northern California occurred in 1955, 1964, 1971, and 1996.

Bank stability. Banks in low gradient mid-drainage-to-valley streams can be strengthened by dense root systems from shrubs and trees. However, the streambank can still be easily undercut, particularly on the outside of channel bends, and may reverse the binding effect of roots. Normally, tree roots are wide and spreading and are not more than a few feet deep. Within the ultramafic areas in these streamtypes much of the bank is armored with durable cobble and boulder material. Where POC trees line the banks, their roots are often undercut, providing instream cover for fish. Since dead POC is resistant to decay, there may be little difference in streambank stability compared to living POC when the overriding forces of streamflow are considered.

Large woody debris. Large wood is recruited from streambanks or transported downstream by debris flows or floatation during high flows. Storm events in the moderate-to-high-gradient channels result in large woody debris moving downstream (Mellen, K., *personal communication*). This general down-valley movement is part of the recruitment process, and provides for wood to accumulate in productive gravel-rich low-gradient depositional stream reaches and enhance rearing and spawning habitat (McCain, M., *personal communication*).

Typical studies in western Oregon (McDade et al. 1990) show that riparian stand source distance for old-growth conifer has a median distance of 34 feet, and 87 percent fall within 82 feet of the stream. Maximum source distance was 198 feet. Furthermore, 11 percent of all woody debris originated from 3 feet of the bank. Fluvial erosion and bank undercutting could be responsible for part of this observed supply. Research has shown that for mature and old-growth coniferous forests, wind and tree mortality are the principal agents in initiating treefall (Lienkaemper and Swanson 1987).

POC large woody debris has tremendous longevity. For example, standing dead cedar in a dendrochronology study were routinely over 100 years old and one snag was dated to 264 years old (Jules et al. 2002). Dead wood that is subject to wetting and drying cycles and microbial decay in air, breaks down faster than when buried in streams. In another study in western Washington, 80 percent of coniferous wood added to a channel was depleted within 50 years, although some wood was buried in the floodplain to be exposed centuries later by stream migration and dated at 1,400 years old (Hyatt and Naiman 2001). POC is expected to have long depletion times; much longer than reported for other coniferous species, whether spanning the channel or buried with sediments. This persistence of POC allows the logs to function for decades to centuries as cover; influencing the storage, sorting, and routing of hillslope sediment and channel substrate, and therefore the formation of pools; and to maintain adequate levels of overall stream habitat complexity.

Large woody debris in moderate-width B channels adds important structural elements that erode or protect banks, change flow direction and velocity, influence deposition zones, and scour pools. The debris adds cover and complex habitats for salmon and trout. The large woody debris is normally retained if its length is at least 1.5 times the channel width or includes a rootwad on the bank. In larger C and D channels, large woody debris is floatable and is moved downstream and can become embedded in jams. The debris is lodged near the high waterline on the outside of channel bends or on mid-channel bars and can initiate meander cutoffs. Secondary channel systems formed are primary areas for salmonid rearing because they provide off-channel refuge during high flows.

The link between POC communities, woody debris, and coho habitat is typically indirect.

There can be a considerable distance and time between the point when large woody debris enters a stream and when it functions as a component of coho habitat. Coho generally spawn and rear in low-gradient, gravel-rich, wood-influenced channels that are located downstream from the steeper headwater source streams (including ultramafic POC-dominated channels) that transport and deliver wood. The structural function of large woody debris, as described above, not only creates instream habitat complexity, but also influences macro-invertebrate diversity and productivity. Small woody debris and fine organics are retained in a properly functioning stream and act as substrate and nutrient supply for fish prey species.

Stream temperature. Stream temperature is based on an array of physical and ecological processes. Summer temperatures are of interest because thermal loading can elevate stream temperatures beyond optimum (14.5 degrees C [58 degrees F]) for salmonids and other aquatic life. The desired water temperature for salmonids during spawning is less than 13 degrees C (55 degrees F). Juvenile rearing salmonids can tolerate diurnal fluctuations of 10 degrees C (18 degrees F) without seeking cooler water if the daily minimum temperature is well within the optimum range (Meehan 1991).

Streams with limited canopy that are exposed during the winter months can have energy losses and a decrease in stream temperature. In most of the Oregon and northern California region, except for areas further inland and at high elevations, temperature losses are minor. This is due to nighttime cloud cover and normally moderate air temperatures (Beschta et al. 1987).

Average dry season precipitation (May through September) varies from 7 inches in the Northern Coastal Region, 9 to 18 inches in the Siskiyou Region, and 4 to 5 inches in the Inland Siskiyou Region (Oregon State University 1982). Mid-summer is even drier and streamflows recede in the POC region to about 0.22 cubic feet per second per mile square by July through August. The sun's vertical position (zenith angle) is higher in the summer and its horizontal position (azimuth) is more northerly. These interactions of solar physics result in greater incoming direct-beam solar radiation, the most important factor influencing summer stream temperature change (Brown 1969). Greater available solar radiation, peaking in June–August, coupled with low flows, can result in lesser stream buffering capacity to maintain temperature.

Depending on the sun's path and time of day in summer, trees and shrubs and topography cast shade on streams. When the sun is high, trees closest to the stream provide shade, and as the suns position lowers, vegetation farther from the stream intercepts radiation and casts shadows. Shade is often used as a surrogate for temperature because when shadows block the sun there is much less heat energy gain (Beschta et al. 1987). Depending on the riparian site (including topography, stream orientation, tree height, tree overhang, canopy density, stream width, stand composition, and relative abundance of POC infected with PL) lesser shading may or may not result.

Angular canopy density (a measure of shade quality) can be used to track changes in shade from forest vegetation. Old-growth coniferous stands in western Oregon average 80 to 90 percent angular canopy density (85 to 90 percent shade), and undisturbed riparian coniferous forests in northern California average 75 percent angular canopy density (80 percent shade) (Beschta et al. 1987). Shade greater than about 80 percent may have no further effect on stream temperature decrease (Boyd 1996).

Shade calculation using a shade simulation computer program was used to simulate a general shade scenario for uninfected mid-drainage and valley streams on ultramafic parent material. The north-south, intermediate, and east-west orientations were modeled. Results showed that if POC was the dominant riparian cover present (as may be the case in many ultramafic riparian plant communities), then 86 percent, 88 percent, and 88 percent shade, respectively, would exist along the mid-drainage streams using the three aforementioned stream orientations; and 70 percent, 69 percent, and 49 percent shade, respectively, would exist along the valley streams (Parks 1993). Furthermore, the model predicts a temperature rise of 1.4 to 1.6 degrees C per mile for the mid-drainage streams and 1.8 to 3.0 degrees C per mile for the valley streams with the predicted shade cover (see Appendix 9).

Modeled shade results should be used cautiously. Factors changing shade values or stream temperature effects may include: (1) site factors; each shade reach has its own specific attributes that should be modeled; (2) secondary shade trees of another species, set back from the water's edge, perhaps on stream terraces, can increase shade above the modeled predictions; (3) lateral adjustment of streams by bankcutting can increase or reduce shade; (4) effects of riparian shade on valley streams decrease with increasing distance from the streambank when influenced by channel confinement and floodplain development—this may lead to a natural conditions equilibrium temperature in these streamtypes because vegetation has less control on temperature rise; (5) mixing of bank-stored water in river alluvium with the stream can lower stream temperature; and (6) water withdrawals can increase stream temperatures.

Water Quality Limited 303(d) Streams

Calculations, based on current data, indicate there are approximately 1,020 miles of Oregon Department of Environmental Quality listed 303(d) stream segments listed for temperature within the POC range in Oregon. This represents 8 percent of the total streams in the Oregon portion of the POC range. The listings are generally along valley and some mid-drainage streams. Because of many site variables, including various proportions of different tree species in the overstory, a site-specific analysis of each riparian plant community with an assemblage of POC would be required to determine if, and to what degree, loss of POC canopy density may have on stream temperature.

Effects of the Alternatives

Hydrology/Fisheries Interactions

Inoculum would continue to be introduced into flowing water by spread vectors under all alternatives. The probability, timing, and spatial distribution of the new occurrences vary under the alternatives. Some alternatives apply more stringent control measures in an effort to limit these new occurrences.

North Coast Risk Region (Siskiyou NF Powers Ranger District, and Coos Bay BLM District). POC is a scattered minor component of riparian associations. Since the infestation has been in the north area the longest (more than 50 years), nearly all streams (75 percent) have become infested (refer to Table 3&4-10 in the Pathology section). Approximately 20 percent of known POC distributions are in high-risk sites along streams, floodplains, bogs, fens or other low and depressional areas, or downslope from infected areas. It is estimated

that an additional 10 percent of uninfected POC in these high-risk sites would become infected in the next 100 years under Alternative 1, 7 percent under Alternative 2, 5 percent under Alternative 3, 20 percent under Alternatives 4 and 5, and 4 percent under Alternative 6 (Table 3&4-10 in the Pathology section).

The loss of POC under any of the alternatives would not have a detectable effect on fish in this region. POC lost to PL in riparian zones would gradually be replaced by those of other conifer species (refer to the Ecology and Plant Associations section). In this region POC is a scattered component of riparian stands. Gaps in the canopy created by dying crowns are small and spatially distributed so average crown density (one of the factors in a shade analysis) is not reduced at a reach scale of analysis. Spaces in the canopy would typically be filled rapidly by adjacent trees broadening their canopies, release of understory trees, or seeded trees. Summer temperatures and large woody debris recruitment would be maintained within the natural range of variability in headwater streams and mid-drainage and valley streams (see discussion below).

The Siskiyou Risk Region (Siskiyou NF in Oregon and Six Rivers, Klamath, and Shasta-Trinity NFs in California). This region has seen increasing spread of PL in POC along roads and down streams in recent years. Many POC in the valley bottoms are old and range 20 to 60 inches in diameter (refer to Background section). Estimates are that 40 percent of known POC distributions are in high-risk sites along streams, floodplains, bogs, fens, or other low and depressional areas, or downslope from infected sites (refer to Pathology section). It is estimated that 27 percent of the high-risk sites are infested. Infestation predictions for the Oregon portion of the range show that an additional 31 percent of POC areas in these high-risk sites would become infested in the next century under Alternative 1, 24 percent under Alternative 2, 16 percent under Alternative 3, 62 percent under Alternatives 4 and 5, and 14 percent under Alternative 6 (refer to Table 3&4-10).

The loss of POC on headwater streams in this region under any of the alternatives will not have a detectable effect on fish because summer temperatures would not be elevated and the function of large woody debris transport would be maintained. Loss of POC on mid-drainage and valley streams within the nonultramafic portions of this region would not have a detectable effect on fish for the same reasons stated above in the North Coast Risk Region (that is, other conifer species gradually replace POC, and summer temperatures and large woody debris function are maintained). In the lower rainfall ecoregions to the east of the Coastal Siskiyous boundary, species present with POC along creeks in nonultramafic soils would be expected to colonize the canopy gaps left by POC loss, and the miles of stream are discontiguous and dispersed among watersheds (see analysis in the Ecology and Plant Associations section).

Mid-drainage and valley streams within ultramafic areas of this region would be affected by the loss of POC. Because POC mortality on these streams is not predicted to disrupt the recruitment of large woody debris (see following discussion), no effects to fish are anticipated related to its function (such as pool formation, instream complexity, and gravel recruitment). However, the loss of POC stream shade and the associated elevation of summer temperatures on these streams could have an indirect short- and long-term effect on fish. For steelhead and most salmonids this effect would not be significant under any alternative because of the very limited habitat area it involves (6 percent of the total habitat), the small contribution to the population the affected fish make, and the ability of steelhead and resident

trout to move and vary their production (see the Cumulative Effects discussion).

Coho also could be affected indirectly in the short and long term by elevated summer temperatures within ultramafic areas of this region. Using steelhead distribution as an estimate of miles of coho habitat, the miles of coho streams affected by the loss of POC in the ultramafic areas would be 6 percent of the total habitat. Within this 6 percent of the miles of coho habitat affected, the impact varies according to the proposed alternatives, which are compared below.

From Alternative 1 to 6, the area affected decreases as the 100-year high-risk riparian infestation prediction decreases to the lowest percentage (41 percent) in Alternative 6 (Table 3&4-10). Under Alternative 1, 58 percent POC infestation would mean that half of the drainages could be affected by elevated temperatures due to shade loss (not that all drainages would lose half of the shade produced by POC). Under Alternative 2, this would be the case also, as 51 percent POC infestation is predicted. The indirect effect to coho from elevated temperatures would be about the same under Alternatives 1 and 2, less under Alternative 6, and the least under Alternative 3 (because of the greater size of POC buffers). Under Alternatives 4 and 5, the 100-year high-risk riparian infestation prediction of 89 percent would mean that most of the drainages in the area would be affected by elevated temperatures, and the effect on coho would be the same under both alternatives.

The indirect effect that elevation of summer temperatures could have on coho in the ultramafic drainages affected by POC mortality would be a decrease in production and survival. However, for the following reasons, this prediction must be qualified. The shade modeling results discussed in this section and given in Appendix 9 are meant to display a worst-case scenario for temperature increase resulting from POC mortality. The modeling was done for ultramafic soils areas and a homogenous stand of POC. However, POC averages less than 50 percent of the overstory in riparian ultramafic plant associations (Table 3&4-11). The current modeling programs predicting shade do not allow variable stand types resulting in variable canopy densities as inputs. Therefore, the predicted loss of shade and stream warming is overestimated. The analysis of the impacts of POC loss on streams using plant association groups indicates that a small percentage of the stream miles in ultramafic soils would be directly affected by the loss of POC. Of the total 897 miles of streams in the Ultramafic Plant Association Groups east of the Coastal Siskiyous, 192 miles (21 percent) would be affected, and within these miles, POC contributes 38 to 50 percent of the overstory. As pointed out in the discussion of this analysis in the Ecology and Plant Associations section, these miles should not be viewed as contiguous, due to the patchy occurrences of the plant associations with POC. Further, the shade modeling is based on the strip of POC up to 25 feet on each side of a stream. Live POC remaining outside of this narrow zone would be able to provide some shade. In some areas, brush species present along creeks would colonize the gaps left by POC loss and recover shade.

The loss of POC on stream segments in the ultramafic areas would not be anticipated to have a significant short- or long-term effect (see the Cumulative Effects discussion) on coho under any alternative because of the very limited habitat area it involves (6 percent of the total habitat), the limited shade loss that could actually result on a given segment of stream, and the relative contribution to the population the affected ultramafic areas make. The significance of the potential for decreased production and survival of coho in the ultramafic areas must be analyzed in the context of the importance of those areas for coho production in the

region. The Illinois River anadromous fisheries are a stronghold for wild anadromous fish repopulation in the Rogue Basin. The majority of wild coho in the entire Rogue Basin spawn in the Upper Illinois River. Ultramafic-influenced streams are not characterized as providing optimal salmonid habitat, and less coho production comes from the ultramafic portions of the upper watershed than from the nonultramafic portions (USDA and USDI 1997; Rogue Valley Council of Governments 1996).

The Disjunct California Risk Region has POC in highly scattered drainages in different vegetation types, and often confined to riparian areas. Infection incidence is less than 10 percent. Estimates are that 40 percent of known POC distributions are along streams, floodplains, bogs, fens, or other low and depressional areas, or downslope from infested sites (refer to Pathology section).

Inland Siskiyou Risk Region (Medford and Roseburg BLM Districts). POC is generally scattered on the Roseburg District in the Coast Range of the Umpqua Basin. POC on the Medford District is primarily associated with riparian areas, particularly on the Grants Pass BLM Resource Area (refer to Background section). Estimates are that 60 percent of known POC distributions are in high-risk sites along streams, floodplains, bogs, fens or other low and depressional areas, or downslope from infested sites (Goheen, D.J., *personal communication*). It is estimated that 15 percent of the high-risk sites are infested. Infestation predictions show that an that an additional 34 percent of POC areas in high-risk sites would become infested in the next century under Alternative 1, 25 percent under Alternative 2, 17 percent under Alternative 3, 68 percent under Alternatives 4 and 5, and 15 percent under Alternative 6 (Table 3&4-10 in the Pathology section).

In the Roseburg BLM District portion of the region, the loss of POC under any of the alternatives would not have a detectable effect on fish. POC lost to PL in riparian zones would gradually be replaced by those of other conifer species (see analysis in Ecology and Plant Associations section). Summer temperatures and large woody debris recruitment would be maintained within the natural range of variability in headwater streams and mid-drainage and valley streams (see following discussion).

In the Medford BLM District portion of the region, the loss of POC on headwater streams under any of the proposed alternatives would not have a detectable effect on fish because summer temperatures would not be elevated and the function of large woody debris transport would be maintained. Loss of POC on mid-drainage and valley streams within the nonultramafic portions of this region would not have a detectable effect on fish for the same reasons stated above for the Roseburg BLM District portion.

The loss of POC stream shade and the associated potential elevation of summer temperatures in mid-drainage and valley streams within ultramafic areas of this region would have an indirect short- and long-term effect on fish. The effects are the same as described above for the mid-drainage and valley streams within the ultramafic areas of the Siskiyou Region.

Headwater Confined Stream Channels (1st and 2nd Order Streams)

Channels in these watershed and landform positions, on smooth to steeply dissected descending sideslopes, share several stream and riparian attributes common to all alternatives. These channels are most often intermittent or ephemeral. Since these channel types are laterally

constrained by hillslopes and streamflow is vertically contained in the channel, only POC that is not already dead and in or near the water column would be affected. There may be some spatially distributed ongoing declines in root strength with infected POC, which could affect bank stability. However, this effect is localized and is not expected to significantly increase slumps or entry of colluvial material into the channel. Windthrow of dead POC would provide a beneficial effect by increasing the hydraulic roughness and creating a random-to-stepped stream profile. However, POC may persist as standing snags for many years before toppling. Stream large woody debris would have very long persistence and create sediment reservoirs with incorporated organic material. The streamside large woody debris recruitment rate would remain within the range of natural variability. POC overhanging the channels affected by PL would have small pocket areas of an estimated 10 to 15 percent canopy density provided by boles and branches. Winter and spring stream temperatures would remain unchanged. There would essentially be no effect on summer stream temperature relations. This is because these stream types are above the water table and go dry during the warm summer months when stream heating is at a maximum. A summary of riparian and stream attributes in differing morphologies and relationship to PL is shown in Table 3&4-18.

Variable implementation of selected management activities (current direction) under Alternative 1 may have a slight short- and long-term positive effect on lessening the spread of the pathogen through water, when compared to Alternatives 4 and 5. The geographic position of these headwater channels (in many cases in steep topography above roads or greater than 40 feet from roads) would de facto slow pathogen spread to animal or human carriers. Additionally, projects within the Riparian Reserves require Aquatic Conservation Strategy consistency. Current management direction regarding POC would be taken into consideration during these analyses.

Management practices under Alternative 2 are applied in a more structured approach by application of the POC Risk Key. Although the Standards and Guidelines in Alternative 1 use the elements of the risk key, the effects of Alternative 2 may be slightly improved in the short and long term. Systematic planning, direction of limited resources, and operational consistency in avoiding, sanitizing, or eradicating POC may result in lower spread of the pathogen. Management Practice 1 (project scheduling during the dry season) would slow PL resting spore transfer to water because road ditches and 65 to 80 percent of the stream network would be dry. Management Practice 2 (using water from known uninfested sources or treating water) would limit spore dispersal into flowing streams. Management Practice 9 (road management measures with a system of road closures in the wet season and eradication along selected roads) could substantially decrease water entry points particularly into roadside ditches and stream crossings. This would effectively reduce up to 50 percent stream extensions by roads. Management Practice 11 (washing project equipment) when implemented with Management Practices 1 and 9 may be very effective in separating inoculum from watercourses. Within 7th field watersheds, the emphasis in the risk key will provide additional benefits.

Alternatives 3 and 6 (apply mainly to the Siskiyou and Inland Siskiyou Risk Region) are expected to aggressively protect specific headwaters uninfested POC core areas by minimal entry, no timber harvest, and eradication. Since many of the 31 6th field watersheds and 162 7th field drainage core areas are above roads, this would assure that transport of the PL spores would be unlikely to spread by project activities. These alternatives would have a slight beneficial effect on retaining the flow of litter and nutrient inputs, and tree overhang

Table 3&4-18.—*Riparian and stream attributes in differing morphologies and relationships to* Phytophthora lateralis

Riparian zone and stream attributes	Headwater confined stream channels	Relationship to *Phytophthora lateralis*	Mid-drainage to valley moderately confined and unconfined stream channels	Relationship to *Phytophthora lateralis*
Normal water width	In channel	Narrow waterborne infection zone	In channel, connected off channel areas, portions of bars	Somewhat wider area of water infection zone
Flood frequency	Bankfull 100-year return interval	Narrow waterborne infection risk; stream is usually vertically contained by hillslopes	Bankfull 100-year return interval	Overbank flow; leads to wider spreading and [+] PL infection area
Watershed position	1st and 2nd Order channels; generally A+, A, and some B channel types [Rosgen 1996]	[+] Road-stream crossings; but large additive area of unroaded channels above highest crossing, minimizing infection entry, leading to [++] distribution of uninfected POC	3-highest order channels; generally B, and C, with some D and F channel types [Rosgen 1996]	[-] Road-stream crossings; but many parallel roads and roadside ditches connected to streams along infection pathways, [++] probability of infection entry, leadind to [-] distribution of uninfected POC
Dead/dying POC	Base of hillslopes at channel	[0]/[+] large woody debris recruitment; creating hydraulic roughness and stepped channel, sediment storage	Floodplains and terraces within 150 feet of the channel	[0]/[+] large woody debris recruitment; creating pools and complex habitats, portions of jam complexes in larger streams with isolated pieces on the floodplain
		[0]/[-] Bank stability [-] Canopy density		[0]/[-] Bank stability [-] Canopy density leading to [Ñ] shade; wider width on floodplains where more water spreading and POC abundance
		[0]/[-] Nutrient input [0] Winter stream temperatures [0] Diurnal stream temperature change; winter/spring		[-] Nutrient input [0]/[-] Winter stream/spring temperatures
				[0]/[+] Stream temperatures in nonultramafics [++] Summer stream temperatures in ultramafics

[1] [0] = no change expected; [+] = increased; [++] = much increased; [-] = less [Ñ] = much less.

with canopy shading in the short and long term. These conditions should maintain intermittent stream winter and spring water temperatures from being cooler than normal and buffer against higher day/night temperature swings. Furthermore, there would be a better chance of natural large woody debris recruitment over temporal and spatial scales in the range of natural variability within the riparian zone. This in turn would trap sediment and organic material and buffer downstream reaches from sediment pulse inputs from infrequent floods.

Alternatives 4 and 5 are similar to each other in that no specific management measures would be applied, other than a POC resistance breeding program in Alternative 4 and general discontinuance in Alternative 5. Effects on water and aquatic resources, above highest road crossings, would be similar to Alternatives 1 and 2 in the short and long term. Effects to POC mortality below roads would likely be greater in the short and long term because there is no containment strategy for PL spread. Even though seed is available for planting resistant stock in the North Coast Risk Region, many sites are inaccessible, small, and not likely to be replanted. Additionally, edaphic conditions suggest that other tree species can easily occupy the sites in this region. Seed would not be available for planting resistant stock in much of the Siskiyou Region until 2010, and is not planned under Alternative 5. Many sites are inaccessible and not likely to be replanted. Seed would not be available for planting resistant stock in the Inland Siskiyou Risk Region under Alternative 4 until 2010, and would not be planned under Alternative 5.

Several regional differences by stream type and watershed position that could influence hydrologic/aquatic effects from loss of POC are summarized in Table 3&4-19. In headwater channels of the North Coast Risk Region, stream debris flows and torrents occur in the sedimentary formations on steep dissected slopes. Presence of dead POC may or may not increase the rate of debris flows over natural levels, because the tree is a minor species in relative abundance and is not likely to affect the matrix of tree roots that hold the banks together. None of the alternatives should have an effect on the chronic loading with debris and sediments and episodic excavations as debris flows.

In the Siskiyou Risk Region, higher surface rock content may lead to some overland flow and higher drainage densities during storms. Some nonchannel-related POC might be vulnerable to infection, particularly in those areas below roads where drainage relief culverts could spread water on the way downslope to a channel. Furthermore, seasonal intermittent snow accumulation and rapid melt above 2,000 foot elevations could cause some overland flows in this region. In order of protection, Alternatives 6 and 3, and to a lesser extent Alternatives 2, and then Alternative 1, would best protect uninfested POC stands in near channel upslope areas.

Mid-Drainage to Valley Moderately Confined and Unconfined Stream Channels (3rd Order+ Streams)

Several riparian zone and stream attributes are common to all alternatives in these landform and channel types. The streams are mostly perennial and have year-round flow. There is a lower incidence of stream/road crossings, but these are larger streams with many parallel roads and road-ditch stream connections, indicating probable pathogen entry points. Furthermore, these channel types are subject to water-spreading during flooding by overtopping the normal channel. The severity of flooding depends on stochastic precipitation events that would control the widths of the floodprone area where new infestations could occur. De-

Table 3&4-19.—*Regional hydrologic/aquatic differences and effects from Port-Orford-Cedar infection*

Region	Headwater confined stream channels	Effect	Mid-drainage to valley moderately confined and unconfined stream channels	Effect
North Coast Risk Region	[0]/[+] large woody debris channel loading Mixed riparian stands with [++] hardwood component, exposing open sky in winter/spring Favorable edaphic conditions	Episodic debris torrents occurring in headwater channels [0] Winter and spring stream temperatures and diurnal fluctuations [0] Nutrient availability Alternative replacement species regeneration	Many larger streams do not have floodplain connectivity Favorable edaphic conditions	[-] Overbank flooding; and [-] risk of spread of PL into the riparian stand Alternative replacement species regeneration
Siskiyou Risk Region	[+] Surface rock content [0]/[+] Drainage density	[+] Overland flow causing extension of stream network; rapid snowmelt above 2,000 feet may flow overland in certain areas [+] Runoff/unit area	Mid-drainage POC mortality	[0]/[+] Episodic mid-drainage inner gorge slides partly due to loss of root strength
Inland Siskiyou Risk Region	Ultramafic parent material and serpentine soils	Limitation on POC growth, density, and replacement of POC mortality by other species	Ultramafic parent material and serpentine soils	Limitation on POC growth, density, and replacement of POC mortality by other species

[1] [0] = no change expected; [+] = increased; [++] = much increased; [-] = less; [N] = much less.

clines in root strength from standing POC mortality may lead to windthrow or localized undercutting by stream currents, especially on the outside of channel bends. This is expected to have beneficial effects for aquatic habitat by providing increased pool depths, complex habitats, and cover. However, if too wide of an area of dead POC is present, the stream may move laterally across the floodplain, the channel may widen, and may not be in equilibrium. POC trees that topple into the streams would create scour pools in the medium-width channels and become parts of jam complexes or be distributed on the floodplains in wider channels. A summary of riparian and stream attributes in differing morphologies and relationship to PL is shown in Table 3&4-18.

In the North Coast Risk Region POC is a minor species and widely scattered in the riparian area. Many larger streams do not have floodplain connectivity (F type channels), which would limit the waterborne spread of PL into riparian POC. Where floodplains are present, other species of conifers or hardwoods would quickly replace infected POC where there are dead crowns and localized holes in the canopy. Edaphic conditions are generally favorable and there is very high competition for light. Replacement species should phase-in as infected POC diminish. Effects on stream temperature would likely be within the range of natural variability, regardless of alternative selected. Alternatives 3 and 6 would have no effect in this region (over Alternative 2) because there are no uninfested 6th field watersheds.

In the Siskiyou and Inland Siskiyou Risk Regions infected POC with dead crowns may contribute to more expansive holes in the canopy in riparian areas along streams. Infections of POC with PL would result in lesser amounts of shade than a healthy stand. Cedar trees that undergo PL mortality still have branches and boles that remain standing for many years. Field studies show that canopy density for this condition on the Siskiyou NF to be in the range of 10 to 15 percent (Parks, C., *personal communication*). On soils derived from ultramafic materials, shading may be reduced for long time periods. Other tree species have difficulty occupying the site due to waterlogged soils with unfavorable chemistry. Western white pine can occupy these sites, but is susceptible to white pine blister rust (refer to Ecology and Plant Associations section).

A lag time can be expected where alder, tanoak, or other pioneer hardwood species invade openings on many POC riparian sites. Alder and other hardwoods will sometimes provide shade over streams within 3 to 5 years of colonization. Study sites along the Smith River in California showed increased amounts of red alder following the death of POC. This would provide abundant shade in the short term. Alder downed wood, however, decays relatively rapidly and is typically of small diameter. Monitoring data on the Medford BLM District shows a residence time for small (less than 12 inches in diameter) alder logs being in excess of 5 years in a 2nd Order perennial stream. Hardwoods, as they mature, are less desirable as downed material for stream function because they are often of smaller diameter than conifers and do not last as long. Whether conifers eventually become established in these streamside areas depends on site conditions and disturbance history. Planting of resistant POC stock will eventually mitigate some of the effects.

POC mortality causing shade loss would be greater where standing water or wider floodplains are present, inoculum is present, and POC is more open grown with a high relative abundance. Mortality may elevate summer stream water temperatures. The amount of temperature increase would depend on stream and site factors, the extent of POC abundance, whether POC is along the stream (primary shade) or further back on the floodplain (second-

ary shade), and the severity of the infestation. The north-south, intermediate, and east-west orientations were modeled for shade loss with POC mortality. Assumptions and results are shown in Table A9-2, Appendix 9. Shade modeling suggests that shade in mid-drainage streams may decrease by 9 to 14 percent, and 9 to 19 percent in valley streams. Further, stream temperatures in mid-drainage streams may increase 1.1 to 1.6 degrees C per mile and 0.5 to 1.2 degrees C per mile in the valley streams. The degree of change modeled would be greatest for Alternative 5; the other alternatives would have lesser change. Partial mortality or stands less than 100 percent POC cover would yield a greater shade estimate and lower temperature rise estimate. However, this condition is more difficult to model and data would need to be field collected. Modeled shade results should be used cautiously (refer to the affected environment for further explanation). For comparison, numerous watershed studies in the coast range of Oregon for clearcut harvesting show maximum temperature increases of 3 degrees to 8 degrees C (Bescha et al. 1987).

Alternative 1

Implementation of selected management activities (current direction) under Alternative 1 may have some effect on lessening the spread of the pathogen through water by limiting pathways for entry, or eradicating infestation centers that could reinfect healthy cedars downstream. Most mid-drainage and valley streams have chronic infection, more in the north and less in the south and inland parts of the POC range. This alternative would most likely be more effective than Alternatives 4 and 5, but slightly less effective than Alternatives 6, 3, and 2, in the short and long term.

There is some risk to fish from the use of Clorox bleach. PL-contaminated waters used for washing and firefighting will be disinfected with a 50 parts per million concentration of sodium hypochlorite, the active ingredient in Clorox bleach. Adding Clorox bleach to water after tanks have been filled and away from the fill site can lessen this risk. Wash stations would be located to avoid direct flow of treated water into streams and other bodies of water, so there should be little or no effect to fish from that source. Direct input of chlorinated water could result from wildland fire operations and would be small in scale and of short duration. Sodium hypochlorite, the active ingredient in Clorox bleach, is a strong oxidizing agent and quickly breaks down in the presence of organic matter producing water and chloride ions. See Appendix 4 for additional information about Clorox's chemistry, toxicity, effect on fishes, and other ecological and environmental relationships.

Alternative 2

Management practices under Alternative 2 are applied in a more structured approach by application of the POC Risk Key. Although the Standards and Guidelines in Alternative 1 use the elements of the risk key, the effects of Alternative 2 may be slightly improved in the short and long term in most areas—and substantially improved in the uninfested 7th field watersheds. Systematic planning, direction of limited resources, and operational consistency in avoiding, sanitizing, or eradicating POC may result in lower spread of the pathogen. Management Practice 1 (project scheduling during the dry season) would slow PL resting spore transfer to water because road ditches and 65 to 80 percent of the stream network would be dry. Management Practice 2 (using water from known uninfested sources or treating water) would limit spore dispersal into flowing streams. However, if Clorox is used to treat water and there is an unintentional spill into surface water, there may be harmful effects on fish and

aquatic life. Management Practice 9 (road management measures with a system of road closures in the wet season and eradication along selected roads) could substantially decrease water entry points, particularly into roadside ditches and stream crossings. This would effectively reduce up to 50 percent stream extensions by roads. Management Practice 11 (washing project equipment) when implemented with Management Practices 1 and 9 may be very effective in separating inoculum from watercourses. Within uninfested 7th field watersheds, use of these practices is even more emphasized by reference in the risk key.

The Clorox bleach risk discussed in Alternative 1 applies to Alternative 2 as well.

Alternatives 3 and 6

Alternatives 3 and 6 are similar in that they both involve POC cores and watershed buffers at the larger to smaller 6th and 7th field-sized watersheds. These alternatives incorporate the features of Alternative 2, and add additional measures to control the spread of PL within 31 and 162 currently uninfested subwatersheds (generally 10,000 to 40,000 acres) and catchments (generally 1,000 to 10,000 acres). Alternative 6 watersheds are more widely distributed throughout the POC range, excluding the Coos Bay and Roseburg BLM Districts, and include most of the POC core areas of Alternative 3. Alternative 3 features a larger acreage of watershed buffers (460,500 acres) throughout the POC range, when compared to Alternative 6 watershed buffers (219,000 acres). These POC buffers in Alternative 3 surround substantially greater miles of anadromous fish and Oregon Department of Environmental Quality current water quality limited 303(d) streams, when compared to Alternative 6. Alternative 3 and 6 POC cores more frequently occupy higher positions in the watersheds along headwater to mid-drainage streams. Therefore, there should be a lesser probability of downstream spore transport and reinfection to mid-drainage and valley stream segments in these stream systems.

The Alternative 3 design would provide greater protection for fisheries and water resources, when compared to Alternative 6, because of the greater size of the POC buffers, and because multiple 6th field drainages often form contiguous larger areas. Besides limiting the uninfested POC cores to entry by common pathogen vectors, and subsequent waterborne dispersal, Alternative 3 (like Alternative 6) would also require management measures including transportation analysis, which could lead to road closures or seasonal use. These actions would slow the dispersal of the pathogen, and secondarily improve water quality slightly by reducing road-related sediment delivery, particularly on winter use roads. When comparing Alternatives 1 and 2, the buffer strategy of the POC cores encompassing watersheds may yield a slightly higher protection in the short and long term. Alternative 2 would be similar to Alternative 6, when an analysis area is within an uninfested core, because the risk key would require similar management measures, although with somewhat greater decision-maker flexibility.

POC stands in the valley bottoms on ultramafic soils tend to include larger-diameter trees (greater than 20 inches diameter) in greater abundance (refer to Background section). Where streamside uninfested stands of large trees are present in POC cores, these areas would beneficially maintain water quality; particularly lessening increases in summer stream temperatures, maintaining a continuous supply of large woody debris, and providing bank stability.

In Alternatives 3 and 6, requirements for water sources require mapping and using only untreated water from the uninfested watersheds for wildland fire operations. The risk of the Clorox bleach water treatment additive from being washed into streams from mixing areas or dumping of treated water during wildland fire operations would be essentially eliminated. These water management practices would have a beneficial effect on fishes and biota by preventing spills and short-term water chemistry changes. The Clorox risk discussion in Alternative 1 applies to Alternative 3 and 6 as well, but not particularly in the uninfested POC cores because of the requirements to use local uninfested water where possible.

Alternatives 4 and 5

Alternatives 4 and 5 are similar in that no specific management measures would be applied, other than a POC accelerated resistance breeding program in Alternative 4 and its general discontinuance in Alternative 5. In the North Coast Risk Region effects on water and aquatic resources would also be similar to Alternatives 1 and 2 in the short and long term. This is because POC is a minor riparian species in this region and 75 percent of the riparian areas are already infested in many of the lower drainages. Additionally edaphic conditions suggest that other tree species can easily occupy the sites in this area. Seed is available for this breeding block and could be planted in select areas. The planted POC would be small and not provide effective shade or large woody debris recruitment for many decades. Alte rnative replacement species including hardwoods like red alder or conifers including western red cedar or western hemlock would most likely occupy the site.

In the Siskiyou and Inland Siskiyou Risk Regions, Alternatives 4 and 5 would be less favorable than Alternatives 1, 2, 3, and 6 in the short and long term. Currently about 27 percent and 15 percent respectively of POC of high-risk riparian areas are infested. The Pathology section describes that an additional 62 percent and 68 percent of these regions will become infested in the next 100 years under Alternatives 4 and 5, compared with 16 and 17 percent under Alternative 3 (from Table 3&4-10 in the Pathology section). Seed would not be available for planting resistant stock under Alternative 4 until 2010, and is not planned for some areas under Alternative 5. Using reforestation and growth described in the Planting Assumption (found in the Assumptions and Clarifications section of this chapter), these effects begin to decrease after 100 years, particularly in Alternative 4.

Summaries of several regional differences by stream type and watershed position that can influence hydrologic/aquatic effects from loss of POC are listed in Table 3&4-19.

Effect of Private Intermingled Lands

Reciprocal rights-of-way on the Coos Bay, Roseburg, and Medford BLM Districts limit access control with private landowners and, hence, limit effective control strategies. Some roads will remain open and management direction in Alternatives 1 and 2 cannot always be implemented. Management Practice 11 (vehicle washing) for the portion of vehicles controlled by the government may reduce, but not eliminate, spore transfer to water.

Indirect Benefits of Closing Roads

Primary mechanisms of PL spread include resting spores being transported by vehicles or equipment with adhering organic or soil material, and movement by surface water (refer to

the Pathology section). Road closures, particularly during the winter when runoff is the highest, can control the spread of the pathogen. Discontinuance of travel and maintenance on certain winter-use roads to lessen PL spread may also coincidently reduce sediment delivery to stream channels. This effect is variable depending on road location, surface type, adequacy of drainage structures, and closure level. Roads can be a source of chronic surface erosion, as well as occasional failures due to poor road location, construction, or maintenance (Beschta et al. 1995). Some roads, especially on BLM-intermingled lands, are encumbered by private rights, and cannot be closed without permission. Other roads that access predominantly Federal lands could be recommended for permanent or seasonal closures. This process may require an agency or district transportation system analysis and NEPA analysis to define competing needs and uses for a road segment in the short and long term. Permanent road closures normally involve decommissioning to various levels; ranging from gating a road, pulling culverts and reestablishing hydrologic flow paths while leaving the road template in place, and road ripping, reestablishing hydrologic flow paths, and establishing vegetative cover. Management measures in the risk key in Alternative 2, including seasonal and permanent road closures and no vehicle entry in POC cores, and transportation analysis and management objectives for POC buffers in Alternatives 3 and 6, would have an indirect beneficial impact on water quality and salmonids.

Cumulative Effects

POC infestation rates along streams are predicted to range from 30 to 95 percent in 100 years, depending upon risk region and alternative. In the North Coast Risk Region sedimentary-rock-derived soils, the loss of POC influencing shade or large woody debris recruitment on perennial streams is not anticipated to be measurable. Scattered distribution of POC and aggressive naturally-occurring alternative species replacement are expected to continue these processes. A gradual transfer of shading from POC to other conifer and hardwood species would most likely occur as POC trees die. The effect on fish and aquatic resources from the loss of shade or change in large woody debris supply from POC mortality would also be undetectable at multiple-watershed scales (5th to 7th field hydrologic unit codes).

Because the relative importance POC as woody debris for coho habitat depends on the proportion of POC in the headwaters, the potential impacts of the loss of POC will vary by watershed and basin (Hicks et al. 1991; McCain, M., *personal communication;* Swanston 1991). As wood source areas, the ultramafic headwater POC-dominated and sparsely vegetated areas of the North Fork Smith and West Fork Illinois Rivers would likely be the most affected by the loss, while the headwater areas of the Middle and South Forks Smith and East Fork Illinois Rivers that contain denser stands of other conifers will be less affected. Therefore, it is likely that over the long term (centuries) and on a large-basin scale, as the sources of POC decline the subsequent proportion of POC in wood jams that contribute to coho habitat would decrease. Coho habitat in proximity to ultramafic headwater areas will likely be the sites that are affected, while habitat in proximity to the other soil types and vegetation communities where POC is not dominant would not be affected (Hicks et al. 1991; Mazer and Sedell 1994; McCain, M., *personal communication*; Swanston 1991).

In the ultramafic riparian areas of the Siskiyou and Inland Siskiyou Risk Regions, POC comprises on average 50 percent of the overstory cover in plant associations where it is prominent in the overstory (refer to Table 3&4-13). The predicted increase in summer temperatures from the loss of POC stream shade in any one stream may not produce immedi-

ate effects on salmonid production. However, the cumulative effects from several tributaries can result in loss of mainstem rearing habitat downstream (USDA-FS and USDI-BLM 1985). Streams on public lands play an important role in the survival of salmonids as they provide cool water to fish habitat lower in the system and provide refugia during summer months when water temperatures are lethal (78.4 degrees F for coho) in the valley segments. The degradation of cold water refugia would have a cumulative effect on salmonid production and survival in the ultramafic portions of these regions because of the current degraded condition of valley segments due to elevated water temperatures, water withdrawals, and natural lack of flow. The magnitude of this impact must be analyzed in the context that it will take place when POC is not replaced by other species. As discussed here and in the Ecology and Plant Associations sections, this is likely on some, but not all ultramafics, or serpentine areas, which are characterized by a lack of many of the attributes of optimal salmonid habitat (USDI-BLM 2003).

Coho would be affected indirectly in the short and long term by elevated summer stream temperatures within ultramafic areas of this region. Out of 220 miles of coho habitat considered to be core areas for production in southwest Oregon, 177 miles (80 percent) are within the Rogue River Basin (Rogue Valley Council of Governments 1996). Coho are an upper tributary spawner and the majority of wild coho in the entire Rogue Basin spawn in the upper Illinois River Watershed. Approximately 40 percent of the area of the upper Illinois River, and perhaps 25 to 30 percent of the stream miles, are on ultramafic soils (USDI-BLM 2003; USDA-FS and USDI-BLM 2000). The area delineated for the analysis of plant association groups in the southeast portion of the Oregon range of POC (Ecology and Plant Associations section) most closely corresponds with the upper Illinois River Watershed. Out of 3,107 total stream miles in this portion of the range, 897 miles (29 percent) were found to be in ultramafic soils. An analysis of the entire POC range in Oregon for the miles of steelhead streams that are ODEQ 303(d) listed for temperature indicated that out of a total of 787 miles, 194 miles (25 percent) were on ultramafic soils. As a conservative estimate, 29 percent is reasonable as the portion of the upper Illinois Watershed coho habitat possibly impacted by cumulative temperature effects.

The elevation of summer temperatures would be likely to decrease reproduction and survival in coho in the drainages affected by POC mortality, due to the cumulative downstream effects of temperature increases. However, it is not possible to discretely quantify the potential decrease in production and survival because: (1) There are limited data to determine baseline juvenile coho production in these tributaries; (2) scarce information for existing summer water temperatures is available (although it is known that summer water temperatures in tributary streams in much of the ultramafic area are at the upper end of the range of temperatures that juvenile coho can tolerate); (3) little information is available describing cold water refuges where fishes can hold during periods of maximum stream heating; and (4) models that predict incremental fish losses from incremental changes in water temperature, short of temperatures predicted to be in the lethal range, have not been found. Given these uncertainties, a qualitative ranking approach to describing the potential effects to coho salmon from the alternatives is warranted.

The trend for cumulative effects under all alternatives is the same as previously stated for the ultramafic areas of the Siskiyou Risk Region, that is, Alternative 3 (due to expanded POC buffer areas) has the least effect; Alternative 6 has slightly more effect; Alternatives 2 and 1 have an increased effect; and Alternatives 4 and 5 have the greatest effect and are equal.

Under Alternatives 3 and 6, approximately 37 percent of the high-risk areas in the affected portion of the upper Illinois Watershed (29 percent) could be impacted by some level of decreased production and survival. This translates to approximately 11 percent of the coho habitat being affected. Since this habitat is within ultramafic areas, which are not characterized as providing optimal conditions for salmonids, this is probably a conservatively high estimate. The cumulative effects under these alternatives would not be significant due to the small percentage of affected area and the disproportionately small contribution the habitat makes to overall production.

Alternatives 1 and 2 differ in the portion of high-risk areas that would be affected (53 percent and 46 percent, respectively), but when applied to the affected portion of the upper Illinois Watershed, account for similar amounts of habitat, 15 percent and 13 percent, respectively. The cumulative effects under Alternatives 1 and 2 would not be significant for the same reasons given for Alternatives 3 and 6, and in addition, a major similarity between the four alternatives tends to decrease the contrast in potential effects. Whiskey Creek and the upper portion of West Fork Illinois are watersheds that, since they are currently infested by PL, would not be designated as POC core watersheds in Alternatives 3 and 6.

Under Alternatives 4 and 5, the portion of high-risk areas that would be affected (85 percent) is the same, and when applied to the affected portion of the upper Illinois Watershed, represents a cumulative effect on 25 percent of habitat in the affected ultramafic area. Alternatives 4 and 5 have intentionally been grouped in this EIS for the likelihood of having similar effects on certain resources. Alternatives 4 and 5 would show a marked difference in their effects from the other alternatives, and it is reasonable to project that their cumulative effect on coho would be significant. This effect would be mitigated somewhat for Alternative 4 in the long term.

A separate biological assessment for effects to coho (presented under separate cover for plan-level consultation) addresses which Federal actions may affect coho and what the likelihood would be of take of a threatened species under the preferred alternative. Through consultation on this plan and any subsequent implementation of it in individual projects, NOAA-Fisheries would consider the Standards and Guidelines and evaluate them for their ability to act as conservation measures in the recovery of coho and critical coho habitat. The result of that consultation will be displayed in the record of decision for the SEIS.

Approximately 25 percent of steelhead habitat would be potentially affected by the cumulative downstream impacts of temperature increases in ultramafic streams. This projection comes from the analysis of the entire POC range in Oregon for the miles of steelhead streams that are Oregon Department of Environmental Quality 303(d) listed for temperature and are in ultramafics (see above for coho). Steelhead production in the region is much more scattered than that of wild coho, and the area analyzed for cumulative effects corresponds to the ultramafic areas within the POC range in Oregon. The qualitative ranking of alternatives is the same as described for coho. The portion of high-risk areas that would be affected when applied to the affected analysis area are approximately 9 percent for Alternatives 3 and 6, 13 and 12 percent for Alternatives 1 and 2, respectively, and 21 percent for Alternatives 4 and 5.

The potential cumulative effects to steelhead would not be significant under Alternatives 1, 2, 3, and 6, for the same reasons given for coho. The cumulative effects potentially would be significant for steelhead under Alternatives 4 and 5. The effects on steelhead might be less

than would be expected for coho because steelhead in the region have a stable population and are less vulnerable due to their life history characteristics (scattered distribution, temperature tolerance, variable production, mobility, and resiliency). The effects on steelhead are representative of resident trout as well due to similarity in habitat needs and life history with respect to temperature requirements. Chinook would not be likely to be impacted by indirect temperature effects on rearing habitat due to the timing of their use of the habitat. Juvenile chinook outmigrate from spawning areas during their first spring, so do not typically use tributaries in the upper watersheds that would be affected by elevated temperatures in the summer months.

Aquatic Conservation Strategy

Forest management projects implemented pursuant to selection of one of the alternatives in this SEIS will have to be consistent with all Standards and Guidelines of the applicable land and resource management plans. The Aquatic Conservation Strategy objectives are one of the land and resource management plan objectives to be considered under question 1 in the POC Risk Key in Alternatives 2, 3, and 6. If the proposed management activity is within a Riparian Reserve or Key Watershed, requirements to complete watershed analysis would also apply and provide further information about the role of POC in the potentially affected watersheds. Similarly, a need to improve water temperatures in 303(d)-listed streams would be considered a land and resource management objective under the risk key.

Most vegetation management projects are outside of Riparian Reserves (the location of most high-risk sites). Timber harvest within Riparian Reserves is only done as needed to attain Aquatic Conservation Strategy objectives, and risks of PL introduction would be weighed into that determination. And while various Agency management activities are a primary factor in PL spread, Agency management of PL helps control the potential disease trajectory through the application, depending upon the alternative, of various levels of known techniques for preventing or slowing the disease. These techniques provide considerable disease reduction. With Alternatives 2, 3, and 6, the Agencies would also be proactive in making extra efforts to prevent infestation of currently uninfested watersheds.

The analysis in this SEIS indicates all significant ecological functions for POC, including those relating to aquatic health, will be retained under at least several of the alternatives. In short, the alternatives provide managers with a suite of PL control measures that will provide for the continued ecological function of POC, and for meeting the goals of the Aquatic Conservation Strategy.

Wildlife

Affected Environment

As noted in the Background and other previous sections, POC is found in many different environments, from sea level to 6,400 feet, and is prominent in 64 plant associations. POC is commonly associated with moist areas; usually along riparian areas, but also in wet areas in the uplands. POC typically occurs as single trees or small groups in the uplands; larger groups may be located in riparian areas and alluvial fans. POC can be prominent in stands occurring in administrative units in the central portion of the POC range. POC is capable of

growing to a large diameter; in serpentine sites they may be the only source of large diameter trees, snags, and down wood. In plant associations found on ultramafic soils, POC may be a prominent overstory species, especially along riparian zones. In plant associations where POC is prominent, 40 percent are on ultramafic soils, 36 percent within Oregon (derived from Table 3&4-12). High-risk POC areas constitute approximately 38 percent of the POC acres in the planning area where POC is prominent. POC occur on approximately 307,000 acres range-wide. In the 104,200 acres where POC is prominent, POC may comprise 35 to 50 percent of the overstory cover, but is not usually the dominant species (see Table 3&4-11). Within many ultramafic associations that contain POC, approximately 32,700 acres in Oregon and 41,500 acres range-wide (Table 3&4-12), POC is a prominent overstory tree, and its loss could have a negative impact upon the ecological functioning of those stands.

Chappel et al. (2001) identified two major wildlife habitat types within southwest Oregon. The Westside Lowlands Conifer-Hardwood Forest extends across western Oregon, and isolating data specific to southwest Oregon out of the data matrixes would be impossible. Queries of BLM and FS biologists have failed to yield information that would indicate that any species is specifically tied to POC (Dillingham, C., *personal communication*; Miller, R.C., *personal communication*; Webb, L.O., *personal communication*) or would be expected to be uniquely affected by the proposed alternatives. There are no terrestrial wildlife species known to be exclusively linked to POC. In general, the species found in the project area are tied more closely to habitat components. Therefore, species occurrence and habitat association data discussed here are derived based upon the Southwest Oregon Mixed Hardwood-Conifer Forest classification, the dominant type in the affected area. Johnson and O'Neil (2002) identified 226 terrestrial vertebrate species that occur within the Southwest Oregon Mixed Hardwood-Conifer Forest (Table 3&4-20). For many areas, POC has a keystone role in riparian habitats (especially in ultramafic plant associations) and provides long-lasting down wood and snags (standing dead trees) (see the Ecology section for more information).

Snags and down wood of all species are important components of the forest ecosystem. A total of 103 species utilize snags and down wood in the Southwest Oregon Mixed Hardwood-Conifer Forest habitat type (Table 3&4-20) for nesting, feeding, and cover. Ohmann and Waddell (2002) found large snag densities (20+ inches diameter at breast height) varied from 2.6 to 9.5 snags per acre (average for all successional stages equaled 5.1) in the Southwest Oregon Mixed Hardwood-Conifer Forest type. Down wood ranged from 18.3 to 29.6 pieces per acre (average for all successional stages was 21.9 pieces) (Ohmann and Waddell 2002).

Effects of the Alternatives

Potential effects to Agency special status species are discussed in the biological evaluation in Appendix 7.

Alternative 1

Under the current strategy for managing POC and PL, very few activities have effects to wildlife habitat and the associated wildlife species. Roadside sanitation efforts may modifiy and decrease POC in mid- and late-seral stages. There are approximately 9 acres of potential treatment area per 1 mile of road, although this is not all habitat. Much of the roadside sanitation area is within the original clearing limits of the road. The loss of the larger diameter POC would reduce the value of the habitat for species dependent upon large trees,

Table 3&4-20.—*Numbers of wildlife species associated with the Southwest Oregon-Mixed Conifer habitat type*[1]

Group	Number	Down wood associated	Large snag associated [>20" diameter]	Large tree associated [>20 " diameter]	Riparian associated
Amphibian	18	8	0	0	9
Bird	130	17	31	39	32
Mammal	64	32	15	19	27
Reptile	14	5	0	0	4
Total	226	57	46	58	72

[1] Reference Chappell and Kagan [2001]; number of wildlife species based upon data queries of the "Matrixes for Wildlife-Habitat Relationships in Oregon and Washington" [Johnson and O'Neil 2001].

depending on the proportion of such trees in the stand that are POC. Due to the spacing of very large trees it is unlikely that a substantial number of large-diameter trees would be removed by road sanitation in any one stand. The precise level of road treatments to occur is unknown, but it is expected to approximate that described in Appendix 2. Although snags are not removed during sanitation treatments, few snags of any species are left standing next to roads due to safety concerns.

The seasonal restriction/closure of certain roads would benefit wildlife by reducing disturbance to the adjacent habitat. Disturbance affects many species in a wide variety of ways causing them to move away from roads, thereby reducing the available habitat, increasing stress levels, predation, and nest abandonment, and reducing fecundity, depending upon the intensity, frequency, and duration of the disturbance. The closure of local and resource roads is expected to have minor landscape-scale wildlife benefits, but may be important at a local scale. ***Note:*** (1) The rural local system primarily provides access to lands adjacent to the collector network and serves travel over relatively short distances (USDI-BLM 2002); and (2) the resource road system provides access for specific management actions and connects to local or collector road systems (USDI-BLM 2002).

PL-contaminated waters used for washing and firefighting will be disinfected by mixing 1 gallon of Clorox bleach to 1,000 gallons of water. This mixture results in a sodium hypochlorite concentration of 50 parts per million (milligrams per liter) (drinking water is about 2 parts per million). The water quality criteria for total residual chlorine as determined by USEPA for freshwater aquatic species is 0.011 parts per million 4-day average, or 0.019 parts per million for 1 hour (USEPA 1984). Research into the control of zebra mussels (*Dreissena polymorpha*) showed it was an effective biocide at concentrations of 1 milligram per liter (1 parts per million) (Martin et al. 1993). Rainbow trout (*Salmo gairdneri*) exposed to a 30 minute dose showed an LC50 value of 0.43 milligrams per liter at 20 C (0.43 parts per million) while triple exposures (or 5 minutes) resulted in a LC50 of 1.65 milligrams per liter (Brooks and Seegert 1977). Wash stations would be located to avoid direct flow of water into streams and other bodies of water, so there would be little or no effects to aquatic amphibians from those sources. Direct input of chlorinated waters could result from wildland fire operations and would be small in scale and of short duration. Tanker spills and discharges of Clorox bleach-treated water into streams during fire suppression activities have been reported, with documented fish kills. This risk has been reduced in some areas by local requirements to add Clorox bleach to tank trucks after filling, away from the stream. Sodium hypochlorite, the active ingredient in Clorox bleach, is a strong oxidizing agent and quickly breaks down in the presence of organic matter producing water and salt ions. See Appendix 4

for further discussion of Clorox bleach.

Projections by pathologists indicate that 40 percent of the high-risk stands currently un-infested with PL will become infested under Alternative 1 by 2103, and that POC mortality in these infested stands would approximate 90 percent (Table 3&4-10). High-risk stands, as described in the Pathology section, include sites near streams, drainage ditches, gullies, swamps, seeps, ponds, lakes, and concave low-lying areas where water collects during rainy weather, out as far as the periodic high water mark for flooding. Loss of overstory POC could impact from 35 to 50 percent of the overstory cover (Table 3&4-11) in these areas. Fifty-eight wildlife species are associated with large diameter trees and may be negatively impacted by the loss of these structures. Impacts may include loss of forage, foraging substrate, nesting/roosting habitat, and the disruption of travel corridors. Terrestrial species may be impacted by changes to the herbaceous plant biomass in the lower strata and changes in climatic parameters, such as wind speed, relative humidity, and temperature.

Terrestrial species may also be negatively affected by loss of future woody biomass, although this effect is low for POC when compared with other tree species. The same wood chemistry characteristics that make POC a valuable commercial species may negatively impact its value to wildlife as a snag. POC is highly resistant to rot and insects and may remain intact for decades (Jules et al. 2002). Jules et al. (2002) examined increment cores from POC snags that indicated those trees died more than 100 years prior. Increment cores must be intact for accurate dating to occur. Research on yellow-cedar (*Chamaecyparis nootkatensis*), a similar species, has found that cavity nesting is rare in snags, even after they have been dead for 81 years (Hennon et al. 2002). POC snags, like yellow-cedar, possibly contribute very little to wildlife habitat components (DeMeo, T., *personal communication*; Jimerson, T.M., *personal communication*; and Hennon et al. 2002). No work has looked specifically at the wildlife contributions of POC snags/logs, but snags probably provide foraging substrate for bark gleaners and roosting/nesting habitat for those species that utilize sloughing bark. Downed logs provide hiding cover and travel corridors initially. Foraging within the log may occur as they progress into more decayed classes, although their natural resistance to decay makes it more likely that they are consumed by fire first.

POC is a prominent canopy species in 32,700 acres of ultramafic plant associations in Oregon and may be a majority in some riparian plant associations. Infestation rates in 100 years in high-risk ultramafic riparian sites will be about 40 percent (Table 3&4-10), with mortality on these infested sites of about 90 percent. This mortality may cause measurable changes at a site-specific and stand scale (such as changes in micro-climate) due to loss of shading and overstory cover. On the landscape scale, however (5th field watersheds and larger), neither individual species nor guilds should disappear.

Ecosystem recovery, primarily the recovery of the overstory canopy, will be highly dependent upon the ability of the stand to revegetate naturally or upon reforestation efforts as described in the Planting Assumption (found in the Assumptions and Clarifications section of this chapter) and Appendix 6. The development of PL-resistant stock would help to restore the POC losses. Available for deployment in 0 to 40 years depending upon breeding zone (see Table 3&4-21 in the Genetics and Resistance section), larger-diameter POC are expected to be in the landscape again 80 to 100 years later.

Alternative 2

The effects of Alternative 2 are the same as Alternative 1 with the following exception.

Alternative 2 prescribes the use of a risk key for determining when mitigative measures are necessary to prevent/reduce the spread of PL, and places additional emphasis on 162 currently uninfested 7th field watersheds. This risk key would standardize the implementation of mitigative measures, and, it is projected, further reduce the infestation of drainages and the loss of POC.

Projections by pathologists indicate that 30 percent of the high-risk stands currently uninfested with PL will become infested under Alternative 2 in the next 100 years. POC mortality in that 30 percent would approximate 90 percent. Potential effects to wildlife would be less than in Alternative 1, but the overall conclusions remains the same.

As in Alternative 1, ecosystem recovery, primarily the recovery of the overstory canopy, will be highly dependent upon the ability of the stand to revegetate naturally or reforestation efforts described under Planting Assumptions (found in the Assumptions and Clarifications section of this chapter). The development of PL-resistant stock would help to restore the POC losses. Available for deployment in 0 to 40 years depending upon seed zone (see Table 3&4-21 in the Genetics and Resistance section), larger-diameter POC are expected to be in the landscape again 80 to 100 years later.

Alternative 3

The effects of Alternative 3 are the same as Alternative 2 except as follows.

Alternative 3 would provide additional protection for 31 6th field watersheds that are currently identified as being uninfested with PL.

Timber harvests would be prohibited in the 34,000 acres (Table 2-2) in the uninfested watersheds that have POC (POC cores), including 2,260 acres of Matrix and Adaptive Management Area that are currently available for regularly scheduled timber harvest and contribute to PSQ (Table 3&4-24a in the Timber Harvest section). This does not preclude salvage in the case of a stand-replacing event. Additionally, within POC cores, roads will be closed or all POC would be removed along them. This equates to about 9 acres per mile of open road. The loss of the larger-diameter trees could have some effect on ability of the stands to function for species associated with large-diameter trees. Due to the spacing of very large trees it is unlikely that a substantial number of large diameter trees would be remove due to road sanitation in any one stand. There is the potential to restrict the recruitment of large diameter POC, but with the exception of ultramafic plant associations, POC is a minor component of the overstory. The restriction against timber harvest will restrict the ability of Agencies to do commercial thinning on approximately 6,000 acres of 40- to 80-year-old stands of Late-Successional Reserves in those uninfested watersheds in order to accelerate the development of late-successional forests or restore ecological processes. Such thinning is a major strength of the Northwest Forest Plan, but with nearly 2,000,000 acres of thinning needs in the Northwest Forest Plan area, this 6,000 acres is inconsequential (0.3 percent of the Northwest Forest Plan area) to achieving Late-Successional Reserve objectives.

Projections by pathologists indicate 20 percent of the high-risk stands currently uninfested with PL would become infested under Alternative 3 in the next 100 years, and POC mortality in these infested stands would approximate 90 percent. As with Alternatives 1 and 2, loss of overstory POC could impact from 35 to 50 percent of the overstory cover (Table 3&4-11). Fifty-eight wildlife species are associated with large-diameter trees and may be negatively impacted by the loss of these structures. Impacts may include loss of forage, foraging substrate, nesting/roosting habitat, and the disruption of travel corridors. Terrestrial species may be impacted by changes to the herbaceous plant biomass in the lower strata and changes in climatic parameters, such as wind speed, relative humidity, and temperature. Terrestrial species may also be negatively affected by loss of future woody biomass, although this effect is low for POC when compared with other tree species for the reasons described under Alternative 1.

Ecosystem recovery, primarily the recovery of the overstory canopy, will be highly dependent upon the ability of the stand to revegetate naturally or upon reforestation efforts as described in the Planting Assumption (found in the Assumptions and Clarifications section of this chapter). The development of PL-resistant stock would help to restore the POC losses. Available for deployment in 0 to 40 years depending upon breeding zone (see Table 3&4-21 in the Genetics and Resistance section), larger-diameter POC are expected to be in the landscape again 80 to 100 years later.

Alternative 4 and 5

These alternatives remove all mitigation measures currently used by the BLM and FS to limit the spread of PL across the landscape. The alternatives differ from each other only in the level of resistance breeding to continue. Under Alternative 4, the current breeding and testing program for the development of resistant stock would be accelerated. Within 10 years, resistant seed and planting stock will be available for all breeding zones in Oregon. Under Alternative 5, the further identification and testing of new resistant trees would cease, but use of resistant seed from the currently developed breeding zones would continue. These cover approximately 26 percent of the breeding zones.

Projections by pathologists indicate that 80 percent of the high-risk stands currently uninfested would become infested in the next 100 years. Loss of overstory POC could impact from 35 to 50 percent of the overstory cover (Table 3&4-11). Fifty-eight wildlife species are associated with large diameter trees and may be negatively impacted by the loss of these structures. Impacts may include loss of forage, foraging substrate, nesting/roosting habitat, and the disruption of travel corridors. Terrestrial species may be impacted by changes to the herbaceous plant biomass in the lower strata and changes in climatic parameters, such as wind speed, relative humidity, and temperature. Terrestrial species may also be negatively affected by loss of future woody biomass, although this effect is low for POC when compared with other tree species for the reasons described under Alternative 1.

Ecosystem recovery, primarily the recovery of the overstory canopy, will be highly dependent upon the ability of the stand to revegetate, either naturally or under reforestation. The development of PL-resistant stock would help to restore the POC losses—Alternative 4 more than Alternative 5. In Alternative 4, seed will be available for all zones within 10 years (see Table 3&4-21 in the Genetics and Resistance section), and larger-diameter POC are expected to be in the landscape again 80 to 100 years later. Resistant stock would not be developed for

some breeding zones under Alternative 5, and replacement of large-diameter trees in infested areas could take centuries or may never be replaced.

Alternative 6

The effects of Alternative 6 are the same as Alternative 3 except as follows.

Alternative 6 would provide additional protection for 162 7th field watersheds that are currently identified as being uninfested with PL (rather than the 6th field watersheds described in Alternative 3). Timber harvest would be prohibited in the 49,675 acres (Table 2-3) that have POC (POC cores), including 3,010 acres of Matrix and Adaptive Management Area that are currently available for regularly scheduled timber harvest and contribute to PSQ (Table 3&4-24b in the Timber Harvest section). This does not preclude salvage in the case of a stand-replacing event. Additionally, within POC cores, roads will be closed or all POC would be removed along them. These equates to about 9 acres per mile of road. The loss of the larger diameter trees could have some effect on ability of the stands to function for species associated with large diameter trees. Due to the spacing of very large trees it is unlikely that a substantial number of large diameter trees would be remove due to road sanitation in any one stand. There is the potential to restrict the recruitment of large diameter POC, but, with the exception of ultramafic plant associations, POC is a minor component of the overstory. The restriction against timber harvest in POC core areas will restrict the ability of Agencies to do manage stands in Late-Successional Reserves to accelerate the development of late-successional forests or restore ecological processes. Such thinning is a major strength of the Northwest Forest Plan, but with nearly 2,000,000 acres of thinning needs in the Northwest Forest Plan area, this amount is inconsequential.

Projections by pathologists indicate 18 percent of the high-risk stands currently uninfested with PL would become infested under Alternative 6 in the next 100 years, and POC mortality in these infested stands would approximate 90 percent. As with Alternatives 1 and 2, loss of overstory POC could impact from 35 to 50 percent of the overstory cover (Table 3&4-11). Fifty-eight wildlife species are associated with large diameter trees and may be negatively impacted by the loss of these structures. Impacts may include loss of forage, foraging substrate, nesting/roosting habitat, and the disruption of travel corridors. Terrestrial species may be impacted by changes to the herbaceous plant biomass in the lower strata and changes in climatic parameters, such as wind speed, relative humidity, and temperature. Terrestrial species may also be negatively affected by loss of future woody biomass, although this effect is low for POC when compared with other tree species for the reasons described under Alternative 1.

Ecosystem recovery, primarily the recovery of the overstory canopy, will be highly dependent upon the ability of the stand to revegetate naturally or upon reforestation efforts as described under Planting Assumptions in the Assumptions and Clarifications section of this chapter. The development of PL-resistant stock would help to restore the POC losses. Available for deployment in 0 to 40 years, depending upon breeding zone (see Table 3&4-21 in the Genetics and Resistance section), larger-diameter POC are expected to return to the landscape in 80 to 100 years.

Cumulative Effects

The effects described above for both PL-caused mortality and for application of various management practices (described above) also need to be considered in context with other reasonably foreseeable actions or events that could affect the same habitat or species. Wildlife habitat could be affected by timber sales or fuel treatment activities, but to a lesser degree other forest management activities.

As noted above, no wildlife species were identified that were exclusively linked to POC. Even POC snags are lesser used than those of other species. Effects to wildlife are thus linked to loss of specific habitat components. Land and resource management plans identify minimum snag and downed log numbers to be maintained during timber sales and other management activities. Since PL increases POC snag and down low components in the short term, but could decrease such features in the long term, only timber sales and other tree-removing activities affecting long-term snag recruitment would have a cumulative detrimental effect. No harvest method reduces long-term snag availability, because trees grow back. Effects of PL-related loss of stands in the Matrix Northwest Forest Plan land allocation would be exacerbated by planned timber harvest, but harvest of Matrix acres is already planned and PL-mortality would only affect timing and arrangement, and then only of the POC portion of the stands, but not the total acres affected.

As noted above, roadside sanitation could adversely affect species associated with late-successional or old-growth habitat (also see biological evaluation, Appendix 7). Such sites are within larger late-successional or old-growth habitat habitats within reserves. No other management activities, except in rare cases the need to remove fire-prone stands, would remove late-successional or old-growth habitat stands in these same areas, so there is no significant cumulative effect on late-successional or old-growth habitat-associated species.

Pacific Yew

Affected Environment

The Pacific yew tree and shrub is unique in western forests, growing inconspicuously either individually or in small groups in the understory of Douglas-fir and other conifer forests. Although important to American Indians and a small contingency of woodworkers, it was overlooked by modern society until taxol, a promising cancer fighting compound extracted from yew, was discovered. Demand soared, and in September 1993, the FS, BLM, and U.S. Food and Drug Administration released the final EIS for the management of Pacific yew. This document provided a comprehensive analysis of Pacific yew including inventories, autecology, occurrence, reproduction and growth forms, effects of management, genetics, ecosystem function, and response to damaging agents including PL. At that time, a total of 19 infected Pacific yew trees had been identified, all in areas with infected POC. Harvest accelerated for a few years, until a synthetic taxol virtually eliminated the need to harvest yew trees. Interest in natural taxol has recently resurfaced, and the future demand is uncertain. However, there are numerous plant communities where Pacific yew grows and POC does not, and from which yew could be collected. For example, Pacific yew is found in 40 plant associations on the Rogue and Umpqua National Forests where POC does not grow.

As noted in the Pathology section, Pacific yew is infected by PL on infrequent occasions (Kliejunas 1994). It has been suggested this is cause for concern, and that this SEIS needs to address Pacific yew in detail, reevaluating the analysis made in the 1993 Pacific yew EIS. However, observations and laboratory trials show that Pacific yew is much less susceptible to PL than POC. Where it has been found infected, yew was growing in close association with many previously infected POC (Murray and Hansen 1997). PL can infect Pacific yew, but rarely.

For the purposes of this analysis, it is concluded there is no evidence that Pacific yew will carry PL on its own, or that PL poses a significant threat to yew.

Effects of the Alternatives

Pacific yew growing in close association with numerous POC will potentially be more susceptible to future PL infections. The potential for incidental Pacific yew growing on high-risk sites to become infected varies by alternative in proportion to the percent of POC predicted to become infected (Table 3&4-8). Within disease-infested areas, yew infections will follow the same infection patterns as those outlined in the Pathology section; that is, they will become infected on infrequent occasions. There are numerous plant communities where Pacific yew grows and POC does not. For example, Pacific yew is found in 40 plant associations on the Rogue and Umpqua NFs where POC does not grow. In all alternatives, overall yew infection rates are expected to be inconsequential.

Genetics and Resistance

Affected Environment

Genetic Variation

Genetic diversity among and within species is the basis for all biological diversity. Most plant species exhibit a large amount of genetic variation, which reflects adaptation to local environmental conditions (Linhart 1995). Paleobotanical evidence indicates that POC formerly occupied a vastly wider range and that restriction to its present distribution left considerable variation intact (Edwards 1985). Such diversity is an asset in allowing a species to survive and adapt to new, changing environments (such as when POC is affected by PL) (Kitzmiller et al. 2003). Knowledge of the patterns of this variability is crucial for successful genetic management, whether in designing elaborate resistance breeding programs, or in developing more passive conservation strategies for natural ecosystems. Recent studies of this genetic variability can be grouped into two major categories: allozyme studies and common garden studies.

Allozyme studies. Electrophoretic analysis of allozymes allows relatively quick, inexpensive quantitative measures of genetic structure, genetic diversity, and mating systems. They are often employed as a first step in describing and understanding the genetic architecture of a species.

In three studies conducted on POC, populations in California were moderately variable in allozymes (comparable to values for other California conifers with small- to moderate-sized

distributions, but notably lower than most widespread conifers). Across all stands, 5 percent of total allozyme variation was attributed to differences among stands, and 95 percent to differences among trees within stands (Millar and Marshall 1991). Elevation was the strongest ecological factor associated with genetic differentiation, but at low elevations, soil contrasts (serpentine versus nonserpentine) was nearly as great (Millar et al. 1991). Overall, relationships between ecological habitat, allozyme diversity, and genetic differentiation over short geographic distances were markedly greater for POC than for more widespread Douglas-fir and white fir (Millar et al. 1991). Sampling on a much wider scale showed contrasts between populations from California and Oregon (Millar et al. 1992). For example, while the mean allozyme diversity was slightly greater for Oregon, the range of diversity was greater in California. In addition, the Oregon cline among populations in allozyme variation was strongest along latitudinal, weaker along longitudinal, and weakest along elevational gradients. In California, the cline was strongest along longitudinal strata, although elevation was also a relatively strong determinant of allozyme diversity (Millar et al. 1992).

Collectively, these studies show that a large number of common alleles associated with allozymes reside in any given population. Therefore, even if scattered stands over the species' range were completely lost in the future, common alleles would not be compromised. However, as expected from quantitative genetics theory, these studies have also illustrated that POC does contain rare alleles, especially at the margins of its range (Anonymous 1994; Millar and Marshall 1991). By their paucity, these genes are more likely to be lost (even from stochastic random events), and, although none have yet been documented as lost to PL root disease, such a probability seems almost certain. On the other hand, selection pressure from PL may also increase the frequency of other rare genes, including those exhibiting "major," as well as quantitative, resistance to the disease (see Program to Develop Genetic Resistance and Gene Conservation discussions). Actual expiration of any population of POC by PL has yet to be documented (Anonymous 1994), nor is it predicted to be by this analysis.

While allozyme studies are useful in describing genetic variation in allozymes, they cannot show definitive, adaptive responses to field environments over time. Investigations of these responses are best accomplished by common garden studies.

Common garden studies. As the name implies, common garden tests are often designed to compare variation patterns of a few to relatively large numbers of genetic identities (those may include provenances, open-pollinated, or controlled-pollinated families, and clones), all grown in at least one, but frequently several, test sites, or "gardens." By careful selection of genetic entries, choice of uniform garden(s) representing environmental gradients or extremes, proper experimental design and statistical analyses, and appropriate management, these research sites can yield a wealth of practical information about genetic variation. If maintained judiciously over time they may also allow evaluation of genetic adaptation to infrequent events (such as severe frosts, droughts, and new disease epidemics) or more subtle future changes (such as global cooling or warming).

In 1995 the BLM and FS began to establish range-wide, common garden tests to further evaluate the genetic variability within POC. Seed was collected from 344 healthy parent trees on Federal land between 1991 and 1994. Stands were sampled throughout much of the species' range; their selection assisted by results of the earlier allozyme studies, noted above. Two different hierarchical models were employed to partition the genetic effects: (1) ecological or watershed model with watersheds, stands, and families; and (2) a breeding model

with breeding zones, seed zones, and families (Kitzmiller et al. 2003).

Short-term studies of height growth response (Kitzmiller and Sniezko 2000), height growth phenology (Zobel et al. 2002), and water relations of terminal shoots (Zobel et al. 2001) were conducted, utilizing seedlings from families transplanted in raised beds at two nursery sites (Dorena, near Cottage Grove, Oregon, and Humboldt Nursery, McKinleyville, California) in 1996. Seedlots from the extremes (high elevation, southern interior in California and low elevation, coastal stands near Coos Bay) of the species distribution exhibited striking contrasts in all traits. Of more practical adaptive relevance, height growth increased, while the proportion of early-season growth declined and proportion of late-season growth increased with change in source location from (1) high to low elevations, (2) from south to north, and (3) from east to west when populations spanning the range were included. Strong clinal patterns were noted for height potential with source elevation, latitude, and longitude (Kitzmiller and Sniezko 2000). Overall, these data showed population structure and geographic patterns similar to, but much stronger than, the allozyme work noted above (Kitzmiller et al. 2003).

Short-duration tests in low moisture and nutrient-stress nursery environments are not well suited to assess cumulative responses to complex, site-specific environmental stresses. Consequently, five individual common garden sites utilizing 266 of the families included in the nursery tests were planted in 1996 to 1998. Data collected on the Humboldt and Trinity Lake plantations for 3 years showed mean height was inversely related to survival at the inland site. Data collected for 5 years revealed a geographic cline in height growth associated with latitude, longitude, and elevation of seed origin. Northern, low elevation, coastal provenances grew taller than southern, high elevation, interior sources at both plantations. However, these faster growing sources also showed the greatest relative reduction in growth and survival when planted at the inland site.

Growth measurements are scheduled to continue, episodic events will be assessed, and genetic effects evaluated. Even very harsh sites with poor survival have value. For example, Sharpe (2002) assessed drought-prone sites (Althouse and Trinity Lake), as well as greenhouse environments. Her findings generally supported those of Zobel et al. (2001); mid-day field water potentials were correlated with survival of seedlings from different breeding blocks. Root growth and morphology also varied among seed sources, with probable adaptive consequences (Sharpe 2002). These data could be helpful in designing PL resistance mechanism studies.

Overall, these POC genetic variability studies fit with the classical, theoretical population genetics theory of changing responses to mutation and genetic drift, as confounded by various selection pressures (over time and space) and by migration patterns and rates (Namkoong 1979). Practically, the gradual clinal trends collectively imply adaptive changes in gene frequencies across the species' range. These data were all considered in developing geographic subdivisions for POC (see Breeding Block and Zone Designations as follows). They are also fundamental in breeding strategy planning (see Program to Develop Genetic Resistance to *Phytophthera lateralis*: Selection, Testing, and Breeding section), for deployment of resistant seed (see Utilization of Resistance section), and for general genetic and silvicultural management practices.

Breeding Block and Zone Designations

A breeding block designates the geographic area that envelops a number of breeding zones. Preliminary breeding blocks and zones have been delineated on the basis of a short-term genetic common garden study (Kitzmiller and Sniezko 2000) and general knowledge of southwestern Oregon and northern California species genecology (Figure 3&4-2).

Genetic common garden studies are short- and/or long-term tests that are commonly used to assess seed transfer or breeding zones (Westfall 1992). The common garden study noted genetic variation associated with latitude, longitude, and elevation of the seed sources. These macrogeographic variables, in part, imply natural selection to temperature and moisture, which affects growth initiation, growth cessation, and growing season length and climatic gradients over the range of the species. Additional studies (Millar and Marshall 1991; Zobel et al. 2001; Zobel et al. 2002) have also noted differences between the coastal and inland sources of POC in relation to allozyme, phenology, and physiological traits. In addition, a long-term common garden field study was established between 1996 and 1998 to assess

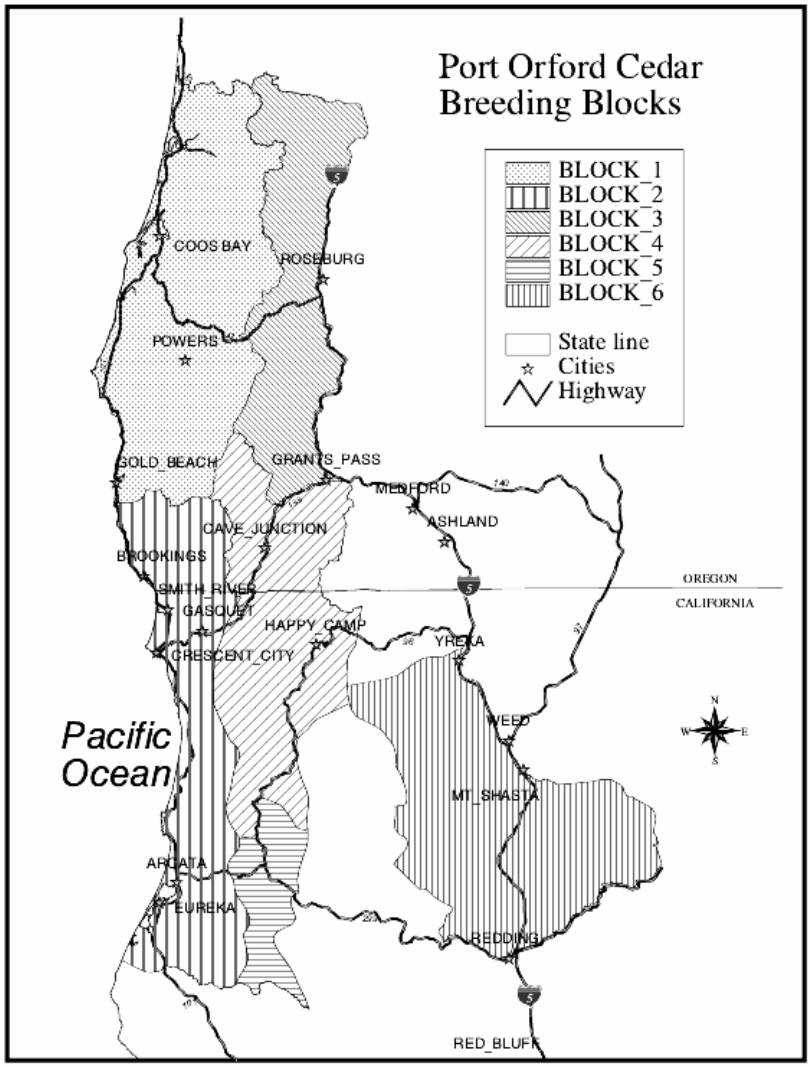

Figure 3&4-2.—*Port-Orford-cedar breeding blocks*

genetic variation patterns over a long timeframe. Future analyses of this study would be used to verify and/or refine the genetic variation patterns inferred from the short-term test.

Breeding blocks and zones represent a geographic area where genetic reproductive materials (such as seed, seedlings, and cuttings) are procured, and then subsequently deployed (seeded or planted). This insures that the seeded or planted stock are adapted to the deployed areas, and also helps conserve the natural genetic structure of the species over the landscape.

The preliminary breeding blocks and zones serve to guide seed transfer and associated breeding activities. Breeding zones are represented by elevation bands within the respective breeding blocks, and designate units of land in which seed transfer and improved populations (resistance breeding) are being developed. The elevation bands are listed in Table 3&4-21 (also see Figure 3&4-2). An elevation band within a breeding block constitutes a single breeding zone; all elevation bands are not represented in every breeding block.

Seedlots may also be delineated in the future within any respective zone on the basis of source soil type. POC occurs on both ultramafic (serpentine) and nonultramafic soil types. A number of plant species have differentially adapted to these distinct soil types (Linhart 1995), but the degree to which POC has specifically adapted is not well known.

Conservation Genetic Considerations

Conservation genetics deals with the inherent genetic diversity of a species, and has been defined as the use of genetics to preserve species as dynamic entities that can evolve to cope with environmental change, and thus minimize their risk of extinction (Frankham et al. 2002, *p. 19*). Conservation genetics is especially relevant to the current POC ecosystem dynamics where populations are being fragmented to varying degrees as the disease spreads through portions of the landscape. The basic principles of genetics can be used to assess the effect on population structure. In addition, current or future conservation measures can be assessed as to their efficacy in conserving genetic diversity. This section will discuss aspects of the following: (1) effect on POC genetic structure where PL is spreading or has been in place; (2) general genetic effects of establishing resistant stock in restoration efforts; and (3) ex situ and in situ genetic conservation measures.

1) Effect on POC genetic structure where PL is spreading or has been in place: Population-level conservation is sufficient for both genetic and species conservation with a simple to very diverse structuring (Namkoong et al. 1988). Population genetic structure refers to the amount and distribution of variation within and among populations. The genetic properties (and structure) are affected by population size, fertility, viability, migration (gene flow), mutation, selection, mating systems, and genetic drift in combination with environments (Falconer 1989).

Many forest species adjust to repeated loss (such as through disease) and subsequent reinvasion (or recolonization) of its range (Stern and Roche 1974, *p. 228*). Change in genetic structure of populations can be summarized by the changes in allele frequencies, heterozygosity, and genetic variances. When populations are completely isolated from others (where there is no gene flow from pollen or seed), fragmentation would typically lead to greater inbreeding (reduced heterozygosity), loss of genetic diversity within fragments, loss of rare alleles, and greater risk of extinction of these populations

Table 3&4-21.—*Projected resistant seed availability per breeding zone by alternative*

Breeding block/ breeding zone	Elevation band	Acres [% serpentine]	Year: Alternatives 1, 2, 3, & 6	Year: Alternative 4	Year: Alternative 5
Breeding Block 1 [Oregon]					
115	< 1,500'	50,083 [5]	2002	2002	2002
130	1,500-3,000'	95,260 [20]	2002	2002	2002
140	3,000-4,000'	20,711 [38]	2010	2010	No seed
150	4,000-5,000'	260 [41]	2030	2010	No seed
Total		166,314			
Breeding Block 2 [Oregon and California]					
215	< 1,500'	817 [16]	2040	2010	No seed
230	1,500-3,000'	1,738 [4]	2035	2010	No seed
240	3,000-4,000'	484 [10]	2020	2010	No seed
250	4,000-5,000'	39 [69]	2040	2010	No seed
Total		3,078			
Breeding Block 3 [Oregon]					
315	< 1,500'	1,902 [3]	2015	2010	No seed
330	1,500-3,000'	6,910 [27]	2010	2010	No seed
340	3,000-4,000'	1,837 [46]	2020	2010	No seed
350	4,000-5,000'	37 [100]	2045	2010	No seed
Total		10,686			
Breeding Block 4 [Oregon and California]					
415	< 1,500'	13,411 [42]	2025	2010	No seed
430	1,500-3,000'	55,919 [57]	2002	2002	2002
440	3,000-4,000'	47,931 [59]	2030	2010	No seed
450	4,000-5,000'	12,423 [13]	2015	2010	No seed
455	5,000-5,500'	1,227 [12]	2015	2010	No seed
460	5,500-6,000'	214 [8]	2025	2010	No seed
465	6,000-6,500'	55 [0]	2035	2010	No seed
Total		131,180			
Breeding Block 5 [California]					
515	< 1,500'	42 [0]	2068	2068	No seed
530	1,500-3,000'	420 [0]	2012	2012	No seed
540	3,000-4,000'	146 [0]	2060	2060	No seed
550	4,000-5,000'	230 [0]	2044	2044	No seed
Total		838			
Breeding Block 6 [California]					
630	1,500-3,000'	96 [0]	2060	2060	No seed
640	3,000-4,000'	154 [0]	2052	2052	No seed
650	4,000-5,000'	269 [0]	2028	2028	No seed
655	5,000-5,500'	453 [0]	2020	2020	No seed
660	5,500-6,000'	289 [0]	2036	2036	No seed
665	6,000-6,500'	30 [0]	2068	2068	No seed
Total		1,291			

Note:
a] See Figure 3&4-3 for geographic areas; breeding zones relate to elevation bands within the respective POC Breeding Block.
b] Some breeding blocks are entirely in either Oregon [OR] or California [CA]; others span both states.
c] Acre figures refer only to Federal land and are based upon geographic information system approximation. Percentage of land that is on serpentine soil is given in parenthesis [%].
d] Breeding Blocks 5 and 6 are in California and not part of the POC-SEIS; Alternative 4 would not apply to these.
e] Projected resistant seed availability assumes 1,250 field selections needed per breeding zone, and assumes all breeding zones would have orchards. Some breeding zones with few acres may be combined.
f] Breeding Zone 130 would be used for Breeding Zones 140 and 150 until seed for those zones were available.
g] 2010 projections under Alternative 4 assumes 20,000 new field selections would be made and tested from 2003 to 2008 [16 breeding zones x 1,250 trees/breeding zone].
h] Priorities for breeding zones are based upon 2003 input from BLM and FS POC program managers.

(Frankham et al. 2002). Since extirpation has not occurred (see Allozyme Studies section) nor is it predicted to in this analysis, the other genetic consequences are applicable in varying degrees across the species range. The most severe consequences would occur in very small, disjunct, inland locales with limited gene flow among stands.

A large segment of POC habitat can be described as a composite of numerous subpopulations (a deme or group of interbreeding individuals) where gene transfer (migration) occurs among subpopulations over time. The main factor relating to change in population structure is the rate of extinction of subpopulations and number and type of founder individuals that colonize the extinct subpopulations (Hedrick and Gilpin 1997). In addition, it is pointed out that the effective population size is increased when the rate of extinctions is reduced, and the number of subpopulations and rate of gene flow are increased. Selection pressures (as an evolutionary force) in any population will ultimately change allele frequencies to some extent. It is the combination of genetic processes that formulate both genetic structure and magnitude to which the structure changes over time.

Even after a severe PL invasion of prolonged duration, surviving natural POC persist and continue to exchange genes (both pollen and seed transfers) with neighboring subpopulations at variable amounts, depending on size, proximity, and number of subpopulations. A very analogous process would likely occur between resistant stock used to rehabilitate PL infestation sites and surviving POC from the same stand and others nearby, although gene flow may be limited and directional until planted trees reach reproductive capacity (see Genetic Resistance Program section) to balance natural trees.

In natural regeneration events, migration from neighboring subpopulations affects the local genetic structure. When small, relatively isolated stands are considered (often referred to as the island or stepping-stone model) only small numbers of immigrants (~ 1; where 1 = [effective population size] x [percent of immigrants from other populations]) in any respective generation are required to prevent loss of alleles (prevent fixation by drift) and differentiation among populations (Falconer 1989, *p. 80*; Namkoong 1979, *p. 308*). When subpopulations are more continuously distributed over the landscape (neighborhood model typical of coastal conditions) and gene frequencies are more similar (among subpopulations), the effective population size must be on the order of 20 or less (circumstances not generally found in coastal subpopulations) for a large amount of local differentiation (Falconer 1989, *p. 80*). Thus, migration helps to maintain genetic variation at the local and larger scale (macrogeographic) level.

The most severe changes in genetic structure and diversity will occur in the high-hazard isolated stands under specific conditions; such as where mortality is high, founders of resistant progeny (via natural regeneration) are minimal in number, and pollen exchange is minimal from surrounding stands. If the number of founding parents that recolonize a site are extremely low (less than three female parent trees), then conditions favorable for reduction in genetic diversity exist (higher inbreeding over shorter period of time, larger population divergence,) as opposed to the original population conditions. If the number of founders are on the order of magnitude of five or more trees in the recolonization event, then the relative impacts on genetic diversity change at the local population level are lessened substantially. Thus, high-risk sites will range in change to genetic diversity from very low to severe over the range of sites throughout the species range. However,

over the respective large-scale macrogeographic regions of POC, genetic structure is expected to change little from the sole impact of PL.

Changes in allele frequency, heterozygosity, and genetic variation among and within populations can be expressed at the local population/subpopulation level and at the larger macrogeographic/regional level. As mortality and fragmentation affects a higher percentage of populations/subpopulations across the landscape, the genetic structure will be affected to a greater degree. The local affected populations may experience a reduction in heterozygosity, increased differentiation among populations, a greater loss of rare alleles, and increased differences in allele frequencies. In addition, some populations may experience a severe reduction in genetic diversity (and fitness over time) due to the limited number of founder parents (in natural regeneration) that recolonize sites. The cumulative affects at the larger macrogeographic/regional scale can be generalized in relation to the amount of changes that occur at the local population levels. In general, the cumulative allele frequencies (pooled across all populations) would change little and the common alleles (already present in numerous populations) would not be lost. There would be a loss in rare alleles, commensurate with the accumulative loss at the local population levels. The amount of heterozygosity would decrease across the larger macrogeographic scale, and the amount of genetic variation would decrease by some small degree. The distribution of genetic variation among and within populations would change to some extent, where variation among populations is increased relative to the initiation of mortality and fragmentation events. These same generalizations would apply to other catastrophic events which create similar fragmentation and loss of populations/habitat (such as wildland fires). In general, as the mortality and habitat loss increases, there is an increasing possibility of losing segments of subpopulations over time (assuming no mitigation to reestablish), and some reduction in the natural genetic variation will take place. However, there is expected to be little net effect on the genetic structure in POC over the respective large-scale macrogeographic regions of the species from mortality caused solely by PL.

2) General genetic effects of establishing resistant stock in restoration efforts: Resistant stock can be deployed to various habitats throughout the natural range in order to help restore the habitats where the disease has occurred. Once disease resistance is obtained it can be improved over time in an operational breeding program (Zobel and Talbert 1984). In addition to restoring the habitat, planting would help reestablish gene flow to a degree, enabling pollen flow and migration (seed transfer) of selectively advantageous alleles/genes to be spread to adjacent subpopulations over time (Ledig 1986).

The genetic structure of the local or subpopulations would be dependent on the effective population numbers of the planted stock in addition to the various factors presented earlier (such as gene flow and number of subpopulations). The genetic structure over the species range could be changed to a degree, depending on the scale of plantings and genetic variation of the planting stock. However, the number of plantings would probably not be on a scale sufficient to change effective population sizes over a large continuum of the respective macrogeographic regions.

3) Ex situ and in situ genetic conservation measures: Gene conservation conserves and stores gene pools which in turn helps prevent the loss of genes, gene complexes, and

genotypes (Zobel and Talbert 1984, *p. 461*). In practice, application of gene conservation strategies, common genetic conservation measures that are undertaken to conserve genetic variation of a species, can be separated into two broad categories: (1) ex situ (saving genes offsite such as seed banks, clone banks, seed orchards), and (2) in situ (management of populations onsite). Saving genes with efficiency, security, and completeness are the first objectives for conserving biological diversity, and ex situ conserves genes more conveniently (Namkoong et al. 1988, *p. 152*). In situ continues the evolutionary process in the wild, but it may not be practical (Namkoong et al. 1988, *p. 152*), or the natural stands may be vulnerable to damaging agents (such as disease) or catastrophic events (Ledig 1986). Thus, conservation measures are selected and put into place to meet specified conservation objectives.

a) In Situ — Coastal Populations: Millar and Marshall (1991) suggested that in California, because of low allozyme distance among populations and high proportions of variability within stands, a few large (as opposed to many small) natural areas would conserve much of the genetic diversity in POC. The same conclusion should also apply to coastal Oregon populations. Indeed, even in stands that have been severely infested for 30 to 40 years, some seed bearing POC seem to survive, whether by favorable location on microhabitat niches that escape infection, by random chance, or by some combination of heretofore undetected genetic resistance mechanisms. Furthermore, the precocious and prolific seed production of POC (Zobel 1979), its relative shade tolerance, and ability to establish itself on a variety of seedbeds (Zobel et al. 1985) seem to result in continued natural regeneration on these infested sites. On the Oregon coast, it appears that natural conservation areas are presently functionally covered by Reserve and Withdrawn Land Use Allocations (Table 3&4-3).

b) In Situ — Inland populations: Frequently disjunct, inland stands of POC have much smaller preinfection effective population sizes, restricted gene flow with "neighboring" subpopulations, and a higher "average" predicted infection percentage (Table 3&4-10, Pathology section), as well as a likelihood of the occurrence of proportionally more rare alleles. Some notable stands and large acreages are also protected by Reserve or Withdrawn Land Use Allocation (Table 3&4-3). Examples include the Kalmiopsis Wilderness, Brewer Spruce Research Natural Area (RNA) southwest of Grants Pass; Beatty Creek RNA west of Riddle, Oregon; Caves National Monument; and Late-Successional Reserves. Riparian Reserves may be particularly unsuited for protection of POC, since they are often, by definition, high-risk sites.

By their very nature, in situ reserves are exposed to natural selection pressures and catastrophic events. The 2002 Biscuit Fire in southwestern Oregon and northern California provides a dramatic example. If a large number of natural stands are completely consumed, the acreage currently protected and/or as a possible in situ reserve would no longer be available. In any event, in situ reserves may not meet the intended need for the long term, and assessments of their genetic value would need to be made periodically.

c) Ex Situ — Seed Collections: Several authors have noted that ex situ collections can extend the range of genetic protection and reinforce in situ programs (Millar and

Marshall 1991). Ledig (1986) advised that ex situ methods should be used when possible as added insurance against loss. Millar and Marshall (1991) recommended that seeds should be collected as soon as possible from main stands throughout the range, especially in infested areas and from dying trees. These recommendations are especially pertinent to that portion of the POC range in Oregon where infestation is occurring. They further noted that early evidence suggests that POC seeds may retain high viability for more than 50 years under proper cold storage conditions.

A substantial quantity of POC is available in operational reforestation seed lots. Over 120 pounds of seed, representing discrete elevation bands ranging from 1,000 to over 4,000 feet, collected from over 250 wind-pollinated trees from natural stands are in storage at the five administrative units (Coos Bay, Medford, and Roseburg BLM; the Siskiyou NF; and the FS Dorena Genetic Resource Center). This broad-based store from locally well-adapted, but primarily nonresistant parents, all collected since 1989, is available for project work, rehabilitation following catastrophic events, and as operational baseline controls (for contrasts with bred, resistant stock). In some breeding zones, operational seed lots are rapidly being replaced by resistant seed from orchards, although the rate of conversion would vary by alternative (see Table 3&4-21 in Program to Develop Genetic Resistance section).

Open-pollinated cone collections from single trees of precisely known location formed the basis for many past genetics research projects, including the range-wide common garden study (see Genetic Variation discussion). Approximately 500 of these half-sibling families each retain at least 50 seed in storage. While their primary utility may be for additional research projects, they can also serve simultaneously as ex situ genetic reserves. Dorena Genetic Resource Center also maintains an operating, expanding collection of full-sibling families, inbred lines, and a variety of other materials used in their work on breeding PL resistance.

d) Ex Situ — Vegetative Material: There exist a number of ex situ collections of clones/families which are preserved at various locales. Dorena Genetic Resource Center maintains a breeding arboretum of numerous clones, in containers. The BLM Tyrrell Seed Orchard, southwest of Eugene, Oregon, currently contains numerous clones, with 3 ramets per clone, in an “in-ground” clonebank. More room is available for expansion, as an offsite backup and longer-term repository, for material from the Dorena Genetic Resource Center.

The numerous validation plots established in the field (see Genetic Variation subsection at the beginning of this section) also serve as repositories of known identity and pedigree. The range-wide common garden plantations also preserve half-sibling, open-pollinated families, as well as bulked reforestation lots. Finally, although their natural origins are largely unknown, the 50 or more cultivars currently still available commercially (Zobel et al. 1985) could be of interest, especially since their adaptability to a wide range of climatic extremes may be appreciated by horticulturists.

These materials represent a sampling of the gene pool, and preserve both resistant and nonresistant materials from across the species’ range. They would be utilized in the future breeding program to some extent, and help conserve the gene pool on a limited scale.

Program to Develop Genetic Resistance to *Phytophthora lateralis*: Selection, Testing, and Breeding

Nearly all POC seedlings and trees are highly susceptible to PL, which largely explains the very high mortality levels (potentially 90 percent) on infested high-risk sites in natural ecosystems. On these sites, very few, if any, seedlings would ever survive beyond the sapling stage. There appears to be genetic resistance within native POC populations; however, only a very small percentage of trees have complete resistance (probably less than 1 percent of trees) and only a low frequency of trees appear to demonstrate partial resistance or slower rate of mortality (further investigation is underway) (Sniezko, R.A, *personal communication [unpublished data]*). The rare, resistant trees are too scattered to expect natural interbreeding toward resistant stock without severely compromising genetic diversity in the high-risk areas. A resistance program coupled with restoration efforts can overcome this.

Based on initial indications of genetic resistance in the late 1980s (Hansen et al. 1989) and confirmation in cooperative work between the BLM, FS, and Oregon State University in the early 1990s, an operational program to develop resistance was begun in 1997. Over 9,000 prospective resistant trees were selected between 1997 and 2001 on Federal and non-Federal lands (Bower et al. 2000; Sniezko et al. 2003b) funded in part by a special technical development proposal. Until the start of this program, only a handful of trees had been identified with complete resistance. By 2002, more than 100 trees had been identified with complete resistance. Traditional resistance breeding, employed in this program, brings together stock from those parents and allows them to cross-pollinate to generate populations of diverse, adapted, and resistant trees, without having to utilize the recently devised but controversial genetic engineering techniques used in the development of genetically-modified organisms.

The resistance program is based at the FS Dorena Genetic Resource Center and is a cooperative venture between the BLM and FS. Oregon State University provides basic research, disease testing facilities, and further technical pathology input. The primary resistance test is a greenhouse root dip test of seedlings or rooted cuttings (Sniezko et al. 2003a, 2003b). In the greenhouse, rooted cuttings of some field selections consistently show high levels of survival (usually 100 percent), while rooted cuttings of susceptible parents often show 0 percent survival (Sniezko and Hansen 2003b**)**. Seedling survival in greenhouses can vary from 0 to 100 percent 9 months after inoculation depending on the family tested (Sniezko and Hansen 2000; Sniezko and Hansen 2003a; Sniezko et al. 2003a, 2003b).

Field validation plantings have been established at more that 20 sites (Federal, county, and private cooperators), but most tests were established since 2000. The oldest field test (planted in 1989) is at Oregon State University's Botany Farm. Despite some early mortality, the resistant clones (using rooted cuttings of parent trees selected at field sites) and a seedling family have shown good survival and little new mortality in the last 7 years (Sniezko et al. 2000). Nearly all of the susceptible clones died within the first 2 years at this site (Sniezko et al. 2000). Three-year results from one of the 2000 test series involving 26 seedling families showed that short-term greenhouse testing correlated well ($r = 0.65$ to 0.84) with a raised bed test and with tests at two field sites (Sniezko et al. 2004). All four of these tests had moderate to high mortality levels (41 to 69 percent). Analyses of additional tests of this nature are underway, but at this point current data suggest the utility of resistant trees on high-risk areas would be good.

There is difficulty finding good field validation sites on BLM and FS land; however, other interested landowners (county and private) have recently provided sites. These validation tests would be followed over time to determine whether resistance holds up under an array of environments, as well as whether the resistance is durable.

Two of the earliest field selections have survived in high-risk areas infested with PL since the late 1980s. In addition, the earliest confirmed resistant tree (CF1) has survived greater than 20 years in a high-risk area infested with PL at Oregon State University. Progeny and/or rooted cuttings of trees with complete resistance have been repeatedly tested in short-term greenhouse tests and have consistently demonstrated higher survival (50 to 100 percent) than the most susceptible trees (less than 10 percent); they have also shown higher survival in the young field tests (Sniezko and Hansen 2003a; Sniezko et al. 2004). Complete resistance in POC is likely a form of major gene resistance, but it is unknown at this point whether there is more than one resistance mechanism for complete resistance.

Future breeding efforts would focus primarily on improving the levels of partial resistance as these traits are confirmed. Several generations may be needed to increase the levels of partial resistance to levels sufficient for field use. Under natural stand conditions, this process would proceed slowly, if at all, due to the rarity of resistant trees and the pollination by susceptible trees outside the immediate high-risk areas. In a managed greenhouse environment, breeding generations for POC are relatively short (3 to 6 years or more depending on funding). Parents with partial resistance could also be easily added to orchard populations as desired. Resistance from a putative major gene(s) and the affiliated complete resistance already yields moderate to high survival (50 to 75 percent in seedling families in greenhouse testing), and this resistance would generally be incorporated directly into the seed orchard populations. The potential addition of partial resistance would increase the diversity of resistant mechanisms and should bolster the durability of resistance. As feasible, the genetic base for each breeding zone would incorporate selections from throughout the breeding zone. Breeding strategy would be adaptive to take advantage of new findings on inheritance of resistance and to try to keep the genetic base of orchard populations broad. Seed production levels from orchards could easily and inexpensively be increased as needed to meet any Federal or non-Federal needs for resistant seed. Once resistant populations are established in the field it is anticipated that resistance in future generations of natural regeneration would be sufficient to sustain populations in areas of high risk (assuming resistance continues to be durable, which will be monitored in field plantings as described above).

The biology of POC (Elliott and Sniezko 2000; Sniezko et al. 2003b) and high levels of interagency cooperation have allowed very rapid development of resistant populations and orchards for a few breeding zones (Table 3&4-21). Current estimates based on greenhouse and limited field tests indicate that 50 to 75 percent of the seedlings from orchards should survive areas infested with PL versus less than 5 percent of highly susceptible parents. The first resistant seed from seed orchards was available in fall 2002 (Table 3&4-21). If funding is available, selection and testing of additional resistant candidates would help establish seed orchards for additional breeding zones.

Work on the inheritance of resistance and field validation continues, directed by staff at Dorena Genetic Resource Center. With funding and plant materials from the BLM and FS, Oregon State University has undertaken a project to examine the underlying nature of some types of genetic resistance. Results from these projects and trials would help lead to more

efficient development of resistant populations of POC. As new information becomes available it would be incorporated. Containerized seed orchard technology developed at the Dorena Genetic Resource Center for POC allows orchards to be updated as frequently as needed to increase genetic diversity or the amount and types of resistance.

Co-evolution of POC and PL. The genetic variability and evolutionary potential of the pathogen can also be important in developing resistance that would be durable. PL appears to have relatively little genetic variability (McWillams 2000a; Goheen et al. 2003). The geographic origin of PL is unknown, but is thought to be outside the range of POC (Goheen et al. 2003), and thus POC and PL have not co-evolved. The low genetic variability suggests the likelihood of a single or limited number of introductions. PL may or may not exhibit greater genetic variability in its sites of native origin. The chance of accidental importation of new strains of PL is very low, but could cause concern if strains with virulence to resistance in POC were introduced. However, the spread of such a strain should be slow, especially if any management measures that slow the spread of PL are in place. The lack of genetic variability in PL in the Pacific Northwest increases the likelihood of developing durable resistance. Pathogens with lower migration rates and relatively low population sizes are hypothesized to have relatively lower evolutionary potential (McDonald and Linde 2002). Thus, there appears to be good likelihood for durability of complete resistance in POC. Even if breakdown of resistance were to occur in one location, the redistribution of any new virulent strain would be slow, or would not occur. An array of management techniques and options are available (Goheen et al. 2000) and can be utilized to increase the potential durability of resistance for POC. Confirmed resistant parent trees in the field can be monitored over time to assay whether a new virulent strain of PL may have arisen.

In summary, the majority of trees in high-risk areas infested with PL would die. Without the use of resistant seedlings there would be little chance of large tree structure developing for POC in these areas. Some of these areas would continue to have large POC on nearby adjacent sites that are low risk (particularly where POC is not confined primarily to riparian areas). Private landowners are unlikely to plant nonresistant POC, decreasing the species diversity on their lands. The continued utility of resistant seed will depend upon its continued effectiveness in providing POC that survives in infested high-risk areas.

Utilization of Resistance

The current anticipated level of resistance from seed orchards to PL (50 to 75 percent survival) is high enough to deploy in those breeding zones for which there is orchard seed. The level and the number of resistant mechanisms should increase in the future. Resistant seed is now the option most likely to be successful in restoring large POC on high-risk sites. Monitoring of existing plantations will continue to update information on durability of resistance. Resistant seed can be used on almost any high-risk site for PL, except in areas where there is a high probability that infection would spread to uninfected POC downstream, or in sanitation areas along roads (because 25 to 50 percent of the seedlings from the first-generation orchards would be susceptible, and that even the resistant seedlings may be host to PL spores [at a reduced level]). Planting guidelines for resistant POC should take account of the current expected levels of resistance.

Vegetative propagation (rooted cuttings for POC) may increase the survival to 75 to 100 percent, while still planting a diverse array of genotypes. However, this may not be the most

cost-efficient because of (1) the added cost of rooted cuttings (over seedlings), (2) the potential added selection pressure on the pathogen (if relatively few clones are planted), and (3) the potential of increasing the resistance level available in the near future from seed.

Large amounts (millions) of resistant seed can easily be produced for those breeding zones for which there are containerized seed orchards. Direct seeding may be a viable alternative to planting in some cases.

The ease of seed production for POC also opens an opportunity to supply non-Federal landowners with seed for reforestation or horticultural needs. Estimates from 2000 indicate that the need from these landowners in coastal Oregon would be more than 275,000 seedlings per year. Without resistant seed, most non-Federal landowners would not plant POC (or would plant at much lower levels) and the forest plantations would be less diverse.

Effects of Alternatives — General Discussion

Port-Orford-Cedar Genetic Structure: The most critical variable for determining change in genetic structure of POC over the landscape may pertain to the percent of an area that is of high risk to the disease, and the respective probabilities for infestation and associated mortality over time. This percentage would vary over the next 100 years, depending upon the selected management alternative, over portions of the POC range accordingly: North Coast Risk Region—16 percent to 19 percent; Siskiyou Risk Region—17 percent to 36 percent; and Inland Siskiyou Risk Region—18 percent to 50 percent (Table 3&4-10). On the basis of the affected areas where mortality might progress/occur, and the fact that subpopulations would infrequently be (if ever) entirely extirpated in the POC range, the very localized genetic population structure(s) would be impacted to varying degrees, depending on the degree of isolation, recolonization via natural regeneration events, and/or the amount of mitigation measures taken. The cumulative changes in genetic structure across the respective large-scale macrogeographic risk regions would be impacted to a lesser degree since the overall structure is based on pooling both the affected and unaffected populations across the large regions. The North Coast Risk Region would be changed the least, due to the large number of natural regeneration events, the proximity of neighboring subpopulations or stands, and migration events (gene flow) that occur over time. The Siskiyou and Inland Siskiyou Risk Regions may be impacted to a greater degree due to the isolation, relatively smaller size of POC stands, and potential for more fragmentation on the basis of the projected mortality over time. The degree to which resistant stock is reintroduced into the infested locales would also be a factor in the effects per alternative. The basic causal factors associated with changes in population structure apply to the planted stands as well. Gene exchange continues amongst the neighboring subpopulations, and the genetic structure evolves for the same reasons as stated previously.

Availability of Resistant Seed for Restoration: Although POC is not in danger of extinction, there are some high-risk areas (particularly riparian areas) where 90 percent or more of the POC trees are dead. In these PL infested areas it is not likely that POC would get older and bigger as long as the disease is present and there is no resistant stock planted. If large POC trees in these specific areas are desired, the use of restoration with resistant seedlings may be the most efficient route for accomplishing this (contingent upon the continued effectiveness of resistance). Restoration, either following PL infestation and mortality, or preemptive (on sites anticipated to suffer high mortality in the next 50 or 100 years), would

potentially allow for reestablishment of POC as it existed before PL. The use of standard silvicultural tools may be used to promote good growth of POC, thus decreasing the time to develop large POC trees.

Once resistant trees are established in heavily impacted areas, they would serve as parents for future generations, thus allowing for natural regeneration. This would be particularly desirable if there are affected portions of Late-Successional Reserves where large POC is desirable for future generations. In most areas, the genetic base for future generations would be large and would include both surviving POC around the infested riparian area and the resistant POC. Thus, the genetic composition for the future would continue to be broad and help ensure adaptability of POC to changing environments.

In fall 2002, large quantities of resistant seed became available for 3 of the 19 breeding zones that include Oregon (some of these zones also include parts of California). Seed from one of these breeding zones could probably be used for two others without much compromise in either resistance or adaptability. Thus, the option of restoration with resistant seed is now available to land managers, particularly in the coastal Oregon Breeding Block 1 (Table 3&4-21). Under current program levels, it is projected that resistant seed would be available in 2010 to 2045 for other breeding zones (Table 3&4-21)

Since POC readily produces abundant seed in a managed orchard, resistant seed could be made available to non-Federal landowners, although some barriers to this seed transfer need to be overcome. Use of resistant POC by non-Federal landowners would add to the biodiversity on the landscape and potentially boost local economies. This is also important in these areas because of the recent negative impacts of Swiss Needle Cast disease of Douglas-fir as well as the potential impacts of Sudden Oak Death to the diversity of the forests and plantations (POC is thought not to be susceptible to either of the causative pathogens). Management of the seed resource by the BLM and FS would help ensure genetically diverse seed would be used—this should help ensure durability of resistance by limiting the potential for plantations involving only one or a few clones. Guidelines could be developed to help all landowners play a role in maintaining the durability and utility of the resistant POC resource.

There are several options for breeding zones without enough tested selections to find resistant parents to utilize for seed production, including:

1) No mitigation of high-risk PL-infested areas with POC mortality, now or in the future, leaving the process to strictly natural regeneration when only a few rare scattered resistant POC serve as the foundation for future regeneration may severely restrict genetic diversity. Large trees (if they do develop in each local area) would be very limited in their genetic variability (they would probably be the offspring of only a couple resistant trees even if pollen were to come from additional susceptible trees).

2) No current mitigation of high-risk areas due to lack of resistant seed, but proceed with the development of resistant orchards to allow restoration efforts at a future date (2010 to 2045 depending upon breeding zone). The restoration of large POC in the ecosystem would be delayed, but the genetic diversity would be broader when they are established. This would provide for a POC population more likely to persist over generations.

Breeding zones vary dramatically by the acreage of POC on Federal lands (see Table 3&4-

21). However, the breeding zones where resistant seed would be most valuable for restoration may depend on other factors, including the role of POC in the specific ecosystem, the percentage of POC on high-risk sites, and the relative abundance of POC in a area. Prioritization of breeding zones (by managers) would potentially enable earlier resistant seed development in the zones given higher priority. New selections could generally have a resistance evaluation and be producing seed in as little as 5 years of selection in the field—timing of orchard seed availability depends upon level of funding available, and to a lesser extent, limits of facilities and personnel.

Effects of Alternatives — Discussion by Alternative

Alternative 1

Port-Orford-Cedar Genetics Structure: In Alternative 1, the projection of infestation (Table 3&4-10) varies between 17 to 29 percent over the extent of the species' range in Oregon. Changes in genetic structure cannot be given in absolute terms, but can be expressed in relative terms. The North Coast Risk Region (17 percent infestation projection) has larger continuous stands and populations, which should allow both natural regeneration and pollen flow throughout the area. This should create less population-level divergence, and should promote population structure stability over time. Here, both the local and regional genetic structure should be impacted little, and to a lesser degree than the Siskiyou and Inland Siskiyou Risk Regions. The Siskiyou Risk Region (23 percent infestation projection) would likely incur more fragmentation of populations throughout the region than the North Coast Risk Region. However, there would still be survivors within the immediate infested area (about 10 percent), and neighboring uninfested POC (seed trees) reside within the confines of riparian vegetative habitat (outside of, or on microsites within, the highly infested zone). The change in structure in some of the smaller isolated stands may vary from minor to severe, and the cumulative change in structure across the Siskiyou Risk Region may be slightly higher than that of the North Coast Risk Region. Fragmentation would likely be greater in the Inland Siskiyou Risk Region (29 percent infestation projection) in comparison to the other two risk regions. The Inland Siskiyou Risk Region has a greater potential to incur changes in the local population structure, due to the higher percent infestation projected and smaller, more isolated populations. However, this risk region would still have 71 percent (projection) of its habitat not affected by the disease spread, which would tend to buffer against any large-scale change in genetic structure across the region.

Resistant stock would also be planted in varying amounts in infested areas, and this would help conserve the gene pool and structure to a commensurate degree. The planting of resistant stock in those breeding zones with orchard production should enhance genetic diversity in comparison to those breeding zones without. This is a result of the relative difference in gene frequencies (seed orchard population versus local stand population), which creates a more diverse genetic base in this locale after planting.

Availability of Resistant Seed for Restoration: Under Alternative 1, the interagency resistance program would proceed at current levels (assumes funding is stable). No resistant seed was available until fall 2002 (and then only for some breeding zones). Restoration with resistant seedlings can now be considered in project analyses and used as a mitigation technique where relevant, and could supplement the existing efforts to slow or prevent the spread of PL. Monitoring the field trials will continue to update information on durability of resistance.

Seed orchards have been established for a few breeding zones, but for most breeding zones, many more field selections (probably more than 1,250 per breeding zone) are needed to find the low-frequency resistant trees.

The source and timing of funding for additional field selections would determine what other breeding zones resistant orchards are developed as well as the timeline to develop them. Table 3&4-21 displays, by breeding zone, when resistant seed are projected to become available. In order to increase the diversity of resistance and level of resistance, breeding would need to continue after the initial first generation orchards were established.

For planting on low-risk sites, nonresistant or resistant seedlings could be utilized. Under this alternative, restoration on high-risk sites could now begin for only certain breeding zones; other breeding zones would not have resistant seed for another 7 to 42 years (Table 3&4-21) (see the Planting Assumption found in the Assumptions and Clarifications section of this chapter). Without this restoration effort, large POC would likely not develop in many affected areas.

Alternative 2

Port-Orford-Cedar Genetics Structure: The projection of infestation (Table 3&4-10, Pathology section) varies between 17 to 24 percent over the extent of the species' range in Oregon. This is similar to Alternative 1 projections. The emphasis on uninfested 7th field watersheds could help maintain more populations. For the reasons described in Alternative 1 there will be some effects on the local population structure, while the structure across the respective risk regions should not be changed to a great extent. One minor difference pertains to the slightly decreased infestation rates, with obvious, commensurate declines in need for restoration plantings.

Availability of Resistant Seed for Restoration: Alternative 2 would be similar to Alternative 1 (see above) in potential effects of resistant seed. One of the objectives of this alternative is to attempt to reestablish POC in plant communities where it has already been significantly reduced in numbers by root disease. Restoration with resistant seed would best accomplish this. As in Alternative 1, the continued development of resistant stock for various breeding zones would continue at current levels (assuming current funding levels are maintained). A discussion of the assumed reforestation rates under each alternative is described earlier in this chapter. There would be seed available immediately after stand replacement events such as large-scale wildland fires, because a seed bank for each breeding zone that has an orchard for the production of resistant seed would be established.

Alternative 3

Port-Orford-Cedar Genetics Structure: The projection of infestation (Table 3&4-10) is 16 to 19 percent over the extent of the species range in Oregon. In Alternative 3, the relative changes in genetic structure and diversity outside of the POC core areas should be similar to effects stated in Alternatives 1 and 2. Protecting uninfested POC cores and buffers (see Map 1), if successful in preventing infection by PL over a longer period of time, would maintain a greater number of populations in a more natural state. The population structure would be affected less in these areas, where they evolve without PL being present. This alternative has a greater effect in helping to preserve the genetic structure in the Siskiyou and Inland

Siskiyou Risk Regions as opposed to the North Coast Risk Region; in comparison to Alternatives 1 and 2.

Availability of Resistant Seed for Restoration: The use of resistant seed and its effects (increasing the potential of large POC trees in high-risk areas infested with PL in the future) should be similar to Alternatives 1 and 2. Because of the additional protected areas, there should be fewer PL-infested areas that may need restoration with resistant seedlings.

Alternative 4

Port-Orford-Cedar Genetics Structure: The greatest amount of infestation occurs in Alternatives 4 and 5 (Table 3&4-10): North Coast Risk Region—19 percent; Siskiyou Risk Region—36 percent; and Inland Siskiyou Risk Region—50 percent. The effect of this alternative in the North Coast Risk Region would be similar to those stated in Alternatives 1 and 2. Population structure would not change to a great extent in this area, with or without the planting of resistant stock, in consideration of the large amount of natural regeneration, gradual environmental gradients, and more continuous interbreeding populations. The largest amount of fragmentation and effect on population structure would occur in the Siskiyou and Inland Siskiyou Risk Regions. The planting of resistant stock provided in this alternative would be helpful in conserving and/or improving upon the diversity of gene pools. The accelerated level of resistance breeding provided in Alternative 4 should enable resistant stock to be planted at a quicker rate across more breeding zones (see the Planting Assumption found in the Assumptions and Clarifications section of this chapter). Planting programs in the Siskiyou and Inland Siskiyou Breeding Zones would also modify the populations to a greater extent than that for the North Coast Risk Region. Initially, effective population sizes would probably decrease (in numerical number), even more in the Siskiyou and Inland Siskiyou Risk Regions because of high-risk sites (scattered riparian habitats) being spread (with resultant fragmentation) across the landscape. Planting resistant stock in these situations may have the greatest relative genetic benefit (see discussion on migration of genes in Effects on Genetic Structure section). The relative changes in structure across the Siskiyou and Inland Siskiyou regions would be greater than that of the North Coast region. In addition, the change in structure would be greater than those projected in Alternatives 1, 2, 3, and 6. However, the effective population sizes (pooling over all populations) should still be within the orders of magnitude, where it is expected to have little net effect on the genetic structure in POC over the respective macrogeographic risk regions.

Availability of Resistant Seed for Restoration: Alternative 4 would expedite the availability of resistance seed for those priority breeding zones in which seed is not available (Table 3&4-21). More high-risk areas would be expected to experience mortality under Alternative 4 (80,300 acres compared to 45,800 acres under Alternative 3, and 51,600 acres under Alternative 2); more resistant seed would be needed to replace dead POC (however, seed availability is not anticipated to be a limiting factor, once an orchard is operational for a given breeding zone). There are still many areas in all parts of the range of POC that are low risk. In the future as resistant trees develop (and assuming no change in effectiveness of resistance), this alternative should lead to an increase in large POC over the landscape in those high-risk areas that would be PL infested under other alternatives. The sooner the resistant seed is developed the sooner the restoration of large POC can develop.

Alternative 5

Port-Orford-Cedar Genetics Structure: The predicted levels of infestation are the same as in Alternative 4, but resistant stock would be limited primarily to the North Coast Risk Region (about 65 percent of the POC acreage). Population structure would not change to a great extent in this region for the reasons described in Alternative 4. The changes in population structure and probable changes in the gene pool for the Siskiyou and Inland Siskiyou Risk Regions would be greater in this alternative versus Alternative 4. This is due to the minimal opportunities for restoring the impacted habitats with genetically diverse resistant stock. While natural evolution of resistance to PL is theoretically probable, the rate and degree of natural resistance would vary markedly over time and space. Selection pressures in this alternative would have similar effects as in Alternative 4, where allele frequency change over time reflects the high selection pressures within the infested areas. Failure to plant resistant POC in the Siskiyou and Inland Siskiyou breeding zones of highest disease incidence can lead to lesser effective population numbers in localized areas (where disease is present). This could lead to a greater degree of population divergence, a higher rate of inbreeding, and greater loss of rare alleles in a portion of the local populations. The effects of this alternative will be greater than that of Alternative 4, where there will be greater degrees of change in structure over the range of local populations, and the cumulative change in genetic structure across the Siskiyou and Inland Siskiyou Regions will be the highest of any alternative. In general, as the mortality and habitat loss increases, there is an increasing possibility of losing segments of subpopulations over time (assuming no mitigation to reestablish), and some reduction in the natural genetic variation will take place. However, as in Alternative 4, genetic structure is expected to change little from the sole impact of PL over the large-scale macrogeographic regions of POC.

Availability of Resistant Seed for Restoration: Under Alternative 5, only some breeding zones would have resistant seed available (only those for which orchards are currently available) (see Table 3&4-21). For most breeding zones, 85 percent of high-risk areas for PL would seldom achieve large POC, resulting in a loss of large POC across the landscape (in high-risk areas which include many riparian areas). Further development of the resistant program would cease, limiting the diversity of parents represented in current orchards as well as the potential for including other resistance mechanisms. Impacts could be reduction in potential durability of resistance to PL, as well as continued absence of large POC in some areas. Under this alternative, there would be the most acres affected (similar to Alternative 4) and the fewest acres with restoration using resistant seed (few breeding zones would have seed available), resulting in the fewest acres potentially achieving large POC.

Alternative 6

The infestation projections in this alternative are nearly identical to those in Alternative 3; from 16 to 18 percent infestation over the respective risk regions of the species range in Oregon. The effects should be similar to those stated in Alternative 3. Providing additional protection of POC cores and buffers in the uninfested 7th field watersheds would help maintain portions of the populations in their natural state. Alternative 6 protects a greater acreage in the POC cores (49,000 acres) than Alternative 3 (34,000 acres). In addition, the Alternative 6 POC cores are more widely distributed across the POC range. This will protect a larger absolute number of populations in addition to a larger set of peripheral populations across the region. Thus, this alternative would probably have a greater effect in helping to

preserve the natural genetic structure across the regions as a whole and to a slightly greater degree than Alternative 3.

Availability of Resistant Seed for Restoration: The use of resistant seed and its effects (increasing the potential of large POC trees in high-risk areas infested with PL in the future) should be similar to Alternatives 1, 2, and 3. Because of the additional protected areas, there should be fewer PL-infested areas that may need restoration with resistant seedlings.

Cumulative Effects

The effects of PL-caused mortality on genetic resources also need to be considered in context with other reasonably foreseeable actions or events that could affect these same resources. For the reasons noted above, particularly that mortality is not 100 percent in any significant area, that mortality is primarily limited to the narrow high-risk area, and that there is considerable genetic variability within POC stands, significant genetic resources are not at risk under any of the alternatives. Other likely management activities or events (except large intense wildfire) will also not remove POC in areas large enough to threaten genetic resources. Timber harvest in the Matrix and other management activities, while potentially affecting a considerable acreage of POC in total, will never remove enough POC in one place to be a genetic concern, even in conjunction with PL-related mortality. This is in part because harvest unit size is limited, seedlings are left or replanted, and Riparian Reserves are typically wider than the high-risk areas, thus leaving uninfested areas between harvest units and PL mortality areas.

Large-scale disturbance events the size and intensity of the Biscuit Fire may remove at least rare alleles from the population. However, because PL-related mortality only affects a percentage of stands in any one area and a large fire may take out a large block, the two events are unrelated as far as gene conservation is concerned. There is no foreseeable activity or event that, along with PL, threatens to significantly affect POC genetic conservation.

Fire and Fuels

There are three aspects of Fire and Fuels potentially affected by POC root disease and the alternatives for its management: (1) the management requirements of the various alternatives can have a direct affect on the Agencies' ability to fight fire successfully or to use wildland fire to meet resouce objectives; (2) the direction in the various alternatives can have a direct affect on the Agencies' ability to reduce forest fuels; and (3) the level of fuel loading created by disease-killed POC. Since POC killed by the root disease contribute directly to forest fuel loading, the success of the alternatives at reducing mortality affects forest fuel-loading levels. Mortality-related fuel-loading differences between the alternatives is much less than 1 percent of the total fuels in the area at any one time, because of the distribution and stocking levels of POC in the landscape, the relatively slow spread of the disease, and the relatively limited difference in annual POC mortality between the alternatives. Hence, this third aspect will not be discussed further in this section.

Affected Environment

Wildland Fire Operations

Wildland fire operationsare common within the range of POC. Southwestern Oregon has a long history of major fire occurrence (Cooper 1939; Haefner 1975; Morris 1934; Pyne 1983). Recent large fires have included the 499,965-acre Biscuit Fire in 2002, the 6,998-acre Mendenhall Fire in 1994, the 2,201-acre Chrome Fire in 1990, and the 9,860-acre Longwood Fire and 96,310-acre Silver Fire in 1987.

Fire occurrence has averaged 35 fires per year on the Siskiyou NF (1970 to 2003), and 34 fires per year on BLM-administered lands (1970 to 2002). A majority of these wildland fires (71 percent) are suppressed at less than 0.25 acres. A little over 1 percent exceeded 100 acres. Most are lightning caused (52 percent), as are nearly all of the large fires (greater than 1,000 acres) (79 percent). The next most common cause of all wildland fires (22 percent) is from recreational users (such as campfires and smoking). Fire season is typically during the drier months with approximately 86 percent of all fires occurring from June 1 through September 30. Fires are generally less frequent from east to west and south to north in the range of POC. The Powers Ranger District, for example, has the greatest concentration of POC in the world, but averages less than three wildland fires per year (1970 to 2003) with the largest fire at 94 acres.

Wildland fire operations include both wildland fire suppression and wildland fire use. Wildland fire suppression is an appropriate management response to a wildland fire that results in curtailment of fire spread and eliminates all identified threats (USDA and USDI 1998). Wildland fire use is the management of naturally ignited wildland fires to accomplish resource objectives within predefined geographic areas. There are currently no approved fire management plans that authorize wildland fire use within the range of POC in Oregon. However, it is reasonably foreseeable that wildland fire use could be authorized within the Kalmiopsis Wilderness and adjacent roadless areas with the completion of fire management plans and/or land and resource management plan revisions. A majority of this area is within the recent Biscuit Fire. The effects of POC management practices on wildland fire use would be similar to wildland fire suppression. Wildland fire use should require fewer resources due to low to moderate burning conditions and preplanning within specific geographic areas.

The objective of initial attack fire suppression is to safely and efficiently suppress unwanted fires in conformance with existing policy and procedures, consistent with approved fire management and land and resource management plans (USDA-FS and USDI-BLM 2003c). The FS has initial attack responsibility for the Siskiyou NF and the BLM has contracted with the Oregon Department of Forestry for its initial attack fire suppression.

All wildland fire suppression Agencies in southwest Oregon have interagency agreements to share suppression resources within preplanned responsibility areas. These areas generally border adjacent Agency jurisdictions, and several Agencies could respond to a wildfire in these mutual aid areas. Resources dispatched to a wildland fire depend on the Agency jurisdiction, values threatened, preplanned dispatch plans, fire danger rating for the day, and resource availability.

All of the wildland fire Agencies rely on similar fire-suppression resources, such as engines, hand crews, tractors, aircraft (including fixed-wing air tankers and helicopters), smoke jumpers, and rappellers. The staffing and availability of these resources are determined by the time of year, available funding, seasonal severity, and minimum fire organization. Engines are typically the primary resource in areas with road access. The use of water can quickly facilitate containment, control, and mop-up of a fire. Hand crews, tractors, and aircraft (helicopters or air tankers) may also be part of the preplanned dispatch or ordered if necessary by the incident commander. Where road access is poor, crews may have to walk long distances to reach a fire. In these cases, aircraft are often used to mobilize hand crews, rappellers, or smoke jumpers. Firefighters in remote locations also utilize portable pumps to access water from sources close to a fire.

Fixed-wing air tankers may deliver fire retardant and helicopters may provide water bucket drops to knock down rapidly initiating fires regardless of ground access. The helicopter buckets are filled from streams, rivers, lakes, or ponds close to the fire that are large enough for the bucket and safe to access by the helicopter. The primary initial attack fire suppression helicopter is a shared-resource, rappel-capable, light helicopter (130 gallons of water per bucket) based in Merlin. The Oregon Department of Forestry also staffs medium helicopters (300 to 700 gallons per bucket) for 60 days at the peak of the fire season in Central Point and Roseburg. In severe fire seasons, a heavy helicopter (1,500 gallons per bucket) has occasionally been staged for initial attack.

A wildland fire that escapes initial attack enters extended attack or the transition phase to a large fire operation. These fires become increasingly complex and large with many resources, logistics needs, and safety concerns. Only a small percentage of all fires enter this phase, but they require the most resources, and aircraft, and affect the largest number of acres.

Firefighter and public safety is the first priority in every fire management activity (USDI et al. 2001). If there is risk to firefighter or public safety, the incident commander would safely and efficiently take appropriate suppression action with available resources without any POC considerations. Equipment could be ordered and used as soon as it was available on the fire, and water could be used from any source.

POC management practices become a concern to fire managers when there is POC near the fire and especially when it is known to be uninfested. Some POC management practices are not a concern during wildland fire operations. Initial attack fire suppression resources, such as engines and crew vehicles, are normally clean and washed on a daily basis, and water in the fire engines is usually from uninfested sources. The fire season is also during the dry season and the warmer times of the year when the risk of spreading POC root disease is the lowest.

Management practices start to effect wildland fire operations when additional water is needed on a fire (such as refill engines, pumping from local sources, and helicopter bucket drops) and/or resources accessing the fire are going through both clean and infested areas. Management practices to reduce the risk of PL spread decrease the efficiency of fire suppression resources and increase the costs of operation. The greatest effect would be on a fire with uninfested POC where the closest available water source is infested. Application of Clorox bleach (see Appendix 4) in engines or water tenders to kill PL spores would be relatively

inexpensive and not lose much time. Planning for and installing a pumping station to treat water before pumping it to the fire would require time and additional personnel (if it was feasible). If a helicopter would have to travel 5 minutes longer to a clean source for bucket use it would reduce the number of bucket drops in a day. Helicopter water operations usually attempt to keep the turn time for a bucket load to less than 15 minutes. If the infested source was a 10-minute turn and the clean one was 15 minutes, the effect is a 33 percent reduction in the number of buckets the helicopter can deliver in an hour.

The Biscuit Fire of 2002 is an example of how POC management practices can affect wildland fire operations. Five lightning fires that started in the Kalmiopsis Wilderness and adjacent roadless areas burned together over several months into the 500,000-acre fire (USDA-FS 2002a). These remote fire starts were initially a low priority for suppression resources when many other fires in southwest Oregon and the region were threatening communities. The size of this fire resulted from concerns for firefighter safety, early resource unavailability, poor road access, fire weather conditions, protecting structures and communities at risk, and using available roads and topographic features for control lines. POC management practices probably did not affect the size of this fire, but did affect the cost.

The drainages around the initial fire starts were known to be uninfested and have populations of POC. Management practices in place early on included ensuring contract equipment were clean and inspected before going to the fireline, and locating clean water sources for the few aircraft available. As the fire grew increasingly larger and more complex, the POC mitigations also increased in scale and complexity. None of the mitigations affected firefighter or public safety or property. There were up to four incident management teams at one time on this fire, with thousands of firefighters, hundreds of pieces of equipment, multiple fire camps, incident command posts, and hundreds of miles of fireline and access roads. Management practices for protecting POC included: identification of travel access routes, multiple wash stations, identification and mapping of approved water sources for helicopter and ground resources, and installation of helicopter dip tanks to supply treated water closer to the fire. Wash stations were also installed at the fire camps, spike camps, and equipment staging areas. Many of these stations were staffed 24 hours a day for several months with a minimum of two persons, a water tender, and an engine. All vehicles were washed at least once a shift and sometimes several times depending on their assignment and travel route. If equipment was moved between Divisions on the fire, it was also washed if it was going from an infested area to a clean one. All of these management practices increased the number of personnel on the fire, increased the amount of equipment, increased the time personnel spent washing vehicles or following longer travel routes, reduced the efficiency of helicopter and ground resource water use, and required planning to implement. It is estimated these practices added between $1.5 million and $3 million to the suppression costs of $150 million, or about 1 to 2 percent to the total cost. On smaller fires, the percentage could be higher.

Each wildland fire situation is different and it is impossible to estimate the cost of POC management practices over the entire southwest Oregon area. It should be assumed that implementation of POC management practices would not affect firefighter or public safety or private property, but could increase the acreage burned, damage to natural resources, and cost of operations for wildland fires where POC is found. Severe wildfires can kill POC. Large, severe fires in the range of POC would result in the loss of more POC to wildfire mortality. Small fires on average have lower total fire suppression costs than large fires, but have far higher per acre costs. Additional aircraft time could easily double the cost of a small fire.

Siskiyou NF average costs per acre (1990 to 1999) for fires less than 1 acre is $4,740, and for fires 5,000 to 10,000 acres is $373. The cost of the Biscuit Fire (the most expensive wildfire to suppress in history) was approximately $300 per acre. Costs for wildland fire use would be less than suppression costs due to low to moderate burning conditions and preplanning within specific geographic areas.

Future Wildland Fires: Historic fire regimes describe fire-return intervals and severity (Hardy et al. 1998). The fire regimes in the range of POC are characterized as generally frequent, low- to moderate-severity fires (Fire Regime Working Group 2000). An estimate of annual acreage burned under the historic natural fire regimes was derived using fire-return interval data (USDA-FS 2003a). For the 0 to 35-year fire-return interval, an average fire-return interval of 20 years was used for analysis purposes. A 30-year average was used for the 0 to 50-year fire-return interval; an 80-year average was used for the 30 to 100-year fire-return interval; and an 150-year average was used for the 100 to 200-year interval. Using these factors and estimating fire regimes for BLM lands, an estimated 45,075 acres would be burned annually in the range of POC on Federal lands, for an average across the range of 35 years. Considering the stochastic nature of wildland fire occurrences, this may be better expressed as 450,750 acres per decade historically. Such a figure is not inconsistent with annual wildland fire predictions of 1,130,000 acres per decade appearing in the "Draft SEIS To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines" (USDA-FS and USDI-BLM 2003c) for the entire range of the northern spotted owl. This figure is useful for comparing the number of acres of wildland fire, hazardous fuels treatments, and other management activities with historical fire patterns.

From 1993 to 2002, approximately 473,618 acres burned in wildland fires in the range of POC in Oregon. The majority of this acreage was in the 2002 Biscuit Fire (462,591 acres). For comparison purposes, in the decade from 1983 to 1992, approximately 149,974 acres burned in wildland fires. The majority of this acreage also burned in one fire year (1987) and one fire event (the 96,310-acre Silver Fire).

Wildland fire will continue to threaten POC. Although POC was adapted to the historic fire regimes in southwest Oregon, years of fire suppression have increased hazardous fuels and potential for severe wildland fires. The recent Biscuit Fire (USDA-FS 2003b) is such an example, where approximately 63 percent of the area burned at a moderate to high intensity (equal to or greater than 50 percent canopy mortality). Small (hundreds to thousands of acres), low-to-moderate severity fires would normally have occurred in the area.

The Biscuit Fire itself, however, changes the likely future burn rate for the POC range because Biscuit Fire burned an estimated 29 percent of the POC range. Because of the intensity of the burn, portions of Biscuit Fire will likely not burn again in the near future. Another third of the range is in coastal areas, much of it checkerboarded with privately managed younger stands. Average fire return interval for mixed-severity fires in most of this area is normally 50 to 100 years. Stand replacing events here could be soon or hundreds of years away, with the roaded intensively managed checkerboard ownerships being the least vulnerable. An area equivalent to the remaining POC area, the third of the Oregon portion of the range outside of the Biscuit Fire area that is in drier vegetation types, could be expected to be exposed to wildland fire within the next 20 to 50 years, but this area too has the advantage of considerable checkerboard ownership with its relatively intensive management and more roads (than the Biscuit Fire). The proportion of a future fire that is high intensity will

depend on the fuel conditions in the area of the fires, the level of fuels treatment done between now and when the fires occur, the amount of wildland fire use, and the weather patterns during the events. An order-of-magnitude summary, if one were possible, would thus predict having high-intensity fire to cover another 250,000 acres of the POC range within the next 100 years. Such fires, by proportion, could affect up to half of the POC outside of the Biscuit Fire and the North Coast Risk Region, or up to 50,000 acres of POC.

Fuels Management

The 1995 "Federal Wildland Fire Management Policy" directs Federal land management Agencies to achieve a balance between wildland fire suppression and fuels management to sustain healthy ecosystems. While previous policies emphasized wildland fire suppression, the current policies emphasize fuels management as a part of ecosystem management (USDI et al. 2001). This approach recognizes fire as part of the ecosystem, and focuses on hazardous fuels reduction, integrated vegetation management, and firefighting strategies (USDI et al. 2001). The "Healthy Forests Initiative" (2002) also emphasizes more active forest and rangeland management to reduce the accumulation of fuels and to restore ecosystem health. Attainment of the goals of the 10-year Comprehensive Strategy requires an investment. Market-based approaches (selling by-products) to offset the cost of hazardous fuels reduction are encouraged wherever feasible and cost effective (USDI et al. 2001).

Hazardous fuels treatments should be designed to:

- Reduce the risk of wildand fire to communities and the environment;
- provide safety to firefighters; and
- improve ecosystem health.

The focus is on actively managing acres in the wildland-urban interface, and acres outside of the wildland-urban interface that are in Condition Classes II or III (have missed two or more natural fire cycles) to reduce hazardous fuels and restore fire-adapted ecosystems (USDA and USDI 2003c).

The wildland-urban interface is defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel (USDI et al. 2001). The analysis area used in this document is the area mapped as communities at risk by the Oregon Department of Forestry and a 1.5-mile buffer around them. Communities at risk within the range of POC and near Federal lands include Agness, Cave Junction, Grants Pass, O'Brien, Powers, Selma, Williams, and Wolf Creek. The BLM has the largest percentage of Federal lands in the interface in southwest Oregon. The highest priority treatment areas are generally on the eastern and southern Oregon portions of the range of POC.

Condition class is the degree of departure from historical natural fire regime resulting in changes to key ecosystem components, such as stand structure, age, and degree of canopy closure. Due to fire exclusion policies, grazing, invasive plant species, and insects and disease (1995 "Southwestern Oregon Late-Successional Reserve Assessment") many areas in southwest Oregon are in Condition Class II or III. Fire frequencies have been altered and there is an increase in fire size, frequency, intensity, severity, or landscape pattern. The risk of losing key ecosystem components is also moderate to high. The recent Biscuit Fire is such an example (USDA-FS 2003b). Large areas of Late-Successional Reserves, Riparian Re-

serves, and uninfested POC were lost.

Federal agencies in southwest Oregon have actively managed hazardous fuels on Federal lands for many years. Treatments were historically linked to timber sale activities, but are becoming more associated with treatment of natural fuels in the wildland-urban interface and areas in Condition Class II and III. These wildland-urban interface areas are the priority areas for hazardous fuels treatment to reduce wildland fire risks to communities and allow wildfire to take a more natural role in the surrounding forest. The Medford BLM District and the Siskiyou NF currently treat the most acres of the administrative units in the planning area. Over the next 5 years, the Grants Pass BLM Resource Area could accomplish 70,000 acres, the Glendale BLM Resource Area 4,200 acres, and the Siskiyou NF 23,000 acres. Most of these treatments are not in stands with POC. The actual acreage treated is highly dependent on funding and is lower than the numbers indicate, because many of these treatments are accomplished on the same acre.

Hazardous fuels treatment objectives are to change fire behavior by reducing its rate of spread or intensity within the wildland-urban interface or other areas that must be protected from fire, and to reduce unwanted fire effects elsewhere. Combinations of treatments are used in southwest Oregon to restore vegetation and historic fire conditions. Most of these treatments are noncommercial, but integrated vegetation management with commercial timber harvesting or producing by-products also occurs. In the high hazard areas next to communities, pretreatment is often needed prior to any prescribed fire use. This is because most areas are well outside the natural fire regime and fire cannot be reintroduced without first modifying the fuels in some way (pretreatment). Dense understory vegetation from years of fire exclusion has resulted in the accumulation of excess down woody fuels that serve as ladder fuels and contribute to crown-fire initiation. Pretreatments include: the cutting, hand piling, and hand pile burning of excess vegetation and fuels; mechanical treatments to masticate or crush fuels and vegetation; and small diameter tree removal for by-products. The usual plan is to underburn within a few years of the pretreatment to reduce vegetation regrowth and maintain desirable fire behavior characteristics.

Hazardous fuels reduction and integrated vegetation management is a potentially large and recurring program in the range of POC (tens of thousands of acres per year). The majority of acres needing treatment would not have POC in the stands, but about 17 percent of the planning area contains stands with POC as a component. Drainages could have POC populations, and access roads could traverse areas with POC. POC management practices could affect wet season (October 1 through May 31) operations, road access, water use, and available treatment options. This in turn would affect the timely implementation, cost, and accomplishment of fuel treatment activities.

Many of these fuel treatments are labor-intensive mechanical or manual treatments. Workers may walk over nearly the entire stand at several different times to cut vegetation with chain saws, lop and scatter slash, hand pile slash, and burn hand piles. Daily production rates are low and large crews and/or a long season is required to accomplish the amount of work. Walk-ins to the work site reduce crew production rates. Mechanical treatments that masticate or crush vegetation have higher production rates, but require access for the machinery and operators, and maintenance and refueling on a daily basis. Seasonal restrictions or road closures limit the amount of time a contractor can work or restrict access. Work in summer is often affected by seasonal industrial fire precaution level restrictions due to fire season

severity. Even in the dry season contractors may not be allowed to run saws or motorized equipment.

Road access affects treatment options, access to work areas, travel time to work areas, and access to water sources. Treatments such as small-diameter tree removal and commercial timber harvest require a well-developed road network to be feasible or economically viable. Crews also need some road access to accomplish hand treatments and prescribed burning. Long walk-ins increase costs and risks with prescribed burning, and reduce the feasibility of treatments.

Prescribed fire uses, such as hand pile burning or underburning, are normally accomplished during the wet season to meet burning prescription objectives and reduce fire escape risk. Hand crews and engines usually accomplish the burning. Equipment is washed and cleaned on a daily basis, and water in the engines is from uninfested sources. Unlike wildland fire operations, prescribed fires are preplanned and have a project-specific burn plan. Where POC is a concern, the burn plan specifies mitigation measures that could include: priority of operations, travel routes, water sources that require treatment with Clorox bleach, or additional washing.

The costs of hazardous fuels treatments and the number of acres accomplished are interrelated. High per acre treatment costs result in fewer acres being treated due to funding limitations.

Effects of the Alternatives

Alternative 1

Wildland Fire Operations: POC management practices have the greatest potential effects on wildland fire operations where there is no immediate threat to firefighter safety, public safety, or private property, and the fire is either not suppressed during initial attack by ground-based resources or requires local water use by crews (portable pumps) or helicopter water drops. Larger wildland fires (or wildland fire use) require equipment inspections, travel access management, wash stations, identification of clean water sources, setting up helicopter dip tanks to treat water closer to the fire, and greater use of water tenders. When engines and water tenders need additional water, Clorox bleach is available to treat unknown or infested water sources in the field. To the extent these actions delay suppression action or decrease the efficiency of fire operations, the potential size, cost per acre, and total cost of a fire could be increased.

Approximately 20 percent of all fires on NF lands and 30 percent of all fires on BLM lands receive helicopter water bucket drops. Assuming safety and property are not threatened, delays can occur if POC status and clean water sources are not already known and identified. For example, if there were uninfested POC in the fire area, helicopter water drops would be from the closest clean water source. It could require additional time to find and verify a clean water source. If the clean water source is farther away than an infested source, then the potential efficiency of the helicopter has also been reduced and there could be both a larger fire size and an increased cost per acre. The increased cost is the flight time to deliver the water needed on the fire. One solution when resources are available is to add extra or larger aircraft ($600 to $900 per hour for a light and $1,200 to $1,800 per hour for a medium) to

make up for the difference in lost efficiency if multiple water drops are needed. Another is to utilize an air tanker with retardant (approximately $5,000 per load) to hold the fire until other resources can get to the fire. If resources are unavailable or additional time is necessary to acquire them, then the fire could get larger. The use of these additional resources could easily double the cost of a relatively small fire. All of these activities increase the complexity, number of resources, and cost of an incident.

If POC management practices result in larger fires, it increases the areas at risk to PL spread from suppression actions, and could result in the loss of more cedar to fire mortality. These practices could also result in fewer acres of wildland fire use to reduce the risk of PL introduction or fire mortality.

Fuels Management: POC management policies would affect wet season operations. If uninfected POC is within the work area or accessed by roads with seasonal restrictions, activities could be restricted to the dry season. This would contribute to scheduling difficulties to accomplish the work, require hiring more seasonal workers, and provide a less stable local work base. It could also make the purchase and use of specialized small-diameter tree removal or masticating equipment uneconomic by local contractors if it cannot be used for a large part of the year. This would increase the cost and time to accomplish the work, and limit the available treatment options. Mitigations such as daily washing of vehicles and tools, scraping mud off of boots, and priority of operations also have a minor affect on the cost. Prescribed fire burn plans would also include restrictions or mitigation measures that reduce the burning window or increase costs through required mitigation measures.

In general, the larger the potential hazardous fuel treatment program in areas with POC concerns the greater the effect would be on accomplishing the work and the potential for increased costs. Although cost increases may only be in the order of 5 percent to 10 percent for planning, implementation, and monitoring, some areas would probably not be treated due to the difficulty of scheduling treatments around seasonal restrictions or road closures (primarily for prescribed burning). Higher per-acre costs would also reduce the total number of acres treated.

Alternative 2

Wildland Fire Operations: This alternative is similar to Alternative 1, but POC management practices would be simpler to implement due to more consistent policy over multiple-agency jurisdictions. Some preparedness planning would be in place, and the POC Risk Key would facilitate quicker decisions by incident commanders, fire use managers, and resource advisors in the field. This would reduce potential delays in planning and implementing wildland fire suppression tactics and operations in low-risk areas compared to Alternative 1. When wildland fires occur within or could spread into uninfested 7th field watersheds on Federal lands (268,691 acres), there could be an increase in fire size and a higher fire cost. This is due primarily to preparedness planning that may require use of either treated or clean water sources during wildland fire operations within these 7th field watersheds. This could slightly increase the size of an unwanted fire and increase the costs within these 7th field watersheds compared to Alternative 1. Protecting POC could also exclude wildland fire use from uninfested 7th field watersheds to reduce the risk of PL introduction and/or increase costs.

Fuels Management: This alternative is similar to Alternative 1, but POC management practices would be simpler to implement due to consistent policy, and the POC Risk Key would facilitate easier identification of POC areas that do not require management practices. Unlike wildland fire suppression, fuels management activities are preplanned and POC management practices are integrated into those plans. This would be expected to slightly reduce the cost per acre of fuel treatments and increase the acreage treated outside of the uninfested 7th field watersheds compared to Alternative 1. Fuel treatment costs within the uninfested 7th field watersheds would likely increase compared to Alternative 1 due to probable application of measures to reduce the risk of PL introduction. There are about 53,713 acres of wildland-urban interface within these watersheds. POC managment practices could result in fewer acres being treated in these uninfested 7th field watersheds.

Alternative 3

Wildland Fire Operations: This alternative could have the greatest potential effect on wildland fire operations. Reducing road density in POC cores (34,028 acres) and buffers (460,464 acres) would limit access for resources such as engines and hand crews. This could increase the time it takes to respond to an unwanted wildfire and lead to larger fires. Future wildland fire use could be reduced due to poor access to topographic or road-related control features. It could also require the use of more resources and water than if better access allowed prompt and successful initial attack. Many of these POC cores and buffers are adjacent to private property and communities. Additional restrictions on water use within the POC cores and buffers could also reduce helicopter efficiency and could increase fire-suppression costs in extended-attack or large-fire operations. POC management practices may have to be foregone in these areas if fire threatens nearby property.

This alternative could contribute to a larger fire size and higher operation costs than the other alternatives. It would slightly increase the risk of POC fire mortality in the POC cores and buffers due to less efficient initial attack and larger fire size.

Fuels Management: This alternative would have the greatest potential effect on fuels management, especially in the wildland-urban interface. Many of the proposed POC cores and buffer areas are adjacent to or include high priority for treatment of wildland-urban interface areas. Approximately 2,700 POC core and 51,000 POC buffer acres are within the wildland-urban interface. Reducing road density or increasing seasonal road closures in POC cores and buffers would limit access for fuel treatment projects and prescribed burning crews and resources. The prohibition on timber sales would eliminate commercial thinning as a tool for treating overstocked stands in areas. Treatment options may not be feasible or costs would be increased. The result would be the least amount of acres treated because of higher costs, or result in not treating the POC cores and buffers and treating less expensive wildland-urban interface acres elsewhere. The latter could result in larger and more severe wildfires in POC cores and buffers as well as threaten communities.

Alternative 4 and 5

Wildland Fire Operations: These alternatives would have the same effect on wildland fire operations. Resources could be used without any considerations for POC root disease. No restrictions on water use or requirements for Clorox bleach would maintain the effectiveness of helicopter-bucket drops and other water-use operations. Fire operations costs and, poten-

tially, final fire size would be the least of all of the alternatives. This would primarily benefit those few wildfires in areas with uninfested POC that escape initial attack and go to extended-attack or large-fire operations. Future wildland fire use opportunities would also not be reduced by any POC considerations.

Fuels Management: These two alternatives would have the least effect on fuels management. Hazardous fuels treatment projects could be implemented without any considerations for POC root disease. The absence of restrictions on water use or requirements for Clorox bleach would maintain the effectiveness of water-use operations during prescribed-burning operations. Road access would be available to more cheaply implement projects and utilize the full mix of fuel treatment options to accomplish the most treatment acres of any alternative.

Alternative 6

Wildland Fire Operations: This alternative is similar to Alternative 3, except that the change to uninfested 7th field watersheds reduces the total watershed acres with added protection by 46 percent. There is a 46 percent increase in the acres of POC cores (49,675 total acres) and a 52 percent reduction in the acres of POC buffers (219,016 acres) relative to Alternative 3. Reducing road density in POC cores and buffers would limit access for resources such as engines and hand crews. This could increase the time it takes to respond to a wildland fire and lead to larger fires. It could also require the use of more resources and water than if better access allowed prompt and successful initial attack. Many of these POC cores and buffers are also adjacent to private property and communities. Additional restrictions on water use within the POC cores and buffers could also reduce helicopter efficiency and could increase wildland fire operations cost. POC management practices may have to be foregone in these areas if a wildland fire threatens nearby property.

This alternative could contribute to larger unwanted wildland fire size and higher operations costs. It would also slightly increase the risk of POC fire mortality in the POC cores and buffers due to less efficient initial attack and larger fire size. This potential is less than Alternative 3, but greater than the other alternatives, due to the reduced acres with added protection. The 7th field watersheds are also more dispersed over the range of POC than the 6th field watersheds of Alternative 3. This could allow more opportunities to maintain and plan access for fire operations (including wildland fire use).

Fuels Management: This alternative would have the second greatest effect on fuels management. Many of the uninfested 7th field watersheds are adjacent to or include high priority for treatment wildland-urban interface areas. Approximately 3,240 POC core and 19,800 POC buffer acres are within the wildland-urban interface. This is more POC core acres, but less POC buffer acres than Alternative 3. Reducing road density or increasing seasonal road closures in POC cores and buffers would limit access for fuel treatment projects. The prohibition on timber sales would eliminate commercial thinning as a tool for treating overstocked stands in cores. Treatment options may not be feasible or costs would be increased. The result would be the second least amount of acres treated because of higher costs, or result in not treating the POC cores and buffers and treating less expensive acres elsewhere. This could result in larger and more severe wildfires in POC cores and buffers as well as threaten communities.

Air Quality

Affected Environment

The Federal "Clean Air Act," as amended in 1990, is designed to reduce air pollution, protect human health, and preserve the Nation's air resources. To protect air quality, the Act requires Federal agencies to comply with all Federal, state, and local air pollution requirements (Section 118).

Effects of the Alternatives

The effects of the alternatives on air quality are unquantifiable and inconsequential. The degree to which Alternatives 1, 2, 3, or 6 might increase wildland fire size because of increased POC mitigation measures is offset by the reduction in overall mortality which would slightly decrease fuel loading and soil erosion that could lead to wind-borne soil.

Recreation, Visual, Wilderness, and Wild and Scenic Rivers

Affected Environment

Recreation within the analysis area ranges broadly, from relatively unstructured and dispersed recreation use, to structured, activity-based recreation within managed areas, sites, roads, or trails. Total recreation use on public lands within the analysis area is approximately 2.5 million visitor use days.

The analysis area has a number of developed campgrounds, lakes, rivers, and trails (such as horse, foot, and motorized) on public lands where recreation use (47 percent) is managed (USDI-BLM 1995b). Managed sites in the area operate near capacity during the high use months of June through September.

Segments of the Rogue, Illinois, and Chetco Rivers within the range of POC are congressionally designated components of the National Wild and Scenic Rivers System; other streams are in various stages of study and evaluation for inclusion within the system. These river reaches provide over 1 million visitors per year with whitewater rafting opportunities.

There are numerous wilderness areas (such as the Kalmiopsis and Wild Rogue Wilderness Areas) throughout the region, and a few wilderness study areas. Wilderness is valuable as an area undisturbed by human activity and left to natural processes. These areas also provide unconfined primitive recreation opportunities for hikers and horseback riders, and mechanized activity is not allowed. These areas do allow horseback riding, pack stock, and some livestock grazing.

Dispersed recreation consists of back-country camping, hiking, horseback riding, picnicking, general sightseeing, driving for pleasure, hunting, fishing, whitewater rafting, winter sports, and off-highway vehicle use. These uses account for about 20 percent of total use throughout the analysis area, and are typically by those desiring an uncontrolled environment, unaffected by other users (as occurs in managed sites). Off-highway vehicles include two-, three-, and four-wheeled vehicles capable of traversing miles of rough terrain in a day, and are some-

times transported in pickups or on trailers from site to site, sometimes in widely separated parts of the POC range including both ways between California and Oregon.

Dispersed recreation activities, which are affected by level of access, are most likely to be affected by general land use management Standards and Guidelines, due to the unstructured nature of the activities and their prevalence on all public lands. Recent innovations with geographic positioning systems and associated games and hunts may encourage an increase in cross-country travel.

There are no existing demand analyses for dispersed recreation opportunities within the analysis area. Off-highway vehicle industry leaders predict, however, that off-highway vehicle use has, and continues to, rise dramatically within the State.

Off-highway vehicle management guidelines vary slightly between the different land management agencies; however, they all basically contain the same tenets of protection of natural resources, providing for visitor safety, and minimizing conflicts among various users (USDI-BLM 1995b).

Depending on the resource conditions and characteristics within different drainages or areas, lands are generally classified as *open*, *closed,* or *limited*, to off-highway vehicle use. *Open* is defined as an area where all types of vehicle use is permitted at all times, anywhere in the area subject to applicable operating regulations and vehicle standards. *Closed* is simply defined as an area where any off-highway vehicle use is prohibited. *Limited* means an area is restricted at certain times, in certain areas, and/or to certain vehicular use (43 CFR 8340.0-5).

These off-highway vehicle use classifications are periodically reviewed as part of each Agencies' land management planning process and are adjusted/changed as needed to respond to changing resource conditions, use patterns, and public input expressing a demand for recreation opportunities.

The Agencies also include off-highway vehicle use, horseback riding, hiking, mountain biking, and any other mode of transport in the construct of specific transportation management plans. Such plans are usually part of or adjunct to the broader land management plan governing that particular administrative unit, and address broad issues concerning access to public lands.

The visual resource within the analysis area has been inventoried and has received scenery quality ratings based upon an analysis of a particular viewshed's uniqueness within the region, its relative importance as a component of the characteristic landscape when viewed from popular observation points (Interstate highways, viewpoints, points along rivers and trails), and other factors. Generally, the scenery quality within the area is considered high by most visitors based upon the prevalence of extensive conifer stands, interesting physiographic features, and opportunities for viewing. Although POC seldom occurs in pure stands, its dense, green foliage makes a significant scenic and esthetic contribution to the forests. Its affinity for water particularly brings it into contact with many forest users, such as at campgrounds and other high-use areas. Recreation activities that may be linked with the occurrence of POC include camping in sites dominated by a POC overstory, and photography.

The overall character and perceived quality of the visual resource varies by location, viewer,

and type of use. Qualitative statements regarding scenic quality are dependent on a variety of factors. It can be assumed, however, that the color contrasts presented by browning POC crown(s) amidst a stand of healthy trees would create a color contrast at that site. Higher mortality generally translates into increased contrasts, thus degrading the visual scene for some visitors. In areas where POC is the dominant species and it is unlikely that a replacement stand will develop (certain ultramafic sites), the impacts to the perceived qualities of the visual resource will be greatest.

Effects of the Alternatives

There are two distinct ways the alternatives affect recreation-related use. The first is the degree to which alternatives limit access. Access and availability of public lands for recreation use is a key variable used for analysis of each alternative. Existing levels of availability of public lands for recreation use is deemed adequate at this time. The second is the degree to which the alternatives contribute to wilderness and esthetic resources by maintaining POC over the long term.

It is assumed that increasing human populations within the area would increase recreation use of public lands. Demand would increase relative to growth. Cumulative effects would be relative to levels of increased demand and reduced availability.

Road closure methods, such as gates, suffer a certain degree of vandalism and forceful breaching by those unwilling to honor the closure. The level of such activity seems related to the level of agency enforcement of the closures. There would likely be an incremental increase in such incidents with increased gating.

Off-highway vehicle use, horseback riding, and all vehicular use are recognized as probable PL export agents, and thus are most affected (targeted) by any use restrictions. Saddle and pack stock require reasonable watering opportunities, increasing the probable exposure to POC and PL areas.

Although the Standards and Guidelines of the various alternatives generally do not affect wilderness, wilderness study areas, or wild and scenic rivers directly, each of the alternatives could allow for varying levels of introduction of PL into these lands and waters via foot and horse traffic. There would be a resultant reduction in wilderness values as well as visual quality and related recreation experience.

Alternative 1

Access to and availability of public lands for recreation use appears to be adequate for present demand. Any effects associated with this alternative would increase or decrease based on the level of access provided to the public. Current direction allows for gating or barricading roads to protect POC when consistent with other resource objectives. A desire to maintain public access is always a major concern whenever a road closure is considered. Public input and feedback thus far has generally not indicated a perception of overly-restricted access. Various other road closures have occurred for other resource-related reasons, and have generally not elicited noticeable public resistance (except in isolated circumstances). As future use increases—depending upon the level of road or seasonal restrictions imposed—demand could be displaced to other lands, resulting in a reduction in the quality of user experience.

This alternative would result in infestation of 49 to 58 percent of high-risk areas (those most associated with water) throughout all portions of the range except at Coos Bay BLM District/ Siskiyou NF Powers Ranger District. There would be a corresponding reduction in the aesthetic environment to individual recreationists. The visual quality of the characteristic landscape could suffer degradation until and if stands recover with replacement conifer species. Negative effects on wilderness values could increase.

Alternative 2

Effects of Alternative 2 are similar to Alternative 1. Management Practices 8 (Routing Recreation Use) and 9 (Road Management Measures) are probable effect-producing actions depending on the degree of the closure or restrictive action. Application would be variable depending upon POC and PL locations and the nature of the use or activity—there is no reliable indicator of the totality of any effect. These types of actions have already occurred over the past decade for various management reasons throughout the area. Individual occurrences of such management actions would require specific analysis based on their scale and scope, and the interest level and nature of stakeholders affected. Depending on the relative importance of certain roads or road systems to particular user groups, controversial or recreation-impacting closures could occur. As future use increases—depending upon the level of road or seasonal restrictions—demand could be displaced to other lands, resulting in a reduction in the quality of user experience.

Given the flexibility of management options within this alternative, and the unlikelihood of substantial decreases in access or availability of recreation opportunities when compared with the current direction, access effects associated with this alternative are considered negligible.

This alternative would result in infestation of 40 to 51 percent of high-risk areas (those most associated with water) throughout all portions of the range except at Coos Bay BLM District/ Siskiyou NF Powers Ranger District. As in Alternative 1, there would be a corresponding degradation in the aesthetic environment as perceived by individual recreationists. The visual quality of the characteristic landscape could suffer degradation until and if stands recover with replacement conifer species. Effects on wilderness values would be somewhat less than Alternative 1.

Alternatives 3 and 6

In addition to the effects described for Alternative 2, Management Practices applying to POC cores (Management Practices 1 [Minimize Entry], 3 [No Vehicles], and 6 [Trails]) are probable effect-producing actions. Alternatives 3 and 6 close or limit use of all discretionary roads in POC cores except mainline (tie) roads. These road closures could reduce access to trailheads and limit accessibility to recreationists. This reduction in accessibility would remain until trails could be built out to the nearest road. Depending on the level of closure involved, the effect would range from low to a level where existing demand for access and availability is not being met, and recreationists (especially off-highway vehicle users) would be displaced to other lands, decreasing the quality of the recreation experience for the user.

POC buffer protection Management Practice 1 (Transportation Analysis) is a probable effect-producing action. The level of availability of roads for public use, and the resulting effects, are the same as those described for the Management Practice 3 (No Vehicles) above.

These alternatives would result in infestations of 32 to 43 percent (Alternative 3) or 30 to 41 percent (Alternative 6) of high-risk areas (those most associated with water) throughout all portions of the range except at Coos Bay BLM District/Siskiyou NF Powers Ranger District. Although less than Alternative 1 and 2, there would be some reduction in the aesthetic environment for individual recreationists. The visual quality of the characteristic landscape could suffer degradation until and if stands recover with replacement conifer species. Wilderness values could be degraded slightly, but would be best protected in these alternatives.

Alternatives 4 and 5

Removing existing POC disease-prevention practices would have little effect on the availability of recreation opportunities on public lands. The lack of closures or access restrictions would, however, lessen the likelihood of impacting an individual user group concerned about losing access to a favorite area. This alternative would also decrease the likelihood of displacement-related congestion in other areas in the future.

This alternative would result in infestation of 83 to 89 percent of high-risk areas (those most associated with water) throughout all portions of the range except at Coos Bay BLM District/ Siskiyou NF Powers Ranger District. Recreation activities that may be linked with the occurrence of POC (such as camping in sites dominated by a POC overstory, and certain photographic activities) would be negatively affected. The effect would simply be the loss of the aesthetic environment that served as a draw to individual recreationists and a backdrop for their chosen activity.

Visual resources would be affected by the eventual loss of POC—effects would vary depending on the amount of POC in a viewshed. The visual quality of the characteristic landscape could suffer degradation until and if stands recover with replacement conifer species. Stands are more likely to recover under Alternative 4 than 5, because of the accelerated resistance breeding program. As explained in the Planting Assumption (found in the Assumptions and Clarifications section of this chapter), however, reforestation efforts will avoid high public use areas, such as campgrounds or along roads, at least until those areas test negative for the presence of PL in the soil. Wilderness values could be significantly impacted as PL spreads to additional drainages.

Areas of Critical Environmental Concern and Research Natural Areas

Affected Environment

As a part of the preplanning process for the SEIS, the staff considered and evaluated all lands within the Oregon range of POC that are designated areas of critical environmental concern (ACECs) and/or research natural areas (RNAs). "The Federal Land Policy and Management Act" and BLM policy require the BLM to give priority to designation and protection of ACECs during the land use planning process. ACECs are areas within BLM-administered lands where special management is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or natural systems or processes, or to protect life and safety from natural hazards. Appendix 8 contains a complete description of the ACEC criteria.

ACECs may be nominated by members of the public, other agencies, and BLM staff at any time. BLM policy requires that RNAs be managed as ACECs; therefore, areas nominated as RNAs must meet the ACEC criteria. RNA management goals and plans are usually more restrictive than ACEC management alone, as RNAs are created for scientific research and should maintain values for the representative cells and values.

Existing Areas of Critical Environmental Concern and Research Natural Areas

At present there are 37 existing ACECs or RNAs in the range of POC in Oregon. Eighteen ACECs or RNAs do not contain POC; 18 ACECs do. See Appendix 8 for a listing of the ACECs or RNAs that contain POC and their size, primary objectives, and other management information. Appendix 8 also includes the process and requirements for designation of ACECs.

Management activities in or near ACECs must be implemented in such a manner so as to be compatible with specific management objectives identified in site-specific activity management plans. In general, direction requires the BLM to: (1) manage ACECs for the maintenance, protection, or restoration of relevant and important resource values; (2) manage RNAs for the purpose of scientific study, research, and education, and to provide a baseline against which human impacts on natural systems can be measured; and (3) manage outstanding natural areas for recreation in a way which will not damage the natural features that make the area outstanding.

Management plans for each area will address such actions as land acquisition, fire use, interpretation, introduced species, wildland fire operations, domestic grazing, insects and disease, public use, minerals, and hydrology. Direction requires pursuit of mineral withdrawals for all RNAs; the inventory and designation of new RNAs as appropriate “cells” are identified, a limitation of off-highway vehicle use in all special areas to existing roads (unless closed), and development of monitoring plans that address ecological status, defensibility, and compliance monitoring issues.

Effects of the Alternatives

Eighteen of the ACECs or RNAs are not known to have POC; hence, there is no effect under any of the alternatives. Fourteen ACECs or RNAs have POC and no known root disease. Seven of these ACECs or RNAs were selected at least partially for the presence of POC plant communities. Five ACECs or RNAs currently have root disease. Three of the infested ACECs or RNAs were selected at least partially for the presence of POC plant communities.

The risk to any specific ACECs or RNAs is generally the same as percentages described in the Pathology section for each alternative. Under Alternatives 1, 2, 3, and 6, management plans for the ACECs or RNAs would be developed where they do not exist and these areas would be managed to reduce the spread of (or possibly eliminate) PL, according to the Standards and Guidelines of the selected alternative. Under Alternatives 4 and 5, existing areas of PL would remain untreated, placing those ACECs or RNAs selected for the presence of POC plant communities at higher risk of losing those values for which they were selected. These alternatives would raise the probability of infestation occurring, particularly on sites favorable for the pathogen, compared to Alternatives 1, 2, 3, and 6.

Culturally Significant Products for American Indian Tribes

Affected Environment

The current range of POC falls within the traditional territories of numerous American Indian Tribes along the west coast of North America. Included is the 5,400-acre forest of the Coquille Indian Tribe in west-central Oregon which is managed according to many of the Standards and Guidelines of adjacent Federal land. The Tribe and the Bureau of Indian Affairs may choose to adopt the selected alternative at a future date. Other Tribes in Oregon and California also manage lands containing POC, but these are not directly affected by the management requirements of the various alternatives. POC continues to play a significant role in the cultural and religious life of many Tribes living within the POC range from west-central Oregon south through northwest California. Native cultures toward the northern end of the POC range suffered more severe disruption during U.S. settlement of the region in the mid-19th century than those toward the southern end of POC range. As a result, POC use was largely disrupted and information is limited. Specific information concerning where, how, what time of year, and by whom POC is harvested and used is restricted from distribution.

Cedars of all types are considered the most used wood by native cultures of the Pacific Northwest. Despite declining availability, the cultural importance of POC remains high given its physical and structural characteristics, distinctive appearance, and aroma. The smells of POC also enhance the meaning of cultural rituals. Known for its durability, POC has straight grain properties allowing it to be split evenly. In contrast, spruce, which is also valued, does not split as evenly and has more pitch. Therefore POC is sought as a source of planks for building traditional structures and for arrows or lances that support bone or stone projectile points. However, shortages and diminishing accessibility to mature trees sometimes relegates POC to parts of a plank house or sweat lodge, such as benches or sidewalls. This is also true for construction of canoes.

POC has other traditional uses. Boughs are used as brooms, and the bark and roots are peeled and finely shredded for use in making traditional clothing, basketry, nets, twine, mats, and other items. Limbs may be twisted into rope.

Unlike western red cedar and incense cedar, POC has limited medicinal value due to its highly toxic character as a diuretic. Similarly, POC is less effective than incense cedar for preserving and storing perishable materials such as feathers, hides, and other materials. POC typically does not have the cedar-closet aroma of other cedars.

The declining availability of healthy, mature POC trees through the 20th century has increased the importance of remaining POC stands to Tribes. Although the region has experienced an economic and cultural rejuvenation by the Tribes, a declining availability of POC due to several factors, including past timber cutting, disease, endangered species protection, fish protection, and land use allocations, hinders Tribal initiatives to restore and revive cultural traditions.

Agencies issue permits for collection of special forest products including non-POC boughs, beargrass, and cones, but seldom issue permits for POC product collections. Therefore, quantitative data concerning modern-day cultural uses of POC is highly variable among the

Tribes and generally not readily available outside Tribal communities. In general, however, use of POC is at modest levels. No information is available regarding the association of other culturally important species associated with the occurrence of POC.

Maintenance of POC stands on Federal lands as a culturally-important species is important to Tribes and fulfills Federal policies and goals for accommodating traditional Tribal uses. These uses are also consistent with the "American Indian Religious Act," and other statutes that highlight the importance of traditional cultural uses of plants on Federal lands. There are no effects to the exercise of those rights, because there are no off-reservation treaty reserved rights within POC range.

Effects of the Alternatives

There are two distinct ways the alternatives affect Tribal uses of POC products: (1) the degree to which alternatives limit access to products, and (2) the degree to which the alternatives maintain collectable quantities of POC over the long term.

Access to Products: Access is least restricted in Alternatives 4 and 5, and increasingly more restricted with Alternatives 1, 2, 3, and 6, respectively. For example, Alternatives 1, 2, 3, and 6 include a variety of management practices including sanitation measures (removal of roadside POC in disease infested areas), road construction restrictions, restrictions on harvesting boughs, and washing vehicles accessing diseased areas. Alternatives 3 and 6 would result in further access restrictions in some watersheds. However, because of the modest demand and the availability of at least some products from private lands, the actual difference between the alternatives is extremely small, perhaps affecting less than one collection request per year in the most restrictive cases of Alternative 3 and 6. Further, the adverse effect on access is more than compensated for, in the view of the Tribes, by what they view as the long-term benefits of reduced access. The Tribes contacted for this SEIS felt strongly that slowing the spread of the root disease was important to protect their cultural uses. Many responses advocated limiting access to areas to achieve that goal by restricting the introduction of disease-infested soil.

Maintain Collectable Quantities: Even though access and collection restrictions of some alternatives may remain in place indefinitely, the effect on Tribes depends primarily on the amount of healthy POC that would be provided by each alternative over the long term.

An analysis of the six SEIS alternatives on the spread and impacts of PL on POC stands reveals useful trends in determining the implications for availability of POC on Federal lands for cultural use. The pathology effects section indicates the six alternatives pose insignificant differences for POC stands in low-risk areas. The occurrence of low-risk areas varies greatly in the POC range, from 80 percent of the area in the northern coastal areas of western Oregon, to 60 percent in the southern coastal range of California, and 40 percent in inland areas of POC. The analysis does indicate significant differences posed by the alternatives on high-risk areas within the region. Therefore, only 20 percent of the Northern Coastal Range shows significant variation in results of the alternatives over a 100-year period. This increases to 60 percent in the areas further inland. The analysis further determines for uninfested high-risk sites that the alternatives would lead to the following infestation rates over the next 100 years (from Table 3&4-8 in the Pathology section):

Alternative 1 — 40 percent;
Alternative 2 — 30 percent;
Alternative 3 — 20 percent;
Alternative 4 — 80 percent;
Alternative 5 — 80 percent; and
Alternative 6 — 18 percent.

Those stands newly infested are expected to experience a 90 percent mortality rate within 20 years or less of becoming infested.

The primary difference in alternatives is in the application of management actions to prevent/reduce the spread of disease in uninfested areas of Alternatives 1, 2, 3, and 6, and the lack of such provisions in Alternatives 4 and 5. However, Alternative 4 includes a strong emphasis on disease resistance breeding in POC planting stock, which would increase the availability of POC products as they grow older.

Given the following factors that: (1) the alternatives only vary significantly for high-risk sites in regard to rate of disease spread; (2) Tribal reliance on POC stands for culturally important products is at modest levels; and (3) under all alternatives some level of healthy accessible POC stands would be sustained over the 100-year analysis period, the difference in effects on Tribal use of POC among Alternatives 1 through 6 is immeasurable. It should be noted however that Alternative 5 poses a potentially greater effect over a longer time span because it combines lack of disease prevention measures with a nonaggressive genetics program, and thus could impact Tribal product availability more than for the other alternatives. However, the difference will be insignificant through the 100-year period addressed by the SEIS.

Note: Persons contacted in soliciting information for this section included Don Ivy and George Wasson of the Coquille Indian Tribe, the Hoopa Tribe Forestry Department, Jason Younker of the University of Oregon, Forest Service Region 6 Tribal Affairs Specialist Les McConnell, land management agency Cultural Resource Specialists Dr. Steve Samuels, Isaac Barner, Dr. Mike Southard, and Reg Pullen.

Special Forest Products

Affected Environment

POC shares the same decay-resistant properties as other cedars, such as western red cedar and incense cedar, and is used for posts, rails, and shakes. Western red cedar and incense cedar are more sought after because they have a wider range and are more easily accessible.

POC is in greatest demand for boughs during Christmas and to a lesser degree, for year-long floral arrangements. Boughs have a graceful, flat, beaded-lace appearance that makes them ideal for tying continuous strands to a wire backing for garlands or for layering into Christmas wreaths. The foliage also combines beauty with durability and needle retention that allows it to be preserved with glycerin mixtures for long-lasting floral displays. These attributes make POC a desirable commodity for personal use and commercial harvest. Commercial buying sheds in southwest Oregon purchased more than 400,000 pounds of POC

boughs during 2002, yet less than 4 percent came from Federal land. The existing market for POC boughs could accommodate an increase in Federal bough supply either through expansion of demand or substituting POC boughs for western red cedar boughs. The price paid by the sheds ranged from $0.25 to $0.35 per pound, making POC economically desirable to harvest during a time of year when other agricultural work is diminishing.

The nature of commercial POC harvest involves an individual or crew making numerous trips from a vehicle into a grove of POC to clip and carry bundled boughs back to the road. Typically, a road will bisect several draws in a drainage growing POC, and harvesters will drive a road visiting and collecting from each draw. Greatest demand is prior to Christmas, typically a wet time of year, which increases these chances of moving infested soil by mud on shoes or vehicle tires. The intensity and focus of the foot traffic during commercial harvest in POC groves makes this a higher risk activity for PL spread than incidental foot traffic from hiking, hunting, or gathering of other special forest products such as mushrooms.

In addition to spring and fall mushroom gathering, other products potentially sharing range with POC or in demand during the wet season include firewood and Christmas trees. Both of these activities require a permit, so there are opportunities to close areas and direct collectors to areas with low risk. Within the range of POC, the Agencies issue approximately 800 personal use firewood permits, 1,200 mushroom permits, and 2,900 permits for individual Christmas trees each year. Closures of road systems that pass through POC range could affect access to Christmas tree cutting areas or limit availability of firewood permits. Mushroom gatherers using road systems for access or walking through the woods between infested and uninfested areas may be affected either by road closures, spread control techniques, or denial of permits.

Effects of Alternatives

The effects of the alternatives are based entirely on management constraints to the program. POC products are such a small percentage of the live POC on Federal lands that mortality differences between the alternatives are deemed to have little potential to affect supply in the foreseeable future.

Alternative 1

This alternative continues the current direction in the land and resource management plans of the BLM Districts and the Siskyou NF. Limitations on the harvest of POC boughs, stemming in part from incompatibility with the objectives of various land use allocations, and in part because of concerns about the role of bough collection in the spread of POC root disease, would continue. The level of harvest activity from Federal lands is expected to continue to provide only a small percentage (less than 4 percent) of total harvested boughs in southwest Oregon. Other special forest product opportunities within the range of POC are expected to continue at their present levels.

Alternative 2

Alternative 2 is similar to Alternative 1, except that practices currently implemented or recently developed are better described, a risk key is included for clarification of the environmental conditions that would trigger additional control or mitigation measures, and emphasis

is added for 162 uninfested watersheds. Implementation of disease-control practices is expected to be somewhat more consistent than under Alternative 1. Bough harvest is expressly prohibited, except under specified permit conditions. There will be instances where site-specific analysis of a project would require the undertaking of some proactive POC roadside sanitation. These projects could provide several tons of boughs with the utilization of the severed trees. This translates into the level of bough harvest activity from Federal lands remaining approximately the same, or slightly higher, than current levels. Additionally, there may be road management practices that would result in a slight decrease (less than 5 percent) in other special forest products permits for firewood and Christmas trees due to restricting access to lands during the wet season or closing roads. Areas for firewood or Christmas tree cutting outside these closure areas are generally available to accommodate these requests.

Alternative 3

Alternative 3 incorporates all of the direction from Alternative 2, and adds protections for uninfested 6th field watersheds by creating POC core areas totaling 34,000 acres (or over 10 percent of the land base occupied by POC). The key management directions for these POC core areas relevant to this analysis are (1) closing of some road systems, and (2) suspension of all special forest products permitting in these areas. However, as in Alternative 2, there would be POC sanitation projects (including in POC buffer areas) that could provide several tons of boughs for utilization. As with Alternatives 1 and 2, the availability of boughs is tied primarily to sanitation and other management activities, which would remain similar to current levels or increase slightly. Hence, bough availability under this alternative would be approximately the same as current levels.

With restricted road access and special forest products permits in the POC core areas, and additional road closures or seasonal limitations put on activities in POC buffers (approximately 33 percent of the Federal land within the POC range in Oregon), there is an expectation of a slight decrease in mushroom, firewood, and Christmas tree special forest products permits. Because much of the core and buffer areas are in wilderness or inventoried roadless areas, any reductions in available collection areas would be small enough to be essentially negated through permitting in other areas.

Alternatives 4 and 5

Alternatives 4 and 5 remove the current management techniques used to control the spread of PL and are differentiated only by the increase of the disease-resistant seed program in Alternative 4 and discontinuing the resistance breeding program in Alternative 5. The effects for both alternatives with regard to special forest products would be similar. In the long term, a program of growing and planting seedlings may offer more opportunity for bough harvest than natural regeneration alone may offer, but plantings of disease resistant trees are not expected to be subject to bough cutting within the near future. Depending on Agency funding for the preparation and administration of bough sales increases, there would be a enough market and product availability to support 100 to 200 tons of bough collection per year. Additionally, there may be a slight increase in other special forest products permits due to increased access to lands, including during the wet season.

Alternative 6

The effects for Alternative 6 would be similar to Alternative 3. This alternative identifies uninfested watersheds at the 7th field level, which would result in POC cores approaching 49,000 acres (46 percent more than Alternative 3) and POC buffers of 219,000 acres (53 percent less than Alternative 3.) While the POC core acres are larger than in Alternative 3 and not so concentrated to inventoried roadless and wilderness areas, reduced POC buffer areas and closer permit substitute areas (the 7th field watersheds are smaller and less likely to affect large blocks) would likely affect mushroom, firewood, and Christmas tree special forest products permits about the same as Alternative 3. As with Alternative 3, this effect could be offset through increased permitting in other available areas. Road sanitation is predicted to increase, potentially increasing bough cutting available under this alternative when compared with Alternative 3.

Timber Harvest

Affected Environment

Timber harvest occurs for a variety of reasons on the BLM and FS units within the range of POC. An understanding of timber harvest activity and the lands involved is important to calculating the effects of the alternatives on future timber harvest. It is also illustrative about the amount and nature of harvest activity on public lands, acknowledged to be a factor in POC root disease spread.

Probable Sale Quantity

Within the Oregon portion of the range of POC, long-term sustained-volume production is a Northwest Forest Plan goal on about 11 percent of the Federal forestlands. These lands which comprise the harvest landbase, the Matrix and Adaptive Management Area land allocations, are managed for regularly-scheduled timber harvest while meeting a non-declining yield policy objective (Table 3&4-22).

The annual timber harvest volume expected to come from these lands is called probable sale quantity, or PSQ. The decisions regarding harvest methods and scheduling in the Matrix and Adaptive Management Areas are made after considering a variety of nontimber resource

Table 3&4-22.—*Acres by Northwest Forest Plan land allocation and administrative unit within the range of Port-Orford-cedar in Oregon*

	Northwest Forest Plan Land Allocations					
Unit	Congressional Reserves	Late-Successional Reserves	Administratively Withdrawn	Riparian Reserve [1]	Matrix/ Adaptive Management Area	Total
Coos Bay	433	45,941	2,641	79,575	26,526	155,116
Medford	24,894	119,355	1,935	58,460	27,511	232,155
Roseburg	-	45,417	635	23,920	15,293	85,265
Siskiyou	230,583	571,621	44,894	109,267	93,080	1,049,445
Oregon total	255,910	782,334	50,105	271,222	162,400	1,521,981

[1] Includes about 25% Matrix/Adaptive Management Area non-forest. Ratio of Riparian Reserve and non-forest to Matrix differs by administrative unit. Only the Matrix and Adaptive Management Area acres contribute to PSQ.

values at the administrative unit, watershed, and site-specific scales. PSQ levels are established in the land and resource management plan for each administrative unit, and currently reflect the plan amendments of the Northwest Forest Plan (USDA-FS and USDI-BLM 1994b) (Table 3&4-23). No previous PSQ adjustment was made for the current POC Standards and Guidelines. For the purposes of this analysis, it is assumed that PSQ is directly proportional to the forested lands dedicated to its production. That means for each acre removed from the Matrix or Adaptive Management Areas, there is a proportional and nearly straight-line reduction in PSQ. As noted in the Assumptions section earlier in this chapter, the following discussion assumes full implementation of the Northwest Forest Plan harvest volume, and other Northwest Forest Plan objectives.

On most of the Federal land management units in Oregon, POC is concentrated within the riparian areas and therefore contributes little towards the PSQ. The exceptions to this are on the Coos Bay BLM lands and the Powers Ranger District of the Siskiyou NF. Within this area, POC is more well-distributed across the landscape resulting in about 5 percent of the volume in any given harvest unit being POC. Disease-related POC mortality does not necessarily affect attainment of the PSQ. In addition to generally being only a minor stand component, the dead trees remain salvageable for long periods of time, and their growing space, if not readily captured by existing competitors, will be naturally restocked with other tree species

Other Harvests

A strength of the Northwest Forest Plan is the expectation that some form of density management (thinning) will be done in Late-Successional Reserves and some Riparian Reserves to help these lands more readily meet their primary objective of becoming habitat for late-successional forest-related species or contributing to achievement of water quality objectives. This type of harvest is typically limited to thinning in stands less than 80 years old, but may take place in older stands if necessary to reduce the risk of a major wildland fire. The resultant volume does not contribute to PSQ and there is no programmed level of harvest. Nevertheless, within the range of POC, recent Late-Successional Reserve harvest activity has taken place at an estimated rate of 3 million board feet per year and 300 acres per year when combined across all the Oregon management units. There is a considerably higher capacity for these treatments. About 20 to 30 percent of all Late-Successional Reserve acreage within Northwest Forest Plan area are between 30 and 80 years of age and much of that would benefit from thinning. Within the Oregon portion of the POC range, the potential for these treatments is estimated to be about 85,000 acres.

Salvage activities may also take place in most land allocations depending upon the magnitude of the disturbance event. Late-Successional Reserves permit salvage if an event such as a

Table 3&4-23.—*Annual probable sale quantity [PSQ] in millions of board feet annually by administrative unit and within the range of Port-Orford-cedar* [1]

	Administrative Unit						
	Oregon				California		
	Coos Bay	Medford	Roseburg	Siskiyou	Six Rivers	Klamath	Shasta-Trinity
Total PSQ	22	47	37	24	16	51	82
PSQ within POC range	13	6	6	24	7	10	1

[1] Millions of board feet in 32-foot logs.

fire, windstorm, or disease has reduced canopy cover below 40 percent on an area larger than 10 acres. Salvage may be proposed, for example, within the Late-Successional Reserves of the 2002 Biscuit Fire area. Annual levels of salvage volume are highly variable. The exception to salvage operations occurs upon the nearly 17 percent of Federal lands designated as Congressional Reserves.

Harvest Activity

Harvest volumes per acre are variable depending upon the land allocation and whether a complete (regeneration), partial (thinning), or salvage harvest is implemented; but it would be reasonable to estimate about 20,000 board feet per acre is average. Further, the average logging truck carries about 5,000 board feet. Finally, the ratio of tractor to cable partial-suspension or full-suspension (ground-based to nonground-based) logging is about 20 to 80. With these numbers, general levels of ground-disturbing activities and road use related to logging can be calculated.

Annual volume harvested on Federal lands in the Oregon portion of the POC range is about 49 million board feet (PSQ plus reserve thinning and salvage volume). This results in harvest on approximately 2,500 acres per year. With 20 percent of the range actually having POC, and 13 percent of that being infested with PL (Table 3&4-10), about 65 acres of harvest are likely to occur on PL-infested soils in any given year. The level of disturbance and therefore the likelihood of moving PL varies by the type of harvesting method used. The harvest methods on Federal lands within the Oregon range of POC were reported to be 23 percent tractor or no suspension, 58 percent cable with partial suspension, and 20 percent full suspension (cable or helicopter).

Transporting the annual volume from the Federal forests in Oregon requires about 10,000 truck trips, traveling to various mills, sometimes out of state. For California, the 19 million board feet being harvested within the range of POC translates to another 3,800 truck trips. Timber management personnel from the northern California forests estimate the amount of wood traveling into Oregon from their timber sales is less than 2.5 million board feet per year, or up to 500 truckloads per year. Some of these trucks could come from PL-infested areas. The potential for exchange of spores at mill yards, using out-of-state logs and logging trucks as infection vectors, is probably very slight, given the level of infestation in northern California forests, Federal timber sale mitigation measures, and poor spore survival under high temperatures (Goheen, D.J., *personal communication*).

On Federal lands, all harvests are done by the highest qualified bidder or their agents, using private logging equipment. There is the possibility of infestation being spread throughout the range or between states with this equipment. The risk is higher with equipment used on private lands within the range of POC where it is not subject to the level of mitigations and seasonal constraints applied to Federal timberlands. This may be of particular concern with equipment used in the area between Port Orford and Coos Bay, Oregon, where POC and PL are scattered throughout many private forest lands and the level of infestation is higher than on any of the Federal lands in this analysis. The current POC management practice of cleaning equipment before permitting a purchaser to work in or near uninfested POC stands on Federal lands reduces the likelihood of such spread. The intermingled nature of private and Federal lands in this area and the relative lack of mitigations and seasonal restraints on private operations increases the potential for infestation of Federal lands along shared haul routes (roads).

Effects of the Alternatives

There are three possible ways the alternatives could affect the level of timber harvest. First, to the extent PL kills trees important to PSQ, the alternatives with the highest mortality would be the ones to most affect timber harvest. As noted in the Affected Environment section, this element has virtually no effect on PSQ either because POC are a minor stand component within most Matrix/Adaptive Management Area land allocations, or because they could be salvaged and their growing space readily utilized by resistant POC stock or other tree species.

Second, if the Standards and Guidelines actually prohibit harvest on certain areas within the PSQ harvest landbase, there is a direct and proportional reduction in harvest levels. This is the case in Alternatives 3 and 6 which include the establishment of harvest-prohibited POC core areas. Thirdly, when considering all of the other costs that go into timber sale economics, if the Standards and Guidelines result in increased cost, some stands within the PSQ landbase may become too expensive to harvest. This effect is real, but very difficult to quantify at the programatic scale.

Alternatives 1 and 2

These alternatives are essentially the same in their effects to PSQ. Neither prohibits harvest on any lands, but both increase costs. The exception to this is the clause in the Alternative 2 risk key which identifies uninfested 7th field watersheds containing more than 100 acres of POC stands on Federal lands. The decision could be made to drop a project. If all of these 7th field watershed stands were dropped from the harvest landbase, the reduction to the combined Oregon PSQ would be about 2 million board feet per year. The actual impact of this Standard and Guideline to Alternative 2 should be less than this amount. Estimates listed in the cost section for washing ($28,000 and $22,000 for Alternatives 1 and 2, respectively) and a portion (33 percent) of the $37,000 sanitation costs ($51,000 and $41,000 for Alternatives 1 and 2, respectively), are probably directly attributable to timber sales and borne by purchasers. This amounts to about $0.80 per thousand board feet. Optional seasonal restrictions for scheduling logging operations could also reduce the availability of prospective bidders or increase the costs related to timber harvest. Many of these additional mitigation treatments and their costs currently exist under Alternative 1, the No-Action Alternative. Alternative 2, would provide for a more consistent application of these treatments. Any additional mitigation treatment costs will impact bid rates and therefore, Federal timber receipts.

The Standard and Guideline in Alternative 2 that encourages nonground based equipment would further increase harvest costs an undetermined amount compared to Alternative 1.

Alternative 3

In addition to the effects listed for Alternatives 1 and 2, Alternative 3 prohibits timber harvest from POC cores. Table 2-2 shows the area of cores falling in the Matrix/Adaptive Management Area/Riparian Reserve land allocation as approximately 5,410 acres. The percentage of this figure that is actually Riparian Reserve varies by administrative unit based on their field experience. Similarly, a portion of this land is non-forest. Applying these factors to the 5,400 acres as shown in Table 3&4-24a results in approximately 2,260 acres within POC cores as currently contributing to PSQ.

Table 3&4-24a.—*Alternative 3 Port-Orford-cedar core acres and resultant PSQ reduction for Oregon*

	Table 2-2 acres	Reduction factor				
Unit	Matrix/Adaptive Management Areas/Riparian Reserves	Riparian Reserves	Non-forest	PSQ acres	PSQ volume per 1,000 acres in MMBF [1]	PSQ reduction in MMBF
Coos Bay	[No cores]	n/a	n/a	0	n/a	0
Medford	1,633	0.43	0.25	522	0.25	0.13
Roseburg	5	0.52	0.09	2	0.41	0.00
Siskiyou	3,772	0.40	0.14	1,735	0.30	0.52
Oregon Total	5,410			2,259		0.65

[1] MMBF = million board feet in 32-foot logs.

The PSQ reduction for each acre in cores can be estimated using each administrative unit's ratio of Matrix/Adaptive Management Area acres (Table 3&4-22) to PSQ (Table 3&4-23). These ratios are shown in Table 3&4-24a are PSQ volume per 1,000 acres. As shown in Table 3&4-24a, the total PSQ reduction for this alternative is about 0.6 million board feet, or about 1.2 percent. There would be a proportional reduction in jobs, and in harvest acres and logging trucks.

There is no prohibition of harvest in POC buffers designated under Alternative 3, so they have no effect on PSQ. As discussed in Chapter 2, the management objective of these POC buffers is to reduce the possibility of PL spreading into the POC cores.

The restriction against timber harvest in the POC cores will also restrict the ability of the Agencies to do commercial thinning on approximately 6,000 acres of 40- to 80-year-old stands in Late-Successional Reserves (approximately one-third of the Late-Successional Reserve acres in these watersheds). This thinning is done to accelerate the development of late-successional forests or restore ecological processes. Such thinning is a major strength of the Northwest Forest Plan, but with nearly 2,000,000 acres of thinning needs in the Northwest Forest Plan area, this 6,000 acres may not be significant unless it conflicts with specific identified habitat or fuel reduction thinning plans. This could occur, however, because a portion of these acres appear to be in the unburned wildland/urban interface along the western edge of the Illinois Valley.

Alternatives 4 and 5

These alternatives would not affect PSQ because they do not make any acres unavailable for timber harvest. The $0.80 per thousand board feet cost, the seasonal restrictions, and the extra cost for nonground-based logging equipment of Alternatives 1 and 2 would not be incurred. Without these current site-specific mitigation measures to control the spread of PL infestation and their associated costs, there should be an anticipated increase in the bid rates and thusly, the Federal timber receipts.

Alternative 6

Alternative 6 is similar to Alternative 3, differing primarily (1) in the application of POC cores and buffers at the 7th field watershed level, instead of 6th field watersheds, and (2) in that watersheds with less than 50 percent Federal ownership were excluded. Table 2-3 shows the area of POC cores in the Matrix/Adaptive Management Area/Riparian Reserve land allocation as approximately 6,630 acres. As with Alternatives 3, the percentage of this figure

that is Riparian Reserve and nonforest is based on each units' field experience. Applying these percentages to the 6,600 acres as shown on Table 3&4-24b results in approximately 3,010 acres currently contributing to PSQ. The predicted reduction in PSQ for this alternative is calculated using the same acres-to-volume ratios as for Alternative 3. As shown on Table 3&4-24b, the total PSQ reduction would be about 0.9 million board feet in the Oregon portion of the POC range, or about 1.7 percent. There would be a proportional reduction in jobs, and in harvest acres and logging truck traffic.

There is no prohibition of harvest in POC buffers designated under Alternative 6, so this designation has no effect on PSQ. As discussed in Chapter 2, The Alternatives, the management objective of these POC buffers is to reduce the possibility of PL spreading into the POC cores.

These analyses are not intended to be precise enough to redeclare PSQ, but to provide a general quantification of the effects of these alternatives. Precise PSQ calculations would require identification of the actual affected stands in unit databases and then rerunning each unit's harvest scheduling model without those stands.

As in Alternative 3, the restriction against timber harvest in the POC cores will also restrict the ability of the Agencies to do commercial thinning (also known as density management within the Late-Successional Reserves) on approximately 9,000 acres of 40- to 80-year-old stands in Late-Successional Reserves (approximately one-third of the Late-Successional Reserve acres in these watersheds). This thinning is done to accelerate the development of late-successional forests, enhance habitat development, reduce fire danger, or restore ecological processes. Such density management thinnings are a major strength of the Northwest Forest Plan, but with nearly 2,000,000 acres of thinning needs in the Northwest Forest Plan area, this 9,000 acres may not be significant unless it conflicts with specific identified habitat or fuel reduction plans. This could occur, however, because a portion of these acres appear to be in the unburned wildland-urban interface along the western edge of the Illinois Valley.

Table 3&4-24b.—*Alternative 6 Port-Orford-cedar core acres and resultant PSQ reduction for Oregon*

	Table 2-2 acres	Reduction factor				
Unit	Matrix/Adaptive Management Areas/Riparian Reserves	Riparian Reserves	Non-forest	PSQ acres	PSQ volume per 1,000 acres in MMBF [1]	PSQ reduction in MMBF
Coos Bay	0	0.62	0.13	0	0.51	0.0
Medford	285	0.43	0.25	92	0.25	0.02
Roseburg	0	0.52	0.09	0	0.41	0.00
Siskiyou	6,343	0.40	0.14	2,918	0.30	0.88
Oregon Total	6,628			3,010		0.9

[1] MMBF = million board feet in 32-foot logs.

Livestock Grazing

Affected Environment

Livestock graze on public and private lands throughout the West. Livestock grazing ranches have been passed down generation lines to their children and can be a sole way of income for some people, or a supplemental income for others. Livestock grazing ranges from riparian zones and meadows to the peaks of the mountains. Livestock will travel between water sources, feed, and salt locations. They are usually controlled within a designated area called a grazing allotment. Every grazing allotment has its own unique grazing management strategy which includes type of livestock, age class, breed type, movement of livestock, distribution of livestock, season of use, topography, pasture rotations, and environmental constraints.

Since the 1950s PL has been causing root disease and death among POC trees in southwestern Oregon. PL spores are borne by water and spread through waterways or by transfer of soil (often in the form of mud). This can occur by vehicles, humans, and animals. POC is found in riparian areas throughout the Siskiyou NF and BLM lands, but very few POC populations are found within grazing allotments in this area. The table below indicates the grazing allotments that are within the range of POC for BLM- and FS-administered lands.

Effects of the Alternatives

As noted in the Table 3&4-25, grazing allotments total 9,282 acres of BLM and 33,882 acres of FS lands within the range of POC. The number of livestock grazing is low within allotments having POC, and those allotments are relatively large. The result is that all except two NF allotments have minimal cohabitation with livestock range of use and POC habitat. As indicated in the Pathology section, large animals have a probability of 5 to pick-up and transport infested soils and the probability drops to 1 during the months of June through September. Unlike wildlife movement, grazing management strategies can greatly control and reduce the potential of PL spread and POC contaminations by livestock. This can be done by educating the permittee/public, limiting the season of use around POC habitat to the drier periods, eliminating movement from infested areas to uninfested areas, removing mud from livestock prior to entering the area, and washing mud from vehicles prior to entering POC area. The transportation of livestock over long distance greatly reduces the potential for caring the PL from infested areas to uninfested POC habitats.

In Alternative 1, 2, 4, and 5, little effect would occur on the permittees operations. In Alternatives 1 and 2, one or more of the above measures may be applied if there appears to be significant risk.

Alternative 3 would close connector (but not mainline) roads in or near POC in uninfested watersheds. These closures will have most effect on the Pistol River and Signal Butte Allotments because they are relatively large and have a higher concentration of POC than other allotments. Closures would limit access within (but probably not to) the allotments, affecting permittees' ability to transport cattle to and from the grazing areas, limiting salt placing, cattle distribution, improvement maintenance, and utilization monitoring and other management.

Table 3&4-25.—*Livestock grazing allotments within the range of Port-Orford-cedar on BLM- and FS-administered lands*

Agency	Allotment	Acres	Animal unit months /animal units [1]	Season of use	Permit status	POC present
Grants Pass BLM	Deer Creek	1,165	15/30 18/27 9/18	4/1 - 5/31 5/1 to 5/31 10/16 - 12/15	Vacant	No
Grants Pass BLM	Q Bar X	15	5/2.5	10/1 to 10/15	Vacant	No
Grants Pass BLM	Reeves Creek	2,313	38/95	4/15 to 6/15	Canceled	No
Grants Pass BLM	Cherry Gulch	40	3/6	4/1 - 5/30 9/1 - 10/15	Canceled	No
Grants Pass BLM	Glade Creek	580	5/17	4/20 - 7/31	Canceled	No
Grants Pass BLM	Jump Off Joe	40	8/8	4/16 - 5/15	Canceled	No
Grants Pass BLM	Pickett Mountain	540	6/38	4/1 - 8/30	Canceled	No
Grants Pass BLM	Easterly Lake	4,457	38/152	4/1 - 7/31	Canceled	No
Glendale BLM	No grazing allotments					
Roseburg BLM	No grazing allotments					
Coos Bay BLM [2]	Kamph	113	56/336	10/1 - 4/1	Active	No
Coos Bay BLM [2]	Haga/Barton	13	13/78	4/1 - 10/01	Active	No
Coos Bay BLM [2]	Knapp	6	6/36	4/1 - 10/1	Active	No
Siskiyou NF	Pistol River	7,150	40/200	6/1 - 10/31	Active	Yes
Siskiyou NF	Chetco	4,445	36 /144	6/1 - 10/1	Active	Yes
Siskiyou NF	Signal Butte	2,103	10/120	4/1 - 3/31	Active	Yes
Siskiyou NF	Oak Flat	102	19/76	6/1 - 9/30	Active	No
Siskiyou NF	Agness Ranch	43	7/ 49	3/1 - 9/30	Active	No
Siskiyou NF	Big Bend	72	24/150	4/25 - 10/31	Active	Yes
Siskiyou NF	Shasta Flat	10	3/36	4/1 - 3/31	Active	No
Siskiyou NF/Rogue NF	Big Grayback	20,000	60/280	6/1 - 10/31	Active	Yes
Total BLM		9,282	220/843.5			
Total FS		33,882	199/1055			

[1] All FS grazing allotments animal unit months/animal units are in number of head months.
[2] Coos Bay BLM are not allotments, but Cooperative Management Agreements and the nearest POC are two or more miles away. There are other grazing allotments on the Coos Bay BLM Resource area, but they have no POC habitats within the allotments.

The Chetco, Big Bend, and Shasta Flat Allotments fall all or partially within uninfested watersheds in both Alternatives 3 and 6. Management on the Chetco Allotment could be affected, but to a much lower scale because the POC is located in the steep topography of the northeast corner of the allotment were cows do not reach very often. Effects to management on the Big Bend and Shasta Flat Allotments will have minimal because they are small and along main roads.

A decision to prohibit cattle within POC cores (Management Practice 1, Minimize Entry) could lead to closing some of these allotments because of the difficulty of fencing the POC stands.

Mining

Affected Environment

Mining often occurs within the range of POC, frequently in or near habitats associated with POC. Mining history in the area dates back to the first gold discovery in Oregon, in Josephine Creek about 1850.

There are approximately 800 mining claims on the Siskiyou NF, mostly on the Illinois Valley and Galice Ranger Districts. A lesser number of additional claims are concentrated on the Medford BLM District, mostly in these same drainages, and there are additional claims scattered across of the range of POC. Most of these claims are placer claims associated with streams. The remainder are generally upslope, away from POC or on sites at low risk for spread of PL. Some streams are claimed along most of their length. Mining claimants have various access and use rights on the claims, a type of property right; numerous laws apply.

Claimants and other prospectors generally submit a written or verbal notice of intent to operate each year, describing the intended scope of their operation. The Agencies consider the location, season, and scope of the operation and advise the claimant whether a plan of operation is required. A plan of operation is generally not necessary when miners are using suction dredges less than 4 inches diameter, moving only a few yards of material, not proposing to leave established roads or alter vegetation, and working within the June/July through September/October (depending on location) dry summer season. A free State dredging permit is required for these "casual use" activities.

The number of notices of intent received by the Siskiyou NF is down to an estimated 30 to 50 per year; the number of actual operations within the POC range in Oregon is believed to be under 100 per year, down substantially from 200 to 300 ten years ago.

Claimants normally work a week or two, or some weekends; and typically camp in dispersed campsites along system roads or on short spur roads. Their camping and traffic numbers are far exceeded by annual recreational traffic on the same roads, in the same areas.

If claimants or prospectors propose to operate outside of the summer season or otherwise propose an action that is likely to cause a significant surface disturbance, a plan of operation is required. These plans require a NEPA evaluation, restoration plan, and bond. The agencies append and enforce various reasonable environmental safeguards to such plans including applicable PL control measures, but such requirements may not necessarily prohibit the miner from reaching and operating their claim. Few claims in the POC range are operated at a large enough scale to require a plan of operation, and the ones that are, should, with PL mitigations measures in place, not pose disease risk in excess of that for any other forest management operation.

Each of the existing land and resource management plans contains Standards and Guidelines relevant to mining.

Effects of the Alternatives

All of the alternatives would have little if any effect on activities not requiring a plan of operation. This type of summer use is generally considered a minimal threat to POC.

For operations requiring a plan of operation, Alternatives 1, 2, 3, and 6 would have a similar effect, potentially increasing costs by requiring PL-controlling management practices where indicated by the risk key (Alternatives 2, 3, and 6) or other analysis (Alternative 1). In some circumstances, all alternatives, particularly Alternative 4 and possibly 5, would lead the Agencies to require restoration efforts to include planting of resistant POC. The effects for Alternatives 3 and 6 would be similar to 1 and 2, since ultimate access to claims within POC

cores generally would not be prohibited.

Costs

Affected Environment

Introduction

Presently, Federal Agencies use a number of program activities to lessen the spread of PL. These efforts cost money that is ultimately borne by the Agencies, either directly or indirectly. Direct program costs are paid via Agency appropriated funds for such things as labor, vehicles, equipment, and facilities. Almost all of the POC program costs, in fact, are funded in this manner. The direct program activities include such costs as the design, sale, and administration of POC special forest products; the design, conduct, and administration of POC timber sale and service contract stipulations; program monitoring; resistance breeding; planting POC; and overall program management.

Direct costs related to mitigating adverse effects of spreading the pathogen, but within the context of larger, unplanned activities, such as wildland fire suppression costs of washing fire vehicles or treating water with Clorox bleach, are not captured in this analysis. On the Biscuit Fire of 2002, approximately $1.5 million was spent for vehicle washing, dust abatement, and treatment of firefighting water with Clorox bleach (see Chapter 3&4, Fire and Fuels, Wildland Fire Operations subsection).

Indirect program costs more integrally interwoven into general Federal land management practices have not been captured or analyzed. For example, best management practices to benefit POC management objectives, such as appropriate road drainage design, are components of specific projects that are not distinguishable as POC program costs. Since these indirect program costs are not easily quantifiable, they are not included here. They are a relatively small, but not necessarily insignificant, part of the total cost for these activities. Also not included are general overhead and support costs. The following discussion covers only identifiable direct POC program costs.

Existing Costs by Program Activity

POC program work-units and unit costs are grouped into the following eight basic program categories. In this analysis, reported Federal administrative unit costs were used to calculate Alternative 1 costs. The total direct program costs are estimated at $860,000 per year. This is the Alternative 1 cost displayed in Table 3&4-26 in the following Effects of the Alternatives section.

Program Costs: Under the current conditions of Alternative 1, labor costs for two full-time Agency program managers and District support personnel, for the BLM and USFS respectively, are the principle costs. Included in their expenses are vehicles, supplies, and travel costs. In addition, there are other employees designing and administering elements of the program with similar program costs. While the costs of FS pathologists providing regional consultation for POC issues are included in this element, it should be recognized that these positions would probably not be eliminated but rather the workload would shift for POC to

Table 3&4-26.—*Summary of average annual Port-Orford-cedar program costs for the first 10 years [$] by category and alternative*

	Alternative					
Category	1	2	3	4	5	6
Programmatic costs	348,000	348,000	348,000	0	0	348,000
Eradication	4,000	6,000	12,000	0	0	16,000
Roadside sanitation	51,000	41,000	102,000	0	0	153,000
Roads/trails	37,000	37,000	48,000	0	0	54,000
Washing	28,000	22,000	28,000	0	0	28,000
POC special forest products	5,000	5,000	5,000	0	0	5,000
Resistance breeding	381,000	381,000	381,000	475,000	92,000	381,000
Monitoring	6,000	6,000	8,000	2,000	1,000	8,000
Totals	860,000	846,000	932,000	477,000	93,000	993,000

[1] Estimated costs are rounded to the nearest $1,000. Expenditures are computed using present-day values and are gross costs. An annual compound rate of 2-6% increase should be anticipated for maintaining a given program funding level.

other disease projects. The total program costs for Fiscal Year 2002 are estimated at $348,000.

Eradication: In the last 7 years, only one eradication project has been completed, at a cost of $23,000. A follow-up treatment is estimated to cost $5,000. With the $28,000 spread over a 7-year period, the average annual cost is $4,000.

Roadside Sanitation: In a recent survey of all BLM and FS Oregon administrative units, sanitation costs were estimated to be $2,500 per mile for removal of unmerchantable POC on about 20 miles of roads per year. The total annual cost for roadside sanitation is approximately $51,000.

Roads/Trails: Current treatments include renovation or relocating existing roads, road closures, and moving trails. These costs are estimated at $37,000 per year.

Washing: Current costs of washing applied to timber sale contracts average approximately $2,700 per sale. Analysis for Alternative 1 assumed 1.5 timber sales per year for each of the four administrative units. Under service and construction contracts, there is an average of six contracts per year per administration unit, with an average estimated washing cost of $500 per contract. The existing washing cost is estimated at $28,000 per year.

Port-Orford-Cedar Special Forest Products: Under current management direction, only one administrative unit sells POC boughs. It costs that unit approximately $5,000 per year to manage these sales.

Resistance Breeding: BLM and the FS spent $333,000 in Fiscal Year 2001 on the resistance breeding program. As described in a 2002 interagency agreement between the BLM and FS, the costs for Fiscal Year 2003 are $369,000 for the resistance breeding program.

Monitoring: Present POC monitoring includes field measurement and evaluation of common garden study sites, operational project monitoring, semiannual technical review of POC research, and annual program reviews by each administrative unit. These costs are estimated at $6,000 per year. It should be noted that some of the above POC program treatments are often undertaken for other reasons. Roadside sanitation, for example, is partially accom-

plished as a by-product of routine roadside brushing.

Effects of the Alternatives

Alternatives 2 through 6 costs are predicted using Alternative 1 as a baseline and then adjusting each expected alternative costs based on the differences in the Standards and Guidelines for each alternative. A summary of this data is shown in Table 3&4-26 and discussed in detail as follows.

Program Costs: There would be no change in costs with the implementation of Alternatives 2, 3, or 6. These costs cease under Alternatives 4 and 5.

Eradication: It is assumed that under Alternative 2 eradication treatments would be tried more regularly than under current practices. With a 50 percent increase under this alternative, the cost would be $6,000 per year. Eradication treatments are predicted to triple under Alternative 3 and quadruple under Alternative 6, to three and four (respectively) eradication projects needed every 7 years under this alternative, because of aggressive action to eliminate new infestations in the POC core areas within the uninfested watersheds. The average annual costs under Alternative 3 would be $12,000, and $16,000 under Alternative 6. Alternatives 4 and 5 would not use eradication.

Roadside Sanitation: Use of the site-specific POC Risk Key under Alternatives 2, 3, and 6 permits better identification of areas not needing treatment in the North Coast Risk Region. There will probably be less roadside sanitation on the "checkerboard" lands of the BLM districts under Alternative 2, and about the same level as under Alternative 1 on the remainder of the range. It is projected that this would result in a 20 percent decrease in the road miles treated, and a projected cost of $41,000 per year. With Alternatives 3 and 6 there would still be a probable decrease in roadside sanitation on the "checkerboard" lands of the BLM Districts; however, this would be offset by the requirement for roadside sanitation in the POC buffers of the uninfested 6th field watersheds. It is estimated that the cost for Alternative 3 would be double Alternative 1, or $102,000 per year. For Alternative 6, because core acres are about 50 percent more than in Alternative 3 and the 7th field watersheds are spread more throughout the range, the cost is estimated at $153,000 per year. Alternatives 4 and 5 assume that no roadside sanitation would be done, so there are no costs.

Roads/Trails: The POC Risk Key described as part of Alternatives 2, 3, and 6 would indictate appropriate road and trail management actions. Cost-effectiveness criteria, as defined by the Purpose statement of this SEIS, may further direct proposed actions to not necessarily treat roads and trails themselves, but to mitigate their effects on POC. An example of this rationale could be to sanitize a given road system rather than surfacing it. Most of the road renovations, relocation of existing roads, road closures, and moving of trails has previously occurred on the Siskiyou NF and would continue at the level identified for Alternative 1. Alternatives 3 and 6 require additional road treatments to protect POC core areas. However, many of the POC core areas are in withdrawn land uses or administratively designated roadless areas, particularly in Alternative 3. There is a projected 30 percent increase in road relocation and closure cost under Alternative 3, and a 45 percent increase projected for Alternative 6, for at total cost of $48,000 and $54,000 per year respectively. Under Alternatives 4 and 5 road projects to specifically address POC considerations would not be done.

Washing: Similar to the discussion for roadside sanitation, the use of the site-specific POC Risk Key under Alternatives 2, 3, and 6 provides greater predictability about the level of vehicle washing that will take place. There will probably be less vehicle washing within the "checkerboard" lands of the BLM districts under Alternative 2, and about the same level as under Alternative 1 on the remainder of the range. It is projected that this would result in a 20 percent decrease in the amount of vehicle washing and a projected cost of $22,000 per year. With Alternatives 3 and 6 there would still be a probable decrease in vehicle washing within the checkerboard lands of the BLM districts, but this would be offset by the increase in washing in the POC buffers. It is estimated that this cost would be the same as Alternative 1, $28,000 per year. Washing for lessening the probability of long-range PL spread would continue for Alternatives 1, 2, 3, and 6. Alternatives 4 and 5 would terminate present washing expenditures.

Port-Orford-Cedar Special Forest Products: Alternatives 2, 3 and 6 would not change this expenditure, while Alternatives 4 and 5 would terminate special permit administration related to PL control, and related cost.

Resistance Breeding*:* Actual costs for Fiscal Years 2001 through 2002, and projected costs for Fiscal Years 2003 through 2006, as described in a 2002 BLM and FS interagency agreement is used as a basis to estimate the resistance breeding program costs. For the last 4 years of the 10-year analysis period, breeding costs are assumed to remain level at $350,000 per year. Included in these costs are breeding and monitoring costs. Also, increases or decreases of these costs for Alternative 4 or 5, respectively, were estimated by the FS Dorena Genetic Resource Center personnel. Associated field work, such as new field selections, would remain the same for Alternatives 1, 2, and 3, accelerate under Alternative 4, and not occur under Alternative 5. Although cost projections in this section are limited to 10 years, it should be noted that at current cost projections, the Alternatives 1, 2, 3, and 6 overall breeding program costs will ultimately total approximately $16 million dollars spent over the next 42 years, while the total estimated cost of Alternative 4 would be approximately $3 million dollars expended over the next 7 years. Breeding costs under Alternative 5 would generally be discontinued. Costs for maintaining breeding orchards at the appropriate alternative level would continue under all alternatives. Future sale of resistant seed to private industry could offset some of these costs.

Monitoring: Alternative 2 would leave these costs unchanged. Alternatives 3 and 6 would require one-third more administrative monitoring to maintain disease-free POC cores and buffers. The cost for Alternatives 3 and 6 monitoring would be $8,000 per year. Alternatives 4 and 5 eliminate many of the monitoring elements contained in Appendix 5, Monitoring. Alternative 4 would keep about one-third of the Alternative 1 monitoring costs to track genetic results and root disease spread, for a cost of $2,000 per year. Alternative 5 would retain about 15 percent of the Alternative 1 costs for tracking root disease spread, or about $1,000 per year.

Additional Costs for Port-Orford-Cedar Mitigation Measures During Fire Suppression. While the increase in Biscuit Fire suppression costs attributable to POC mitigation practices (estimated at $1.5 million) is indicative of a direct program cost applicable to Alternatives 1, 2, 3, and 6, it is very difficult to estimate this type of unplanned event on an annual cost basis. The Biscuit Fire burned about 500,000 acres and 29 percent of the Federal acres with POC in a single year. The Fire and Fuels section of the "Draft SEIS To Remove or Modify the

Survey and Manage Mitigation Measure Standards and Guidelines" (USDA-FS and USDI-BLM 2003c) predicted future wildland fires within the range of the northern spotted owl will encompass 113,000 acres annually. Although the POC range includes some of the most fire-prone portions of the owl range, the proportion of the 113,000 acres attributable to the POC range cannot exceed 15 to 20 percent. Such a relationship would suggest fire-related root disease mitigation costs might be range from about $30,000 to $40,000 per year. Basing such numbers on the Biscuit Fire, however, is not representative. As noted in the fire section, fires that are extinguished during initial attack have few costs attributable to POC mitigation. On the other hand, the Biscuit Fire was so large as to generate economies of scale; mid-size fires would experience a higher percentage of suppression costs going to POC mitigation. A reasonable prediction is tens of thousands of dollars per year applicable to Alternatives 1, 2, 3, and 6.

Costs May Vary by Year. While annual costs are projected over a 10-year horizon, individual category expenditures may vary over the period. Some category costs will be higher at the beginning of implementation, while becoming lower at the end of the 10-year period. Under Alternative 4, resistance breeding is a category where annual program costs would began at $333,000 in 2003, increasing to to $516,000 in 2007, and then settling to $433,000 in 2010. Other cost categories shown in Table 3&4-26 may vary from year-to-year also, but are anticipated to remain on a relatively even-flow over 10 years. While cost estimations were for a 10-year timeframe, it is not implied that POC program costs for any of the alternatives would stop at the end of the decade.

Environmental Justice

Affected Environment

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, February 11, 1994) requires that all Federal agencies

> . . . make achieving Environmental Justice part of [their] mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.

Potential effects on minority groups, low income, and subsistence populations are to be addressed. Potential effects on American Indians are covered in Chapter 3&4, Culturally Significant Products for American Indian Tribes section. Race, class, occupational classifications, and immigration policies influence people's environmental perceptions, encounters, and experiences (Taylor 2002).

Racial Background

Illustrating this point, many nontimber forest workers involved in the collection of POC forest products, as well as other special forest products, originally came from other countries, such as Canada, Mexico, Guatemala, Honduras, and El Salvador in the Americas; and Laos and Cambodia in Southeast Asia (Brown and Marin-Hernandez 2000). While personally

interested at many levels in natural resource management issues, many of these groups of people may also have linguistic, institutional, cultural, economic, or historic barriers to actively participating in public planning processes (Frewing-Runyon 1999).

Ten counties within the states of Oregon and California encompass the natural range of POC. Racial composition of the people that live within these counties is shown on Table 3&4-27.

Wages and Employment

While over 76 million new jobs were created in the last 30 years in the United States, the manufacturing sector of the economy that includes forest products has declined from nearly 22 percent of all jobs to less than 12 percent. Within the range of POC, county employment levels have reflected this trend—manufacturing sector jobs in Del Norte County, in northern California, for example, decreased from 25.1 percent in 1970, to 4.3 percent in 2000. While higher-paying manufacturing jobs became replaced by generally lower-paying services-related jobs, average annual earnings in these counties have declined (see Table 3&4-28). Compounding the effects of the lower personal incomes has been flat-to-rising unemployment rates. On a relative basis, every county unemployment rate is higher than both the State and national averages.

Table 3&4-27.—*Demographic statistics within the Oregon portion of the range of Port-Orford-cedar [2000 Census]*

County	White	Black or African American	American Indian/ Alaskan native	Asian	Native Hawaiin/other Pacific Islander	Some other race	Two or more races
Coos	57,740	194	1,515	568	107	664	1,991
Curry	19,634	32	452	147	24	234	614
Douglas	94,234	177	1,530	628	93	1,025	2.,712
Jackson	166,125	724	1,980	1,631	322	5,218	5,269
Josephine	71,103	202	949	476	83	883	2,030
Total	408,836	1,329	6,426	3,450	629	8,024	12,616
State total	2,961,623	55,662	45,211	101,350	7,976	144,832	104,745

Table 3&4-28.—*Average earnings and unemployment rate for the Oregon counties within the range of POC*

	Annual earnings [$]		Unemployment rate [%]	
County	1990	2000	1990	2000
Douglas	26,850	25,724	8.1	7.8
Coos	26,735	24,636	8.3	7.4
Curry	22,273	20,571	6.6	6.3
Josephine	23,453	23,421	7.1	6.9
Jackson	26,414	26,614	6.8	5.3
State average	29,203	32,493	5.9	4.9
National average	33,153	36,316	5.5	4.0

Source: Sonoran Institute/BLM Economic Profile System, 2003.

Effects of the Alternatives

This SEIS supplements EISs for the land and resource management plans of the three BLM districts and the Siskiyou NF, and the Environmental Justice discussion and consequences therein. These previous documents analyzed the effects of related management actions including human health, economic, and social effects.

The potential of the alternatives to affect American Indians was identified as an issue in this SEIS, and is addressed in the Culturally Significant Products for American Indian Tribes effects section earlier in this chapter. Tribal input was specifically sought during scoping and during analysis of effects of the alternatives.

There is high participation by minority and low-income populations in collecting special forest products. Permits for collecting boughs will be severely restricted in Alternatives 1, 2, 3, and 6 (similar to current direction). Permits, both commercial and personal use, for wild plants, mosses, bark, roots, mushrooms, firewood, and others could be reduced from current levels under Alternatives 2, 3 and 6 (as described in the Special Forest Products effects section in this chapter), depending in part upon the results of analysis under the POC Risk Key. Such permits would be reduced further under Alternatives 3 and 6 by restrictions in the POC core and buffers for uninfested watershed featured in these alternatives. However, under all three alternatives, it is expected that special forest products permits would be reduced by less than 5 percent from current levels. Conversely, Alternatives 4 and 5 will markedly increase special forest products harvest levels. These potential impacts to Environmental Justice are less than current levels under Alternatives 4 and 5, and slightly more than current under Alternatives 2, 3, and 6.

Alternative 3 would result in a PSQ reduction of 0.6 million board feet per year, or about seven full-time jobs directly in the logging and milling industry. Alternative 6 would result is a PSQ reduction of 0.9 million board feet per year, or about ten full-time jobs. As part of Alternative 4, direct employment will increase by the equivalent of approximately eight full-time jobs resulting from an expanded special forest products program. No other Environmental Justice effects are identified.

Civil Rights Impact Assessment

Introduction

The Civil Rights Impact Assessment examines whether the alternatives identified in the draft SEIS may result in an adverse or disparate effect to additional groups of people beyond those considered by the Environmental Justice section. In accordance with USDA Departmental Regulation Number 4300-4, these additional groups or classes include:

Race, Color, National Origin	Age
Disability	Gender
Marital, Familial, Parental Status	Religion
Sexual Orientation	Genetics
Political Beliefs	Income from Public Assistance

It is assumed that these populations of people will continue to use or enjoy Federal forest lands for diverse purposes (such as recreation, hunting, and employment) and may be interested in, or potentially affected by, the proposed alternative.

Because this proposed alternative will result in a notice to be published in the *Federal Register*, this Civil Rights Impact Analysis has been prepared in accordance with Interim Use Departmental Directive (DR) 4300-4, Section 9.a.(1).

Demographic Information

Consistent with Council on Environmental Quality guidelines for determining affected environment for Environmental Justice (Council on Environmental Quality, Environmental Justice Guidance under the National Environmental Policy Act, December 10, 1997, section III.C.3), three maps were examined (see file copy of draft assessment) that describe specific racial groups (African American, Asian Pacific Islander, and Hispanic) living within the area of both the natural range of POC and the ten counties covered by the range of POC, five in Oregon and five in California. A fourth map was also examined, identifying population levels of people with disabilities (mobility disability for ages 16 to 64). Information on the other groups is either not available or too generalized to be useful for evaluation.

Analysis of the maps shows that the identified ethnic and disabled populations are present or in areas adjacent to the natural range of POC, but do not live evenly throughout this area. People with disabilities, for example, are generally congregated along the Interstate 5 highway corridor. The analysis area covers both metropolitan areas with diverse populations and economies, and rural areas with lower population densities in general, and lower population levels of minorities and disabled persons specifically.

Alternatives Considered

Alternative 1

This alternative would maintain the existing language in the Coos Bay, Roseburg, and Medford BLM District RMP/EISs and the Siskiyou NF EIS that described the range of social impacts of the existing program direction. No additional civil rights impacts are expected to accrue from maintaining the existing direction.

Alternatives 2, 3, and 6

Hispanic and some Asian populations tend to be disproportionately involved with the collection of special forest products from Federal lands within the natural range of POC. No reduction in collection of POC boughs is anticipated under these alternatives, but a slight decrease of less than 5 percent of other special forest products is predicted, and therefore, a slight adverse economic impact on these groups of people is anticipated. No mitigations for this effect have been identified.

Alternative 4 and 5

The analysis shows no additional adverse effects beyond Alternative 1, in terms of adverse civil rights impacts, are expected from implementing any of these three alternatives. Benefi-

cial effects can be expected for groups involved with bough collecting, as levels of special forest products permitting dramatically increase.

Conclusion and Findings

This document has identified the demographic composition of the affected area; the types of potential impacts, if any, resulting from the alternatives; current information from scoping; and potential adverse or disparate impacts as they relate to groups of people identified in civil rights legislation.

Other than some slight potentially adverse economic effects to Hispanic and Asian populations as described above, no other adverse or disparate effects to the additional groups or classes of people are expected. The proposed action detailed in the draft SEIS is anticipated to comply fully with all applicable civil rights statutes, including Title VI of the "Civil Rights Act" of 1964.

Critical Elements of the Human Environment

Table 3&4-29 addresses the critical elements of the human environment.

Other Environmental Consequences

When considering the overall environmental impacts of this proposal, it is important to remember that this SEIS supplements the Siskiyou land and resource management plan EIS that has been amended by the Northwest Forest Plan SEIS (USDA-FS and USDI-BLM 1994a) and the Survey and Manage SEIS (USDA-FS and USDI-BLM 2000). This SEIS also supplements the EIS for the land management plans for the Coos Bay, Medford, and Roseburg BLM Districts which themselves incorporated the Northwest Forest Plan SEIS (USDA-FS and USDI-BLM 1994a) and were subsequently amended by the Survey and Manage SEIS (USDA-FS and USDI-BLM 2000). The Northwest Forest Plan final SEIS addressed issues and environmental impacts dealing with the full range of multiple-uses on Federal lands and led to sweeping decisions regarding timber management and resource conservation. The Survey and Manage Final SEIS was narrowly focused on issues concerning implementation of the Survey and Manage Standards and Guidelines. This SEIS is narrowly focused on the management practices and mitigation measures for the management of POC and its root disease. This SEIS only addresses management of POC and does not change the fundamental decisions or substantially change environmental impacts disclosed in the previous impact statements.

The Council on Environmental Quality regulations require that the discussion of environmental consequences include

> . . . any adverse environmental effects which cannot be avoided should the proposal be implemented, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented (40 CFR 1502.16).

Table 3&4-29.—*Critical elements of the human environment*

Air Quality	Air Quality is addressed in the Air Quality section.
American Indian Religious Concerns	American Indian religious concerns are addressed in the Culturally Significant Products for American Indian Tribes section.
Areas of Critical Environmental Concern [ACECs]	Areas of critical environmental concern are addressed in the Areas of Critical Environmental Concern and Research Natural Areas section.
Cultural Resources	There are no site-specific actions authorized by this programmatic SEIS. No artifacts will be disturbed as a direct result of any of the alternatives.
Energy	Executive Order 13212 provides that agencies shall expedite review and take action to expedite projects that will increase the production, transmission, or conservation of energy. BLM Instruction Memorandum OR-2002-081 requires NEPA documents to contain information from which the Agency can later complete a Statement of Adverse Energy Impacts. Alternatives 1, 2, 3, and 6 contain requirements that could increase the construction and maintenance costs for access and development of energy sources, if any are discovered, as well as for transmission wires or pipes, buried or not. A recent example is the Winston to Coos Bay natural gas pipeline, for which the EIS notes PL-reducing mitigation measures will be required when in the proximity of POC stands. Conceivably a project may have to be rerouted.
Environmental Justice	Environmental Justice is addressed in the Environmental Justice and Civil Rights Impact Analysis section.
Prime Farmlands or Unique Land Characteristics	Prime farmlands and other unique Federal land characteristics are required to be identified and restored as part of the "Surface Mining and Reclamation Act" of 1977. Any surface coal mining operations within the natural range of POC on the Coos Bay, Medford, and Roseburg BLM Districts, and the Siskiyou NF will utilize the appropriate standards and guidelines to maintain POC and meet the requirements of the Act.
Floodplains	Executive Order 11988, as amended, requires agencies to determine if a proposed action will occur in a floodplain and if the action will significantly affect the quality of the human environment. The objective of the law is to avoid adverse impacts associated with occupancy and modification of floodplains and to avoid floodplain development. The alternatives themselves do not authorize any actions, only mitigation measures to control POC root disease. These measures do affect floodplains in ways that significantly affect the quality of the human environment. The potential effect of the alternatives on water flows that could affect floodplains is addressed in detail in the Water and Fisheries section.
Invasive Species	Executive Order 13112 requires the prevention of introduction of invasive species and to provide for their control and to minimize their economic, ecological, and human health impacts. PL is considered an invasive species and two of the purposes of this SEIS are to reduce its introduction and to slow its spread.
Invasive and Nonnative Species	The "Lacey Act" of 1981, as amended, makes it unlawful to import, export, sell, acquire, or purchase fish, wildlife, or plants. None of the alternatives propose such activities.
Noxious Weeds	The "Federal Noxious Weed Act" of 1974, as amended, requires carrying out operations or measures to eradicate, suppress, control, or prevent or retard the spread of any noxious weed. The Botany section and biological evaluations [Appendix 7] describe such actions.
Threatened or Endangered Species	Threatened, endangered, and Agency sensitive species wildlife and botanical species are addressed in the draft biological evaluations [Appendix 7]. Two listed fish, the southern Oregon/northern California Coho and the Oregon Coast coho, are addressed in the Water and Fisheries section.
Wastes, Hazardous or Solid	The "Resource Conservation and Recovery Act" of 1976 and the "Comprehensive Environmental Response, Compensation, and Liability Act" of 1980 are laws that regulate hazardous waste that endangers public health or the environment. The alternatives themselves do not authorize any actions, only mitigation measures to control POC root disease. The only potentially hazardous material proposed for use by this SEIS is Clorox. The use and hazard of Clorox are addressed in the Clorox section. Containers will be disposed of in approved dumps.
Water Quality, Drinking or Ground	The Water and Fisheries section address water quality and conformance with state water quality standards.
Wetlands/Riparian Zones	Executive Order 11990 requires Federal agencies to avoid destruction or modifications of wetlands and to avoid undertaking or providing assistance for new construction located in wetlands. The alternatives themselves do not authorize any actions, only mitigation measures to control POC root disease. These measures do not destroy, modify, or undertake/assist new construction located in wetlands. The alternatives address various ways to mitigate root disease in POC, which is often a component of wetlands. The alternatives could variously benefit wetlands.
Wild and Scenic Rivers	Wild and scenic rivers are discussed in the Recreation section.
Wilderness	Wilderness and wilderness study areas are discussed in the Recreation section.

Adverse Environmental Effects Which Cannot Be Avoided

An agency does not have to avoid adverse effects, but must identify and disclose any adverse environmental, social, and economic effects in the impact statement. This SEIS attempts to describe all identifiable adverse effects caused by the alternatives herein. Adverse effects which cannot be avoided include the continued spread of POC root disease at some level. Because the introduced disease is virulent and is spread by vectors such as elk and water, no mitigation could be proposed that could completely stop the POC mortality. At least some of the alternatives seek to mitigate that mortality through an active resistance breeding program.

Relationship Between Short-Term Uses of the Human Environment and Maintenance of Long-Term Productivity

The Agencies' land and resource management plans, as amended by the Northwest Forest Plan, committed NF System- and BLM-administered lands to multiple-use, including commercial timber commodity production. The environmental analyses supporting those plans determined that the loss in long-term productivity of forest soils and other components necessary for a healthy forest environment would be minimal. The alternatives explored in this SEIS are projected to have little relative additional effect on soil productivity. Slight effects are discussed in the Ultramafic Soils and the Water and Fisheries sections.

Irreversible or Irretrievable Impacts

Irreversible refers to a loss of nonrenewable resources, such as mineral extraction, heritage (cultural) resources, or to those factors which are renewable over long time-spans, such as soil productivity. Irretrievable commitment applies to losses that are temporary, such as loss of forage production in an area being used as a ski run or use of renewable natural resources.

Since POC will clearly not be extirpated from any significant portion of its range, nor is it likely to lose any significant genetic variability, there will be no irreversible or irretrievable impacts.

Conflicts with Other Plans

The CEQ regulations (40 CFR 1502.16) require a discussion of

> . . . possible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian Tribe) land use plans, policies and controls for the area concerned.

This SEIS incorporates by reference the discussions in the underlying land and resource management plans as amended, and nothing in this SEIS would alter the conclusions in those plans regarding the possible conflicts with other plans.

The management direction in this SEIS applies only to federally-managed lands where state and local land use plans, policies, and controls have little application. Similarly, the alternatives in this SEIS do not apply to Tribal and Indian-owned lands, with one exception. The Coquille Indian Tribe currently manages approximately 5,400 acres of forest lands (Coquille Forest) under the same Standards and Guidelines as the adjacent Federal land management

agency (Coos Bay BLM District).

Western states have raised concerns about the occurrence of catastrophic wildland fires in recent years, which led to formation of the National Fire Plan, a national multi-agency policy designed to prevent catastrophic wildland fires through broad-scale fuel treatment and improved suppression efforts. The National Fire Plan proposes aggressive hazardous fuels abatement activities around communities and at-risk landscapes. The 2002 fire season was particularly problematic within the range of POC. Some of the harvest prohibitions in Alternatives 3 and 6 could directly affect the Agencies' ability to meet their hazardous fuels treatment commitments around communities in the wildland/urban interface. The other alternatives do not have such restrictions.

Chapter 5 — Preparers, References, Glossary, Distribution List, and Index

Changes Between Draft and Final

The following changes were made to Chapter 5 between the draft and final SEIS. Minor corrections, explanations, and edits are not included in this list.

Changes/edits were made to:

- Add additional words to the Glossary; and
- add a final SEIS distribution list.

Preparers

Port-Orford-Cedar-SEIS Core Team

Frank Betlejewski: *FS Port-Orford-Cedar Program Manager.* B.S., Natural Resource Management, Rutgers University; graduate of the Silviculture Institute. Frank has 24 years of Federal service; most of his career has been as a forester and silviculturist with the BLM in Medford, Oregon. He has also served as Medford District Pacific Yew Specialist, as forest ecologist and silviculturist on the Fungi Taxa Team, and as the Applegate Adaptive Management Area Coordinator. Frank is the author of the "BLM Port-Orford-Cedar Management Guidelines" and has provided technical guidance for managing POC since 1990.

Kirk Casavan: *BLM Port-Orford-Cedar Program Manager.* B.S., Forestry, University of Montana. Kirk has 5 years experience with the FS and 23 years with the BLM. His work includes helitack forman, technical writer, forestry technician, professional forester, environmental protection specialist, and natural resource specialist. He has worked in timber sale contract administration, forest genetics, silviculture, engineering, and forest planning. Kirk has served in his present capacity as BLM's Port-Orford-Cedar Program Manager for the last 8 years.

Jeffrey K. Davis: *Forester.* B.S., Forest Management, University of California, Berkeley; attended Silviculture Institute. Jeff has expertise in environmental assessments, timber management, silviculture, fire rehabilitation, and employee development; and has assisted numerous teams implementing the Northwest Forest Plan since 1994. He has 25 years experience with the BLM in southwestern Oregon and has worked on three NFs Forests in California. Jeff is currently the Lead Silviculturist for the Coos Bay BLM District.

Ken Denton: *Team Leader.* B.S., Natural Resources, Humboldt State University. Ken served on the interdisciplinary teams for the Northwest Forest Plan SEIS (1994), the FS EIS for the northern spotted owl (1992), the Survey and Manage SEIS (2000), and the Survey and Manage SEIS (2003). As Regional Silviculturist for the FS in Region 6 and member of the

Regional Ecosystem Office Late-Successional Reserve Work Group, he has helped implement the Northwest Forest Plan since 1994. He has 33 years experience with the FS and has worked in silviculture and planning on five NFs in California, Idaho, and Oregon; and served for 5 years as District Ranger at Mono Lake.

Maple Taylor: *Writer/Editor.* B.S., Wildlife Science, New Mexico State University; M.S., Range and Wildlife Management, Texas Tech University. Maple's experience includes state and Federal range and wildlife research, and technical and popular writing/editing for publication. He served as writer/editor for two BLM resource management plans, a river management plan, and other NEPA plans. Maple is currently a writer/editor for the Oregon/Washington BLM State Office, Division of Resource Planning, Use, and Protection.

Technical Specialists

Pete Angwin: *Plant Pathologist.* B.A., Biology, Colgate University; M.S. and Ph.D., Botany and Plant Pathology, Oregon State University. Pete worked for 10 years as plant pathologist for the Gunnison Service Center, Rocky Mountain Region, USDA-FS; and for the past 5 years as plant pathologist for the Northern California Shared Service Area Office, Pacific Southwest Region, USDA-FS. As plant pathologist for the four NFs of northwest California, Pete provides information and advice on a wide variety of disease and insect management situations. Root diseases and exotic forest pathogens have been of special interest throughout his career, and he first worked with Port-Orford-cedar root disease in 1987.

Jim Berge: *Special Forest Products Forester.* B.S., Forest Management, Utah State University. Jim has experience in fuels management, fire, and timber programs on three NFs in Idaho and Oregon. He has worked in the Medford BLM District since 1988.

Richard D. Boothe: *Forester.* B.S., Forest Management, University of California, Berkeley. Richard worked for the FS for 28 years on the Six Rivers, Klamath, and Siskiyou NFs. He has experience in fire and fuels management, vegetation, and timber management, and is a certified silviculturist in Region 6. Richard is currently the Fire Management Officer for the Two Rivers Fire Zone, Siskiyou NF.

Dan Carpenter: *Hydrologist.* B.S., Soils, Washington State University. Dan has experience in fire and fuels management, vegetation, and timber management. He has worked as a professional hydrologist, with expertise in watershed planning and watershed restoration, for the past 24 years with the FS and BLM on the Oregon Coast, Western Cascades, and the Great Basin in Nevada.

Tom DeMeo: *Pacific Northwest Regional Ecologist.* B.S., Forest Science, Penn State University; M.S., Forest Science, Oregon State University; Ph.D., Forest Resources Science (wildlife emphasis), West Virginia University. Tom has 15 years experience with the FS in ecology and wildlife biology; including work in ecological classification, inventory, and mapping; landscape analysis; monitoring; rare species management; and data analysis and management.

Jay Flora: *Geographic Information Systems*. B.S., Natural Resources, Colorado State University. Jay has worked for the FS and BLM over the past 20 years in Oregon, Colorado,

and Wyoming. His experience includes working as a Forester in silviculture and sale layout, and wildfire suppression assignments. For the past 7 years, Jay has been the Myrtlewood Field Office GIS Coordinator on the Coos Bay BLM District and also serves as the Coos Bay District's GPS Coordinator.

Chris Foster: *Wildlife Biologist.* B.S., Forest and Wildlife Management, University of Maine; M.S., Wildlife Management, West Virginia University. Chris has 15 years experience working with the FS and BLM in the Pacific Northwest. He has held positions as a Forester, specializing in watershed analysis, and as a resource area Wildlife Biologist where he worked on many forest and wildlife management activities. Chris is currently the District Wildlife Biologist for the Roseburg BLM District.

Don Goheen: *Plant Pathologist.* B.S., Forestry and Ph.D., Plant Pathology, University of California, Berkeley. Don worked for 18 years as plant pathologist and insect and disease training specialist, Pacific Northwest Region, USDA-FS; and has served as entomologist/ plant pathologist with the Southwest Oregon Forest Insect and Disease Service Center for the last 9 years. Exotic forest insects and pathogens have been of special interest to Don throughout his career, and he has worked with Port-Orford-cedar root disease since 1976. Don is an active member of the International Union of Forest Research Organizations Working Party on *Phytophthora* in Forest and Wildland Ecosystems.

Joseph Graham: *Forester.* B.S., Forest Management, Purdue University; M.S., Forest Mensuration and Biometrics, Oregon State University. Joseph has worked for the BLM in western Oregon since 1985 in a variety of positions on the Roseburg and Medford BLM Districts. He also worked as a forester for the Medford Corporation, performing duties which included forest management, inventory, and cooperative research with Oregon State University. He also worked 3 years for the USDA-FS Pacific Northwest Experiment Station, coordinating field operations and analyzing and interpreting examinations of forest regeneration in southwestern Oregon. Joe is currently the inventory coordinator for the Roseburg District BLM.

Jim Hamlin: *Area Geneticist.* B.S., Forest Management, Humboldt State University; M.S. and Ph.D., Forest Genetics, Oregon State University. Jim has worked in southwestern Oregon as a FS Area Geneticist in the field of forest genetics since 1979. Jim also worked as a Forester for private industry in California for about 7 years.

Richard C. Hanes: *BLM Oregon/Washington Cultural Program Leader.* Ph.D., Anthropology, University of Oregon. Richard was the first cultural resource specialist in the BLM Roseburg District Office.

Mark E. Hocken: *Range Management Specialist.* B.S., Environmental Resources - Range Ecology, Wildlife Habitat, & Watershed, Arizona State University. Mark worked for the FS for 6 years on the Safford, Douglas, Sierra Vista, and Nogales Ranger Districts and supervisor's office on the Coronado NF, and 6 months on the Pine Valley Ranger District for the Dixie NF. He has experience in range mangement, vegetation,and fire; and is a certified Range Management Specialist with the Society for Range Mangement. Mark is the Zone Range Management Specialist for the Rogue River/Siskiyou NF.

Thomas Jimerson: *Province Ecologist.* B.S., Wildlife and Fisheries Management, West Virginia University; M.S., Natural Resources (Forestry emphasis), Humboldt State University; Ph.D., Wildland Resource Science, University of California, Berkeley. Tom worked for 8 years as a Botanist for the U.S. Fish and Wildlife Service and FS. Since 1984 he has been an Ecologist for the FS.

John Kliejunas: *Regional Forest Pathologist, Pacific Southwest Region.* M.S., Forestry, University of Minnesota; Ph.D., Plant Pathology, University of Wisconsin, Madison. John has 7 years of experience with *Phytophthora* in Hawaii forest ecosystems, authoring numerous publications on *P. cinnamomi* and native forest decline. He has been on the Forest Health Protection staff in Region 5 since 1979 and has served as acting Forest Health Protection Program Leader. He is one of the original members of the interregional Port-Orford-cedar coordinating group, and has worked with *Phytophthora lateralis* for the last 23 years. John is a member of the American Phytopathological Society and the USDA-FS Wood Import Pest Risk Assessment Team.

Jim Leffmann: *District Recreation Lead.* B.S., Law Enforcement, Southern Oregon State College; M.A., Outdoor Recreation Planning, Oregon State University. In his 26-year career, Jim has worked for the City of Portland, FS, and BLM. He currently works for the Medford BLM District.

John Petrick: *Silviculturist.* B.S., Biology, University of Wisconsin-Eau Claire; M.S., Forestry, Michigan State University. John currently works for the Dorena Genetic Resource Center he is responsible for nursery and seed orchard pest management. He serves as a part of the Region 6 forest insect and disease management training cadre, and as the pesticide use coordinator for the Umpqua NF. John has 23 years of experience with the FS, the last 20 years as a certified Silviculturist.

Jon Raybourn: *Fisheries Biologist.* B.S., Wildlife Management, M.S., Environmental Systems, Humboldt State University. Jon is currently the Fisheries Program Lead for the Grants Pass Resource Area of the Medford BLM District. He has 9 years of fisheries and wetland experience with the BLM in Medford and county government in Washington. He currently works as the fisheries specialist on EAs and EISs for restoration and landscape management projects. Jon's experience with cedar root disease management includes the use of POC to rehabilitate anadromous fish habitat in a mining reclamation project.

Richard A. Sniezko: *Forest Geneticist.* B.S., Forest Science, Humboldt State University; Ph.D., Forest Genetics, North Carolina State University. Richard's work experience includes 3 years as tree breeder/forest geneticist for the Zimbabwe Forest Research Centre, 3 years with the Forest Science Department at Oregon State University working in conjunction with the genetics team at the FS Pacific Northwest Research Station, and 13 years with the USDA-FS as center geneticist at Dorena Genetic Resource Center. Some of the main projects at Dorena have included leading the development of populations of sugar pine and western white pine with resistance to white pine blister rust, and developing populations of Port-Orford-cedar resistant to *Phytophthora lateralis*. Richard has served as chair of the Western Forest Genetics Association, has authored numerous publications dealing with genetic variation and disease resistance, reviewed research grant proposals, conducted technical reviews of articles for journals such as "Theoretical Applied Genetics," "Canadian Journal of Plant Pathology," and "Canadian Journal of Forest Research," and is lead editor on the

forthcoming proceedings from the IUFRO 2001 conference on Breeding and Genetic Resources of Five-Needle Pines: Growth, Adaptability, and Pest Resistance.

Rod Stevens: *District Geneticist.* B.S., Forest Management, Washington State University; Ph.D., Forest Genetics, Oregon State University. Rod worked for 6 years as research geneticist/silviculturist for MacMillan Bloedel Ltd., Nanaimo B.C., Canada, and has worked as District Geneticist at Roseburg BLM since 1978. His BLM work in Roseburg involved operational Douglas-fir tree improvement program development and on sugar pine blister rust resistance. Since enactment of the Northwest Forest Plan, he has concentrated efforts on forest health issues, including root rot resistance of Port-Orford-cedar. In 1968, Rod founded Humbug Tree Farms, a cottage business which began with Christmas tree management and has evolved into hazard tree removal and custom sawmilling.

Maria Ulloa: *Forest Botanist*. B.S., Agronomy, Washington State University. Maria did post-graduate work in Botany at California State University, Chico; and since 1985, has worked on the Clearwater, Mendocino, and Shasta-Trinity NFs. Maria currently works on the Siskiyou NF.

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Technical Consultant

Phil Hall: *BLM Planning/NEPA Specialist.* B.S., Forestry and B.S., Conservation, North Carolina State University. Phil served on the interdisciplinary team for the Northwest Forest Plan SEIS (1994) and was a lead planner in developing the western Oregon resource management plans tiered to the Northwest Forest Plan. He has served on regional teams for the development of watershed analysis guides and monitoring and research. He has provided national-level training for NEPA and resource management planning. With 30 years of Federal service, including work on two BLM Districts and several resource areas, Phil has a broad understanding and familiarity of BLM programs and plans, including the Northwest Forest Plan and EISs. Phil has served on special assignments to the Washington Office and to other BLM Districts in the western United States.

Administrative and Technical Support

Jerry Hubbard: *Logistics Coordinator.* B.S.F. (Forest Sciences), University of Washington; M.S., Forestry (Silviculture), Pennsylvania State University. Jerry has worked as a Forester in the Roseburg BLM District; Soils/Watershed Specialist in the Medford District; Public Affairs Specialist in the Vale District; and Management Analyst in the Oregon/Washington State Office. As part of a management development curriculum, he also produced a regional economic analysis of western Oregon's timber and recreation economies.

Dick Prather: *Survey and Manage SEIS Team Leader.* B.S., Forestry, Northern Arizona University. Dick was the team leader for the Final SEIS for Survey and Manage in 2001. A 31-year veteran of the BLM, he was Field Manager in the Salem District for the last 18 years. Dick worked previously in Coeur d'Alene, Idaho, and Coos Bay, Oregon.

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References

Ainsworth, G.C. 1971. Ainsworth and Bisby's Dictionary of the Fungi. Commonwealth Mycological Institute, Kew, Surrey. 663 p.

Alexander, E. B; Adamson, C.; Graham, R.C.; Zinke, P.J. 1990. Mineralogy and Classification of Soils on Serpentinized Peridotite of the Trinity Opiolite, California. Soil Science 149:138–143.

Anonymous. 1994. Port-Orford-Cedar and the Convention on International Trade in Endangered Species, Appendix II report. 26 p. [And] cover letter to Chief, USDA-FS from J.E. Lowe, Region 6 Regional Forester, R.E. Stewart, Region 5 Regional Forester, and C.W. Philpot, Pacific Northwest Station Director, March 3. 2 p.

Anonymous. 2002. The State of Our Knowledge on Sudden Oak Death. Sudden Oak Death Science Symposium, Monterey, CA, December 17–18, 2002.

Atzet, T.; White, D.E.; McCrimmon, L.A.; [and others] 1996. Field Guide to the Forested Plant Associations of Southwest Oregon. R6-NR-ECOL-TP-17-96, USDA-FS, Pacific Northwest Region, Portland, OR. 353 p.

Azuma, D.L.; Bednar, L.F.; Histerote, B.A.; [and others]. 2002. Timber Resource Statistics for Western Oregon, 1997. Resource Bulletin PNW-RB-237, USDA-FS Pacific Northwest Research Station.

Bartnicki-Garcia; Tsao, P.H., *eds*. *Phytophthora*: Its Biology, Taxonomy, Ecology, and Pathology. American Phytopathological Society, St. Paul, Minnesota. p. 95–107.

Beakes, G.W. 1987. Oomycete Phylogeny: Ultrastructural Perspectives. *In:* Rayner, A.D.M.; Braiser, C.M.; Moore, D.; *eds:* Evolutionary Biology of the Fungi. Cambridge University Press. p. 405–421.

Beckham, S. 1971. Requiem for a People: The Rogue Indians and the Frontiersmen. University of Oklahoma Press, Norman.

Beschta, R. L.; Frissell, C. A.; Gresswell, R.; [and others]. 1995. Wildfire and Salvage Logging, Recommendations for Ecologically Sound Post-Fire Salvage Management and Other Post-Fire Treatments. Oregon State University, Corvallis, OR.

Beschta, R.L.; Bilby, R.; Brown, G.; [and others]. 1987. Stream Temperature and Aquatic Habitat: Fisheries and Forestry Interactions. *In:* Salo, E.O.; Cundy, T.W.; *eds.;* Streamside Management, Forestry and Fishery Interactions. Contribution No. 57:191–232, Institute of Forest Resources, University of Washington, Seattle.

Betlejewski, F. 1994. Port-Orford-Cedar Management Guidelines. USDI-BLM. 32 p.

Betlejewski, F. 2003. Unpublished data. Interregional Port-Orford-Cedar Program Manager, USDA-FS, Central Point, Oregon.

Betlejewski, F. 2003. Personal communication. Interregional Port-Orford-cedar Program Manager, USDA-FS, Central Point, Oregon, Oct. 6, 2003

Bjornn, T.C.; Reiser, D.W. 1991. Habitat Requirements of Salmonids in Streams. *In:* Meehan, W.R., *ed.* 1991. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Publication 19, Bethesda, MD.

Bower, A.D.; Casavan, K.; Frank, C.; Goheen, D.; [and others]. 2000. Screening Port-Orford-Cedar for Resistance to *Phytophthora lateralis*: Results from 7,000+ Trees Using a Branch Lesion Test. *In* Hansen and Sutton, *eds:* Proceedings From the First International Meeting on *Phytophthoras* in Forest and Wildland Ecosystems. IUFRO Working Party 7.02.09, Forest Research Laboratory, Oregon State University. p. 99–100.

Boyd, M. 1996. Heat Source: Stream Temperature Prediction. M.S. Thesis. Departments of Civil and Bioresource Engineering, Oregon State University, Corvallis, OR.

Brattain, D.; Stuntzer, R.E. 1994. Port-Orford-Cedar Alliance: Response to ONRC's Proposal to List Port-Orford-Cedar.

Brian, N. 2003. *Personal communication.* District Botanist, USDI-BLM Coos Bay District, Coos Bay, OR.

Brooks, A.S.; Seegert, G.L. 1977. Effects of Intermittent Chlorination on Rainbow Trout and Yellow Perch. American Fisheries Society Transactions 106(3). 278 p.

Brown, B.A.; Marin-Hernandez; *eds.* 2000. Voices from the Woods. Jefferson Center for Education and Research, 51 p.

Brown, G.W. 1969. Predicting Temperatures of Small Streams. Water Resources Research 5(1):68–75.

Burns, R.M.; Honkala, B.H., *tech. coords*. 1990. Silvics of North America. USDA-FS Agriculture Handbook 654. 877 p.

Burroughs, E. R. Jr.; Thomas, B.R. 1977. Declining Root Strength in Douglas-fir After Felling as a Factor in Slope Stability. USDA-FS, Intermountain Forest and Range Experiment Station Research Paper INT: 90.

Burt, R.; Fillmore, M.; Wilson, M.W.; Gross, E.R.; Langridge, R.W.; Lammers, D.A. 2001. Soil Properties of Selected Pedons on Ultramafic Rocks in Klamath Mountains, Oregon. Communications in Soil Science and Plant Analysis 32(13, 14):2145–2175.

California Employment Development. 1999. Monthly Labor Force Data for Counties, December 1998 (preliminary); 1997 Benchmark.

Carlile, M.J. 1983. Motility, Taxis, and Tropism in *Phytophthora*. *In:* Erwin; Bartnicki Garcia, S.; Tsao, P.H.; *eds*. *Phytophthora*: Its Biology, Taxonomy, Ecology, and Pathology. American Phytopathological Society Press. p. 95–107.

Cavalier-Smith, T. 1986. The Kingdom Chromista: Origin and Systematics. *In:* Round, I.; Chapman, D.J.; *eds*. Progress in Phycological Research (4). Biopress, Bristol, England. 481 p.

Chappell, C.B.; Crawford, R.C.; Barrett, C.; [and others]. 2001. Wildlife Habitats: Descriptions, Status, Trends, and System Dynamics. *In:* Johnson, D.H.; O'Neal, T.A. 2002. Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis.

Cooper, L.J. 1939. A History of the Siskiyou National Forest. USDA-FS, Siskiyou NF, Grants Pass, OR.

Cooray, L.J.M. 1985. Chapter 11: Risk Avoidance, Freedom of Choice or Government Coercion. *In:* Human Rights in Australia, ACFR Educational Publications, Sydney, Australia.

Council on Environmental Quality. 1997. Environmental Justice — Guidance Under the National Environmental Policy Act. 34 p.

Daniel, T.W.; Helms, J.A.; and Baker, F.S. 1979. Principals of Silviculture. McGraw-Hill Publishing Company. 500 p.

DeBano, L.F; Neary, D.G.; Folliott, P.F. 1998. Fire's Effects on Ecosystems. [*Chapter 4; p. 79–81*] Wiley & Sons, Toronto, Canada.

DeMeo, T. 2003. *Personal communication(s)*. Regional Ecologist, USDA-FS Region 6, Portland, OR.

DeNitto, G.; Kliejunas; J.T. 1991. First Report of *Phytophthora lateralis* on Pacific yew. (Abstract) Plant Disease 75:968.

Dick, M.W. 1982. Oomycetes. *In:* Parker, I.S.P., *ed.* Synopsis and Classification of Living Organisms. McGraw-Hill Book Company, New York, NY. p. 179–180.

Dick, M.W. 1995. Sexual Reproduction in the Peronosporales (*Chromistan* fungi). Canadian Journal of Botany 73:5712–5724.

Dillingham, C. 2003. *Personal communication.* Ecologist, Vegetation Management Solutions, USDA-FS Enterprise Team.

Edwards, S.W. 1983. Cenozoic History of Alaskan and Port-Orford-(*Chamaecyparis*) Cedars. Ph.D. Dissertation. University of California, Berkeley. 271 p.

Edwards, S.W. 1985. The Remarkable Range of Port-Orford-Cedar. Four Seasons 7(3):4–15.

Elliott, L.J.; Sniezko, R.A. 2000. Cone and Seed Production in a Port-Orford-Cedar Containerized Orchard. *In:* Hansen and Sutton, *eds.*, Proceedings From the First International Meeting on *Phytophthoras* in Forest and Wildland Ecosystems. IUFRO Working Party 7.02.09. Forest Research Laboratory, Oregon State University. p. 105–106.

Epstein, E. 1972. Mineral Nutrition of Plants: Principles and Perspectives. John Wiley and Sons, New York. 412 p.

Erwin, D.C.; Ribeiro, O.K. 1996. *Phytophthora* Diseases Worldwide. American Phytopathological Society, Saint Paul, MN. 562 p.

Falconer, D.S. 1989. Introduction to Quantitative Genetics. Third edition. John Wiley & Sons, New York, NY.

Filip, G.M.; Kanaskie, A.; Campbell, A. III. 1995. Forest Disease Ecology and Management in Oregon. Oregon State University Extension Service. 60 p.

Fogg, J. 2003. *Personnel Communication.* Surface Water Modeling Specialist-Hydrologist, USDI-BLM, National Science Technical Center, Branch of Science Applications, ST-132.

Foster, C. 2003. *Personnel Communication.* District Wildlife Biologist, USDI-BLM Roseburg District, Roseburg, OR.

Frankham, R.; Ballou, J.D.; Briscoe, D.A. 2002. Introduction to Conservation Genetics. Cambridge University Press, New York, NY. p.19; 309.

Franklin, J.F.; Dryness, C.T. 1973. Natural Vegetation of Oregon and Washington. USDA-FS PNW-GTR-8, Portland, OR.

Frewing-Runyon, L. 1999. Environmental Justice Screening in NEPA Analysis for Oregon, Washington, and Northern California. USDI-BLM, Portland, OR. 17 p.

Frost, E. 2002. Serpentine Fen Conservation Project, Summary of Phase III: Field Surveys for New Fens and Rare Plant Populations on the Siskiyou National Forest, 2002. [Developed for] the Siskiyou NF and Medford BLM District, [on file at] Siskiyou NF Supervisor's Office, Grants Pass, OR.

Frost, E.; Bigg, W. 2003. Distribution and Environmental/Habitat Relations of Five Endemic Plants Associated with Serpentine Fens in Southwest Oregon and Northwestern California. [Developed for] the Siskiyou NF and Medford BLM District, [on file at] Siskiyou NF Supervisor's Office, Grants Pass, OR.

Goheen, D. J. 2003. *Personnel Communication.* Pathologist-entomologist, USDA-FS Region 6, Southwest Oregon Forest Insect and Disease Service Center, Central Point, OR.

Goheen, D.; Angwin, P.; Sniezko, R.; [and others]. 2000a. Port-Orford-Cedar Root Disease in Southwestern Oregon and Northwestern California. *In:* Hansen and Sutton, *eds*., Proceedings of the First International Meeting on *Phytophthora* in Forest and Wildland Ecosystems, IUFRO Working Party 7.02.09, Forest Research Laboratory, Oregon State University. p. 107–111.

Goheen, E.M.; Cobb, D.F.; Forry, K. 1986a. Survey of the Coquille River Falls Research Natural Area. Unpublished report. USDA-FS, Forest Pest Management, Pacific Northwest Region. 10 p.

Goheen, E.M.; Cobb, D.F.; Forry, K. 1986b. Roadside Surveys for Port-Orford-Cedar Root Disease on the Powers Ranger District, Siskiyou National Forest. Unpublished report. USDA-FS, Forest Pest Management, Pacific Northwest Region. 19 p.

Goheen, D.J.; Marshall; K.; Hansen, E.M.; [and others]. 1997. Port-Orford-Cedar Root Disease: Ecological Implications and Management. *In:* Beigel, J.K.; Jules, E.S.; Snitkin, B.; *eds.;* Proceedings of the First Conference on Siskiyou Ecology. Siskiyou Regional Educational Project. p. 189.

Goheen, D.J.; Marshall, K.; Hansen, E.M.; [and others]. 2000b. Effectiveness of Vehicle Washing in Decreasing *Phytophthora lateralis* Inoculum: A Case Study. USDA-FS, SWOFIDSC-00-2. 7 p.

Goheen, D.J.; McWilliams, M.G.; Angwin, P.A.; [and others]. 2003. *Phytophthora lateralis* and Other Agents that Damage Port-Orford-Cedar. *In*: Range-wide assessment of Port-Orford-Cedar (*Chamaecyparis lawsoniana*) on Federal Lands. Chapter 3. [*In press*]

Gordon, D.E. 1974. The Importance of Root Grafting in the Spread of *Phytophthora* Root Rot in an Immature Stand of Port-Orford-Cedar. M.S. Thesis, Oregon State University, Corvallis. 116 p.

Gordon, D.E.; Roth, L.F. 1976. Root Grafting in Port-Orford-Cedar: An Infection Route for Root Rot. Forest Science 22:276–278.

Gordon, G.W. 1994. Natural Organohalogens. Journal of Chemical Education 71(11):907–914.

Green, F. 2003. *Personal communication.* Westbrook Exports, Coos Bay, OR.

Gregory, S. V.; Swanson, F.J.; McKee, W.A.; Cummins, K.W. 1991. An Ecosystem Perspective of Riparian Zones. Bioscience 41:540–551.

Hadfield, J.S.; Goheen, D.J.; Filip, G.M.; [and others]. 1986. Root Diseases in Oregon and Washington Conifers. R6-FPM-250-86, USDA-FS, Pacific Northwest Region. 27 p.

Haefner, H.E. 1975. Reminiscences of an Early Forester. Oregon Historical Quarterly 76(1)39–88.

Hamm, P.B.; Hansen, E.M. 1984. Improved Method for Isolating *Phytophthora lateralis* from Soil. Plant Disease 68:517–519.

Hansen, E.M. 1993. Roadside Surveys for Port-Orford-Cedar Root Disease on the Powers Ranger District, Siskiyou National Forest. Unpublished report. Oregon State University, Corvallis. 17 p.

Hansen, E.M. 2000a. Final Report on New Tools for the Detection of *Phytophthora lateralis*. Unpublished report. Department of Botany and Plant Pathology, Oregon State University. 4 p.

Hansen, E.M. 2000b. Final Report on Demographics of Port-Orford-Cedar on Sites Infested with *P. lateralis* for Many Years. Unpublished report. Department of Botany and Plant Pathology, Oregon State University, Corvallis. 5 p.

Hansen, E.M.; Hamm, P.B. 1983. Resistance Screening of Port-Orford-Cedar to *Phytophthora lateralis* Root Rot. Unpublished final report to USDA-FS, Region 6, Department of Botany and Plant Pathology, Oregon State University, Corvallis. 15 p.

Hansen, E.M.; Goheen; D.J.; Jules, E.S.; [and others]. 2000. Managing Port-Orford-Cedar and the Introduced Pathogen *Phytophtora lateralis*. Plant Disease 84(1):4–14.

Hansen, E.M.; Hamm, P.B. 1986. Screening Port-Orford-Cedar for Resistance to *Phytophthora lateralis*. Unpublished final report to USDA-FS, Region 6, Department of Botany and Plant Pathology, Oregon State University, Corvallis. 26 p.

Hansen, E.M.; Hamm, P.B.; Roth, L.F. 1989. Testing Port-Orford-Cedar for Resistance to *Phytophthora*. Plant Disease 73(10):791–794.

Hansen, E.M.; Hamm, P.B. 1996. Survival of *Phytophthora lateralis* in Infected Roots of Port-Orford-Cedar. Plant Disease 80:1075–1078.

Hansen, E.M.; Lewis, K.J. 1997. Compendium of Conifer Diseases. American Phytopathological Society. 101 p.

Hansen, E.M.; Streito, J.C.; Delator, C. 1999. First Confirmation of *Phytophthora lateralis* in Europe. Plant Disease 83:587.

Harvey, R.D.; Hadfield, J.H.; Greenup, M. 1985. Port-Orford-Cedar Root Rot on the Siskiyou National Forest in Oregon. USDA-FS, Pacific Northwest Region. 17 p.

Hawk, G.M. 1977. A Comparative Study of the Temperate Chamaecyparis Forests. Ph.D. Dissertation. Oregon State University, Corvallis, OR. 195 p.

Hayes, G. L. 1958. Silvical Characteristics of Port-Orford-Cedar. Silvical Series No. 7, USDA-FS, Pacific Northwest Forest and Range Experiment Station, Portland, OR. 11 p.

Hedrick, P. W.; Gilpin, M.E. 1997. Genetic Effective Size of a Metapopulation. *In:* Hanski, I.; Gilpin, M.E., *eds*., Metapopulation Biology: Ecology, Genetics and Evolution. Academic Press, New York, NY. p. 165–181.

Heffner, K. 1984. Following the Smoke: Contemporary Plant Procurement by the Indians of Northwest California. Six Rivers National Forest, Eureka, CA.

Hendryx, M.; Hendryx, B.D. 1991. Plants and the People: The Ethnobotany of the Karuk Tribe. Siskiyou County Museum, Yreka, CA.

Henley, J.W. 1973. Port-Orford-Cedar: An AmericanWood. FS-228, USDA-FS.

Hennon, P.E.; McClellan; M.H.; Palkovic, P. 2002. Comparing Deterioration and Ecosystem Function of Decay-Resistant and Decay-Susceptible Species of Dead Trees. *In:* Laudenslayer; W.F., Jr.; Shea, P.J.; Valentine, B.E.; [and others]; *coords.*; Proceedings of the Symposium on the Ecology and Management of Dead Wood in Western Forests (November 2–4, 1999; Reno, NV.). General Technical Report PSW-GTR-181, USDA-FS Pacific Southwest Research Station, Albany, CA. 949 p.

Hepting, G.H. 1971. Diseases of Forest and Shade Trees of the United States. USDA-FS, Agriculture Handbook No. 386. 658 p.

Hicks, B.J.; Hall, J.D.; Bisson, P.A.; Sedell, J.R. 1991. *In* Response of Salmonids to Habitat Changes. American Fisheries Society Special Publication 19.

Hoopa Tribal Forestry. 1994. Hoopa Valley Indian Reservation Forest Management Plan, Volume 1 for the Period 1994–2003. Hoopa Valley Tribe, Hoopa, CA.

Hoover, L. 2003. *Personal communication.* Forest Botanist, USDA-FS Six Rivers National Forest.

Hyatt, T. L.; Naiman, R.J. 2001. The Residence Time of Large Woody Debris in the Queets River, Washington, USA. Ecological Applications 11(1):191–202.

IARC. 1991. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man. Geneva: World Health Organization, International Agency for Research on Cancer, 1972–Present (Multivolume work). p. 52–173.

Jimerson, T.M. 1989. Snag Densities in Old-Growth Stands on the Gasquet Ranger District, Six Rivers National Forest, California. Research Paper PSW-196, Pacific Southwest Forest and Range Experiment Station, USDA-FS, Berkeley, CA. 12 p.

Jimerson, T.M. 1999. A Conservation Strategy for Port-Orford-Cedar. [*Unpublished paper*]

Jimerson, T. 2003. *Personal communication(s)*. Ecologist. USDA-FS Region 5, Arcata, CA.

Jimerson, T.M.; Creasy, R.M. 1991. Variation in Port-Orford-Cedar Plant Communities Along Environmental Gradients in Northwest California. *In:* Proceedings of the Symposium on Biodiversity of Northwestern California. Harris, R.R.; Erman, D.C.; Kerner, H.M.; *tech. coords*., [p. 122–133], University of California, Berkeley, CA. 308 p.

Jimerson, T.M.; Creasy, R.M. 1997. Series, Subseries and Plant Association Codes for Northwest California. USDA-FS, Six Rivers National Forest, Eureka, CA. 13 p.

Jimerson, T.M.; Daniel; S.L. 1994. A Field Guide to Port-Orford-Cedar Plant Associations in Northwest California. R5-ECOL-TP-002, USDA-FS, Pacific Southwest Region, San Francisco, CA. 154 p.

Jimerson, T.M.; Hoover, L.D.; McGee, E.A.; [and others]. 1995. A Field Guide to Serpentine Plant Associations and Sensitive Plants in Northwest California. R5-ECOL-TP-006, USDA-FS, Pacific Southwest Region, San Francisco, CA. 338 p.

Jimerson, T.M.; McGee, E.A.; DeNitto, G. 2000. A Supplement to: A Field Guide to Port-Orford-Cedar Plant Associations in Northwest California. R5-ECOL-TP-006, USDA-FS, Pacific Southwest Region, San Francisco, CA.

Jimerson, T.M.; McGee; E.A.; Jones, D.W.; [and others]. 1996. A Field Guide to the Tanoak and the Douglas-Fir Plant Associations in Northwest California. R5-ECOL-TP-009, USDA-FS, Pacific Southwest Region, San Francisco, CA. 546 p.

Johnson, D.H.; O'Neal, T.A.; *eds*. 2002. Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis. p. 736.

Jules, E.; Kaufmann, M. 1999. Reconstructing Historical Spread of *Phytophthora lateralis*: I. Patterns of Infection Between Populations of Port-Orford-Cedar. Presentation at rhe Ecology and Pathology of Port-Orford-Cedar: A Symposium [sponsored by USDA and USDI], Gold Beach, Oregon, July.

Jules, E. S.; Kauffman, M.J.; Ritts, W.D.; [and others]. 2002. Spread of an Invasive Pathogen Over a Variable Landscape: a Nonnative Root Rot on Port-Orford-Cedar. Ecology (83)11:3167–3181.

Kagan, J. 1990a. Draft Species Management Guide for *Epilobium oreganum* Greene. Developed for the Siskiyou National Forest and Medford BLM District, [on file at] Six Rivers National Forest Supervisor's Office, Eureka, CA.

Kagan, J. 1990b. Draft Species Management Guide for *Gentiana setigera* Wats. Developed for the Siskiyou National Forest and Medford BLM District, [on file at] Six Rivers National Forest Supervisor's Office, Eureka, CA.

Kagan, J. 1996. Draft Conservation Agreement for *Hastingsia bracteosa*, *H. atropurpurea*, *Gentiana setigera*, *Epilobium oreganum*, and *Viola primulifolia* var. *occidentalis* and Serpentine *Darlingtonia* Fens and Wetlands from Southwestern Oregon and Northwestern California, [on file at] Six Rivers National Forest Supervisor's Office, Eureka, CA.

Karuk Tribe of California. 1989. Karuk Ancestral Lands Forest Management Plan. Prepared for Klamath and Six Rivers National Forest [with technical assistance provided by Siskiyou Forestry Consultants, Arcata, CA], Karuk Tribe of California, Happy Camp, CA.

Kaufmann, M.; Jules, E. 1999. Reconstructing Historical Spread of *Phytophthora lateralis*: II. Infection Dynamics Along a Stream Population of Port-Orford-Cedar. Presentation at the Ecology and Pathology of Port-Orford-Cedar: A Symposium [sponsored by USDA and USDI], Gold Beach, OR, July.

Kitzmiller, J.H.; Sniezko, R.A. 2000. Range-Wide Genetic Variation in Port-Orford-Cedar (*Chamaecyparis lawsoniana* [A. Murr.] Parl.): I. Early Height Growth at Coastal and Inland Nurseries. Journal of Sustainable Forestry 10(1, 2). p 57–67.

Kitzmiller, J.; Sniezko, R.A.; Stevens, R.D.; [and others]. 2003. Genetics of Port-Orford-Cedar. *In:* Range-wide Assessment of Port-Orford-Cedar (*Chamaecyparis lawsoniana*), Chapter 5. [*In press*]

Kliejunas, J.T. 1994. Port-Orford-Cedar Root Disease. Fremontia 22:3–11.

Kliejunas, J.T.; Adams, D.H. 1980. An Evaluation of *Phytophthora* Root Rot of Port-Orford-Cedar in California. USDA-FS, Region 5, Forest Pest Management Report 80-1. 16 p.

Koepsell, P.A.; Pscheidt, J.W. 1994. Pacific Northwest Plant Disease Control Handbook. Oregon State University, Corvallis. 349 p.

Kruckeberg, A. R. 1984. California Serpentines: Flora, Vegetation, Geology, Soils, and Management Problems. Volume 78. University of California Publications in Botany, University of California Press, Berkeley, CA.

Ledig, T. F. 1986. Conservation Strategies for Forest Gene Resources. Forests Ecology and Management 14:77–90.

Lewis, R.J. 1996. Sax's Dangerous Properties of Industrial Materials. 9th ed., Volumes 1–3. Van Nostran Reinhold, New York, NY.

Lienkaemper, G.W.; Swanson, F.J. 1987. Dynamics of Large Woody Debris in Streams in Old-growth Douglas-fir Forests. USDA-FS, Pacific Northwest Research Station, Forest Sciences Laboratory General Technical Reprot PNW-69. 12 p.

Lindenmayer, D.B.; Franklin, J.F. 2002. Conserving Forest Biodiversity: A Comprehensive Multiscaled Approach. Island Press, Washington, D.C. 351 p

Linhart, Y.B. 1995. Restoration, Revegetation, and the Importance of Genetic and Evolutionary Perspectives. *In:* Roundy, B.A.; et al., *comps*. Proceedings: Wildland Shrub and Arid Land Restoration Symposium, October 19-21, 1993, Las Vegas, NV., USDA-Forest Service, Intermountain Research Station General Technical Report INT-GTR-315, Ogden, UT.

Marshall, K.; Goheen, D.J. 2000. Preliminary Results of Effectiveness Monitoring of Port-Orford-Cedar Roadside Sanitation Treatments in Southwest Oregon. Unpublished report. Southwest Oregon Forest Insect and Disease Service Center, 2 p.

Martin, I.D.; Mackie, G.L.; Baker, M.A. 1993. Control of Biofouling Mollusk, *Dreissena polymorpha* (Bivalvia: Dreissenidae), with Sodium Hypochlorite and with Polyquarternary Ammonia and Benzothiazole Compounds. Archives Environmental Contamination and Toxicology 24(3):381–388.

May, C.L.; Gresswell, R.E. 2003. Processes and Rates of Sediment and Wood Accumulation in Headwater Streams of the Oregon Coast Range. *In:* Earth Surface Processes and Landforms 28(4):409–424.

Mazer, C.; Sedell, J.R. 1994. From the Forest to the Sea: The Ecology of Wood in Streams, Rivers, Estuaries, and Oceans. St. Lucie Press, Delray Beach, FL.

McCain, M. 2003. *Personal communication.* Fisheries Biologist, USDA-FS Six Rivers National Forest, Eureka, CA.

McDade, M.H.; Swanson, F.J.; Franklin, J.F.; [and others]. 1990. Source Distances for Coarse Woody Debris Entering Small Streams in Western Oregon and Washington. Canada Journal of Forestry Resources 20:326–330.

McDonald, B.A.; Linde, C. 2002. Pathogen Population Genetics, Evolutionary Potential, and Durable Resistance. Annual Review of Phytopathology 40:349–379.

McNab, H.W.; Avers, P.E.; *comps*. 1994. Ecological Subregions of the United States: Section Descriptions. Administrative Publication WO-WSA-5, USDA-FS, Washington, D.C. 267 p.

McWilliams, M.G. 2000a. Port-Orford-Cedar and *Phytophthora lateralis*: Grafting and Heritability of Resistance in the Host and Variation in the Pathogen. Ph.D. Dissertation, Oregon State University, Corvallis.

McWilliams, M.G. 2000b. Variation in *Phytophthora lateralis*. *In:* Hansen and Sutton, *eds*., Proceedings of the First International Meeting on *Phytophthoras* in Forest and Wildland Ecosystems, IUFRO Working Party 7.02.09, Forest Research Laboratory, Oregon State University, Corvallis. p. 50–55.

Meehan, W.R., *ed.* 1991. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Publication 19, Bethesda, MD.

Mellen, K. 2003. *Personal communication.* Regional Wildlife Ecologist, USDA-FS, Pacific Northwest Region, Portland, OR.

Merkel, Hermann W. 1905. A Deadly Fungus on the American Chestnut. N.Y. Zoological Society, 10th Annual Report. p. 97–103.

Miles, S.R.; Goudey, C.B.; *comps.* 1997. Ecological Subregions of California. R5-EM-TP-005, USDA-FS, Pacific Southwest Region, San Francisco, CA. 233 p.

Millar, C.I.; Marshall, K.A. 1991. Allozyme Variation of Port-Orford-Cedar (*Chamaecyparis lawsoniana*): Implications for Genetic Conservation. Forest Science 37(4):1060–1077.

Millar, C. I.; Delaney, D.L.; Westfall, R.D. 1992. Genetic Diversity in Port-Orford-Cedar: Rangewide Allozyme Study. Summary Report, August 22, USDA-FS, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA. 4 p.

Millar, C.I.; Delaney, D.L.; Westfall, R.D.; [and others]. 1991. Ecological Factors as Indicators of Genetic Diversity in Port-Orford-Cedar: Application to Genetic Conservation, Internal Competitive Grants Program Progress Report, July 1, USDA-FS, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA. 4 p.

Miller, R.C. 2003. *Personal communication.* Wildlife Technician, USDA-FS Illinois Valley Ranger District, Siskiyou National Forest.

Miller, T.; Kenetta, R. 1996. *Personal communication.* Confederated Tribes of Siletz.

Mills, S.D.; Foster, H.; Coffey, M.D. 1991. Taxonomic Structure of *Phytophthora cryptogea* and *P. drechsleri* Based on Isozyme and Mitochondrial DNA Analyses. Mycological Research 95:31–48.

Morris, W.G. 1934. Forest Fires in Western Oregon and Western Washington. Oregon Historical Quarterly 35(4):313–339.

Murray, M.S.; Hansen, E.M. 1997. Susceptibility of Pacific Yew to *Phytophthora lateralis.* Plant Disease 81:1400–1404.

Murray, M.S.; McWilliams, M.; Hansen, E.M. 1995. Survival of *Phytophthora lateralis* in Chlorine Bleach. Unpublished]. Oregon State University, Corvallis. 8 p.

Namkoong, G. 1979. Introduction to Quantitative Genetics In Forestry. USDA Technical Bulletin 1588. 308 p.

Namkoong, G.; Kang; H.C.; Brouard, J.S. 1988. Tree Breeding: Principles and Strategies. Springer-Verlag, New York, NY. 152 p.

National Fire Protection Association. 1986. Fire Protection Guide on Hazardous Materials. 9th ed. National Fire Protection Association, Boston, MA.

Nelson, J. K. 2003. *Personal communication.* Forest Botanist, USDA-FS Shasta-Trinity National Forest.

Nielsen, J. 1997. Port-Orford-Cedar: A Reasonable Risk for Reforestation (Under Specific Conditions). Northwest Woodlands 13:22–23.

Ohmann, J.L.; Waddell, K.L. 2002. Regional Patterns of Dead Wood in Forested Habitats of Oregon and Washington. *In:* Laudenslayer; W.F., Jr.; Shea, P.J.; Valentine, B.E.; [and others]; *coords.*; Proceedings of the Symposium on the Ecology and Management of Dead Wood in Western Forests (November 2–4, 1999; Reno, NV.). General Technical Report PSW-GTR-181, USDA-FS Pacific Southwest Research Station, Albany, CA. 949 p.

Ollivier, L. 2003. *Personal communication.* Wildlife Biologist, USDA-FS Pacific Southwest Research Station, Arcata, CA.

Oregon Natural Heritage Program. 1993. Rare, Threatened and Endangered Species of Oregon. Oregon Natural Heritage Program, Portland, OR.

Oregon Natural Heritage Program. 1998. Rare, Threatened and Endangered Species of Oregon. Oregon Natural Heritage Program, Portland, OR. 92 p.

Oregon Natural Heritage Program. 2001. Rare, Threatened and Endangered Plants and Animals of Oregon. Oregon Natural Heritage Program, Portland, OR. 94 p.

Oregon State University. 1982. Average Dry-season Precipitation in Southwest Oregon, May Through September. Oregon State University Extension Service EM 8226, Corvallis, OR.

Ostrofsky, W.D.; Pratt, R.G.; Roth, L.F. 1977. Detection of *Phytophthora lateralis* in Soil Organic Matter and Factors that Affect Its Survival. Phytopathology 67:79–84.

Pacific Meridian Resources. 1996. Yurok Indian Reservation Forest Management Plan. Prepared for the Yurok Tribe, Eureka, CA.

Parks, C. 1993. SHADOW: Stream Temperature Management Program. User's Manual v. 2.3. USDA-FS, Pacific Northwest Region.

Parker, I.S.P.; *ed*. 1982. Synopsis and Classification of Living Organisms. McGraw-Hill Book Company, New York, NY. 1,166 p.

Peattie, D.C. 1953. A Natural History of Western Trees. [From a scoping letter by] Umpqua Watersheds, Inc.

Pesticide Management Education Program. 1986. Sodium/Calcium Hypochlorite (Clorox, bleach) Chemical Fact Sheet 79. Cornell University, Ithaca, NY.

Prevost, M.; MacLeod, J.; Davis, R.M. 1997. Southwest Oregon Salmon Recovery Initiative, Phase 1: A Plan to Stabilize the Native Steelhead Population from Further Decline. Rogue Basin Steering Committee (South Coast Coordinating Watershed Council), Rogue Valley Council of Governments, Central Point, OR.

Priester, K. 1994. Words into Action: A Community Assesment of the Applegate Valley. Rogue Institute for Ecology and Economy. p. 68–69.

Priester, K. 1997. Public Issues Regarding the Scattered Apples Project in Williams, Oregon. 15 p.

Proctor, J.; Woodell, S.R.J. 1975. The Ecology of Serpentine Soils. Advances in Ecological Research 9:255–366.

Pyne, S.J. 1983. Fire in America. Princeton University Press, Princeton, NJ. 654 p.

Ritts, W.D. 2003. A Quantitative Risk Assessment of Port-Orford-Cedar Root Disease in the Smith River National Recreation Area. Master's Thesis, Humboldt State University, Arcata, CA. 47 p.

Rogue Valley Council of Governments. 1996. Southwest Oregon Salmon Restoration Initiative, Phase 1: A Plan to Stabilize the Native Coho Population from Further Decline. Central Point, OR.

Rogue Valley Council of Governments. 1997. Southwest Oregon Salmon Restoration Initiative, Phase 1: A Plan to Stabilize the Native Steelhead Population in Southwest Oregon from Further Decline. Central Point, OR.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, CO.

Roth, L.E. 1985. Inoculation Methods for Quantitatively Evaluating the Response of Port Orford-Cedar Trees to *Phytophthora lateralis*. Unpublished report. 17 p.

Roth, L.F.; Bynum, H.H.; Nelson, E.E. 1972. *Phytophthora* Root Rot of Port-Orford-Cedar. USDA-FS, Forest Pest Leaflet 131. 7 p.

Roth, L.E.; Harvey, R.D. Jr.; Kliejunas, J.T. 1987. Port-Orford-Cedar Root Disease. USDA-FS R6 FPM-PR-294-87.

Roth, L.F.; Trione, E.J.; Ruhmann, W.H. 1957. *Phytophthora* Induced Root Rot of Native Port-Orford-Cedar. Journal of Forestry 55:294–298.

Powers, R. 2003. *Personal communication.* Research silviculturist, USDA-FS Pacific Southwest Forest and Range Experiment Station, Redding, CA.

Scharpf, R.F.; *tech. coord*. 1993. Diseases of Pacific Coast Conifers. USDA-FS Agriculture Handbook 521. 199 p.

Schmidt, K.M.; Menakis, J.P.; Hardy, C.C.; [and others]. 2002. Development of Coarse-Scale Spatial Data for Wildland Fire and Fuel Management. USDA-FS Rocky Mountain Research Station General Technical Report RMRS-GTR-87, Fort Collins, CO. 41 p.

Segotta, D. 2003. *Personal communication.* Forest Botanist, USDA-FS Siuslaw National Forest.

Shannon, M.; Sturdevant, V. 1995. Organizing for Innovation: A look at the Agencies and Organizations Responsible for Adaptive Management Areas: The Case of the Applegate AMA. Report submitted to the Interagency Liaison, USDA-FS and USDI-BLM.

Sharpe, J.M. 2002. Variation of Drought Resistance and Root Regeneration Among Genotypes of Port-Orford-Cedar (*Chamaecyparis lawsoniana*). M.S. Thesis. Oregon State University, Corvallis. 86 p.

Skinner, M.W.; Pavlik, M.; *eds*. 1994. California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California. Sacramento, CA.

Smith, D.M. 1962. The Practice of Silviculture. John Wiley and Sons, Inc. 578 p.

Sniezko, R.A.; Elliott, L.J.; Goheen, D.J.; [and others]. 2003a. Development of *Phytophthora lateralis* Resistant Port-Orford-Cedar for Restoration in the Pacific Northwest. *In:* Bassman, J.H.; Johnson, J.D.; Fins, L.; [and others], *eds*., Rocky Mountain Ecosystems: Diversity, Complexity and Interactions. Proceedings 17th North American Forest Biology Workshop, July 15-18, 2002, Washington State University Cooperative Extension, Pullman, WA. [*In press*]

Sniezko, R.A.; Elliott L.J.; Hansen E.M.; [and others]. 2004. Genetic Resistance in Port-Orford-cedar to the Non-native Root Rot Pathogen *Phytophthora lateralis*: A Tool to Aid in Restoration in Infested Riparian Areas. Proceedings for the Second Conference on Klamath-Siskiyou Ecology, May 29–31, 2003, Takilma, Oregon. [*In submission*]

Sniezko, R.A.; Hansen, E.M. 2000. Screening and Breeding Program for Genetic Resistance to *Phytophthora lateralis* in Port-Orford-Cedar (*Chamaecyparis lawsoniana*): Early Results. *In*: Hansen and Sutton, *eds*., Proceedings from the First International Meeting on *Phytophthoras* in Forest and Wildland Ecosystems. IUFRO Working Party 7.02.09, Forest Research Laboratory, Oregon State University, Corvallis. p. 91–94.

Sniezko, R.A.; Hansen, E.M. 2003a. Breeding Port-Orford-cedar for Resistance to *Phytophthora lateralis:* Current Status & Considerations for Developing Durable Resistance. *In:* McComb, J.A.; St. Hardy, G.E.; Tommerup, I., *eds*., *Phytophthora* in Forests and Natural Ecosystems; Proceedings 2nd Meeting of IUFRO Working Party, September 30–October 5, 2001, Albany, Western Australia.

Sniezko, R.A.; Hansen, E.M. 2003b. Genetic Resistance in Port-Orford-Cedar to the Non-Native Root Rot Pathogen *Phytophthora lateralis*: A Tool to Aid in Restoration in Infested Riparian Areas. Proceedings Second Conference on Klamath-Siskiyou Ecology, Takilma, OR. *[Paper submitted]*

Sniezko, R.A.; Hansen, E.M.; Bower A.; [and others]. 2000. Genetic Resistance of Port-Orford-Cedar (*Chamaecyparis lawsoniana*) to *Phytophthora laterlais*: Results From Early Field Trials. *In*: Hansen and Sutton, *eds*., Proceedings from the First International Meeting on *Phytophthoras* in Forest and Wildland Ecosystems. IUFRO Working Party 7.02.09, Forest Research Laboratory, Oregon State University, Corvallis. p. 138–140.

Sniezko, R.A.; Hansen, E.M.; Hamlin, J.E. 2001. Variation in *Phytophthora lateralis* Resistance Among 29 Seedling Families of *Chamaecyparis lawsoniana*. *In:* McComb, J.A.; St. Hardy, G.E.; Tommerup, I., *eds*., *Phytophthora* in Forests and Natural Ecosystems; Proceedings 2nd Meeting of IUFRO Working Party, September 30–October 5, 2001, Albany, Western Australia.

Sniezko, R.A.; Hansen, E.M.; Kitzmiller J.H; [and others]. 2000. Range-wide Genetic Variation in *Phytophthora lateralis* Resistance in *Chamaecyparis lawsoniana*. Unpublished manuscript.

Sniezko, R.A.; Kitzmiller, J.; Elliott, L.J.; [and others]. 2003b. Breeding for Resistance to *Phytophthora lateralis*. *In*: Range-wide Assessment of Port-Orford-Cedar (*Chamaecyparis lawsoniana*) on Federal Lands, Chapter 6. [*In press*]

Spelter, H.; McKeever, T. 2001. Profile 2001: Softwood Sawmills in the United States and Canada. Research Paper FPL-RP-594, USDA-FS Forest Products Laboratory.

Spence, B.C.; Lomnicky, G.A.; Hughes, R.M.; [and others]. 1996. An Ecosystem Approach to Salmonid Conservation. TR-4501-96-6057, ManTech Environmental Research Corp., Corvallis, OR.

Sproul, B. 2003. *Personal communication.* East Fork Lumber Co., Inc., Myrtle Point, OR.

Stern, K.; Roche, L. 1974. Genetics of Forest Ecosystems. Springer-Verlag, New York, NY. p. 228.

Strahler, A.N. 1957. Quantitative Analysis of Watershed Geomorphology. Transactions American Geophysics Union 38(6):913–920.

Strahler, A.N. 1964. Quantitative Geomorphology of Drainage Basins and Channel Networks; Section 4-2. *In*: Chow, V., *ed.*, Handbook of Applied Hydrology, McGraw-Hill, New York, NY.

Stuntzer, R.E. 1991. Port-Orford-Cedar Study: A Report on the Socio-Economic Impacts of the Harvest of Port-Orford-Cedar.

Swanston, D.N. 1991. Natural Processes. *In:* Response of Salmonids to Habitat Changes. American Fisheries Society Special Publication 19.

Swingle, R.U.; Whitten, R.R.; Brewer, E.G. 1949. Dutch Elm Disease. *In:* Yearbook of Agriculture, USDA, U.S. Government Printing Office, Washington, D.C.

Tainter, F.H.; Baker, F.A. 1996. Principals of Forest Pathology. John Wiley and Sons, Inc. 805 p.

Taylor, D. E. 2002. Race, Class, Gender, and American Environmentalism. USDA-FS, General Technical Report PNW-GTR-534. 51 p.

Thies, W.G.; Goheen, E.M. 2003. Major Forest Diseases of the Oregon Coast Range and Their Management. Summary of the COPE Project. [*In press*]

Tomascheski, D. 2003. *Personal communication.* Sierra Pacific Industries, Anderson, CA.

Torgeson, D.C.; Young, R.A.; Milbrath, J.A. 1954. *Phytophthora* Root Rot Diseases of Lawson Cypress and Other Ornamentals. Oregon State College Agricultural Experiment Station Bulletin 537. 18 p.

Trione, E.J. 1959a. The Pathology of *Phytophthora lateralis* on Native *Chamaecyparus lawsoniana*. Contributions to the Boyce Thompson Institute 17: 359–373.

Trione, E.J. 1959b. The Pathology of *Phytophthora lateralis* on Native *Champaecyparis lawsoniana*. Phytophtology 49:306–310.

Trione, E.J. 1974. Sporulation and Germination of *Phytophthora lateralis*. Phytopathology 64:1531–1533.

Tucker, C.M.; Milbrath, J.A. 1942. Root Rot of *Chamaecyparis* Caused by a Species of *Phytophthora*. Mycologia 34:94–103.

Ullian, B.; Jules, E.S. 2000. Predictability Begets Optimism: A Conservation Perspective on Port Orford cedar and *Phytophthora lateralis*. Plant Disease 84:12–13.

Umaerus, V.; Umareus, M.; Erjefalt, L.; [and others]. 1983. Control of *Phytophthora* by Host Resistance: Problems and Progress. *In:* Erwin, D.C.; Bartnicki-Garcia, S.; Tsao, P.H.; *eds*. Phytophthora: Its Biology, Taxonomy, Ecology, and Pathology. American Phytopathological Society Press. p. 315–326.

U.S. Coast Guard, Department of Transportation. 1984. CHRIS - Hazardous Chemical Data. Volume II. U.S. Government Printing Office, Washington, D.C.

USDA. 1997. Ecological Subregions of California, Section and Subsection Descriptions. USDA-FS Pacific Southwest Region, R5-EM-TP-005.

USDA-FS. 1965. Silvics of Forest Trees of the United States: Port-Orford-Cedar (*Chamaecyparis lawsoniana* (A. Murr.) Parl.). Agriculture Handbook No. 271: 157–160.

USDA-FS. 1969. California Tree Seed Zone Map (scale 1:5,000,000). USDA-FS, California Region, San Francisco, CA.

USDA-FS. 1973. Washington and Oregon Tree Seed Zone Maps (scale 1:5,000,000). USDA-FS, Pacific Northwest Region, Portland, OR.

USDA-FS. 1983. Forest Disease Management Notes. USDA-FS, Pacific Northwest Region, Government Printing Office. p 695–726.

USDA-FS. 1988. Siskiyou National Forest Tree Improvement Plan. Siskiyou NF, Medford, OR.

USDA-FS. 1992. An Interim Guide to the Conservation and Management of Pacific Yew. USDA-FS, Pacific Northwest Region. 72 p.

USDA-FS. 1989. Siskiyou National Forest Land and Resource Management Plan. Siskiyou National Forest, Grants Pass, OR.

UDSA-FS. 1994a. Port-Orford-Cedar Management Plan. Regions 5 and 6.

USDA-FS. 1994b. Final Environmental Impact Statement, Dunes Management Plan, Oregon Dunes NRA, Siuslaw National Forest. Corvallis, OR.

USDA-FS. 1995a. Land and Resource Management Plan, Klamath National Forest. Yreka, CA.

USDA-FS. 1995b. Land and Resource Management Plan, Six Rivers National Forest. Eureka, CA.

USDA-FS. 1995c. Shasta-Trinity National Forest Land and Resource Management Plan. Vallejo, CA.

USDA-FS. 1998. Plant Associations of the Oregon Dunes National Recreation Area, Siuslaw National Forest, Oregon. Pacific Northwest Region Technical Paper R6-NR-ECOL-TP-09-98.

USDA-FS. 2002a. Biscuit Fire Chronology. Siskiyou and Six Rivers NFs, Medford, OR.

USDA-FS. 2002b. Survey and Manage Species Summary of Recommendations Regarding Category Placement and Range Changes from the 2002 Annual Species Review.

USDA-FS. 2002c. Interim Direction for the ROR/SIS National Forests: Best Management Practices For Noxious Weed Prevention and Management. Port-Orford-cedar Root Disease Prevention and Management.

USDA-FS. 2003a. Fire Regimes Based on Draft Plant Association Groups. Siskiyou NF, Medford, OR.

USDA-FS. 2003b. Biscuit Post-Fire Assessment, Rogue River and Siskiyou National Forests, Josephine and Curry Counties, Oregon. Rogue River and Siskiyou NFs, Medford, OR.

USDA-FS. 2003c. Metadata for Historical Natural Fire Regimes, Version 2000. Fire Sciences Laboratory, Rocky Mountain Research Station, Missoula, MT. [http://www.fs.fed.us/fire/fuelman/firereg2000/firereg_v2k.html]

USDA-FS. 2003d. Biscuit Fire Recovery Project Draft Environmental Impact Statement, Josephine and Curry Counties, Oregon. Rogue River and Siskiyou NFs, Medford, OR.

USDA-FS; Oregon Department of Forestry. 2002. Forest Insect and Disease Highlights in Oregon, 2001. USDA-FS R6-NR-FID-TP-04-02, Portland, OR.

USDA-FS; USDI. 1994. Applegate Adaptive Management Area Ecosystem Health Assessment.

USDA-FS; USDI-BLM. 1985. Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington. USDA-FS Pacific Northwest Region, Portland, OR.

USDA-FS; USDI-BLM. 1994a. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-successional and Old-growth Related Species Within the Range of the Northern Spotted Owl. Portland, OR. 322 p.

USDA-FS; USDI-BLM. 1994b. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl [and] Standards and Guidelines for Management of Habitat for Late Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. Portland, OR.

USDA-FS; USDI-BLM. 1995. Southwest Oregon Late-Successional Reserve Assessment. 150 p.

USDA-FS; USDI-BLM. 1995a. Applegate River Watershed Assessment: Aquatic, Wildlife, and Special Plan Habitat.

USDA-FS; USDI-BLM. 2000. Final Supplemental Environmental Impact Statement for Amendment to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Regional Ecosystem Office, Portland, OR.

USDA-FS; USDI-BLM. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Portland, OR. p. 130+.

USDA-FS; USDI-BLM. 2003a. Survey and Manage Species Summary of Recommendations Regarding Category Placement and Range Changes from the 2002 Annual Species Review.

USDA-FS; USDI-BLM. 2003b. A Range-wide Assessment of Port-Orford-Cedar (*Chamaecyparis lawsoniana*) on Federal Lands. Oregon/Washington State Office, Portland, OR.

USDA-FS; USDI-BLM. 2003c. Draft Supplemental Environmental Impact Statement To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines. Oregon/Washington State Office, Portland, OR.

USDA-FS; USDI-FWS; USDC-NOAA-NMFS; [and others]; Forest Ecosystem Management Assessment Team. 1993. Forest Ecosystem Management: An Ecological, Economic, and Social Assessment.

USDI; USDA; DOE; [and others]. 2001. Review and Update of the 1995 Federal Wildland Fire Management Policy. Interagency Federal Wildland Fire Policy Working Group, Washington, D.C.

USDI; USDA; Western Governor's Association. 2001. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy. Washington, D.C.

USDI-BLM. 1995a. Coos Bay District Record of Decision and Resource Management Plan. Coos Bay District, North Bend, OR.

USDI-BLM. 1995b. Record of Decision and Resource Management Plan. Medford District, Medford, OR.

USDI-BLM. 1995c. Record of Decision and Resource Management Plan. Roseburg District, Roseburg, OR.

USDI-BLM. 1996. Williams Watershed Analysis. Medford, OR. 112 p.

USDI-BLM. 1996a [updated 2002]. Western Oregon Districts Transportation Management Plan. Oregon/Washington State Office, Portland, OR. 36 p.

USDI-BLM. 1998. Environmental Assessment for the Williams Port-Orford-Cedar Management Project. Medford, OR. 52 p.

USDI-BLM. 2002. Transportation Management Plan: Western Oregon Districts.

USDI-BLM. 2003. West Fork Illinois River Watershed Assessment. Medford District, Medford, OR.

USDI-BLM; USDA-FS. 2000. East Fork Illinois River Watershed Analysis. Medford District Office, Medford, OR.

USDI-BLM; USDA-FS; USDI-USFWS; [and others]. 2003. Interagency Standards for Fire and Fire Aviation Operations. National Interagency Fire Center, Boise, ID.

U.S. Environmental Protection Agency. 1984. Ambient Water Quality Criteria for Chlorine. EPA-440/5-84-030.

U.S. Environmental Protection Agency. 1986. Sodium/Calcium Hypochlorite (Clorox, bleach). Chemical Fact Sheet. 4 p.

U.S. Environmental Protection Agency. 1991. Sodium and Calcium Hypochlorite Salts. R.E.D. Facts.

U.S. Environmental Protection Agency. 1998. Ecoregions of Western Washington and Oregon. U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory Map (scale 1:1,350,000), Corvallis, OR.

U.S. Environmental Protection Agency. 2001. Database of Sources of Environmental Release of Dioxin-like Compounds in the Environment. EPA/600/C-01/012.

Van Der Plank, J.E. 1975. Principles of Plant Infection. Academic Press, New York, San Francisco, London.

Vorobik, L.A. 2002. The *Arabis macdonaldiana* Group (Brassicaceae: *A. blepharophylla, A. oregana, A. aculeolata, and A. macdonaldiana*) from Southwestern Oregon and Northwestern California. Report and attachments, USDI-BLM Medford District Office, Medford, OR.

Waddell, K.L.; Bassett, P.M. 1996. Timber Resource Statistics for the North Coast Resource Area of California. Resource Bulletin PNW-RB-214, USDA-FS Pacific Northwest Research Station.

Waddell, K.L.; Bassett, P.M. 1997. Timber Resource Statistics for the North Interior Resource Area of California. Resource Bulletin PNW-RB-222, USDA-FS Pacific Northwest Research Station.

Warren, D.D. 1985. Production, Prices, Employment, and Trade in Northwest Forest Industries. USDA-FS, Pacific Northwest Research Station.

Warren, D.D. 1998. Production, Prices, Employment, and Trade in Northwest Forest Industries, Third Quarter 1997. PNW-RB-229, USDA-FS, Pacific Northwest Research Station. p. 30, 33, and 35.

Warren, D.D. 2002. Production, Prices, Employment, and Trade in Northwest Forest Industries, All Quarters of 2000. Resource Bulletin PNW-RB-236, USDA-FS Pacific Northwest Research Station.

Webb, L.O. 2003. *Personnel Communication.* Forest Wildlife Biologist, USDA-FS Rogue River and Siskiyou National Forests, Grants Pass, OR.

Wemple, B.C.; Jones, J.A.; Grant, G.E. 1996 Channel Network Extension by Logging Roads in Two Basins, Western Cascades, Oregon. American Water Resources Association Water Resources Bullulletin 32(6).

Westfall, R.D. 1992. Developing Seed Transfer Zones. *In:* Fins, L.; et al. *eds*. Handbook of Quantitative Forest Genetics. Kluwer Academic Publishers, the Netherlands. p. 313–398.

White, D.E. 2003. *Personal communication*. Associate Ecologist, Rogue River-Siskiyou NFs, Medford, OR.

Whittaker, R. H. 1960. Vegetation of Siskiyou Mountains, Oregon and California. Ecology Monographs 30:279–338.

Winthers, E.; Fallon, D.; Haglund, J.; [and others]. 2003. Terrestrial Ecological Unit Inventory Technical Guide. USDA-FS, Washington Office Ecosystem Management Coordination Staff. 245 p.

Winton, L.M.; Hansen, E.M. 2000. PCR Diagnosis of *Phytophthora lateralis*. *In:* Hansen and Sutton, *eds.* Proceedings of the First International Meeting on Phytophthoras in Forest and Wildland Ecosystems. IUFRO Working Party 7.02.09, Forest research Laboratory, Oregon State University, Corvallis. p. 148–149.

Younker, J. 2003. *Personal communication.* Anthropologist, University of Oregon, Eugene.

Zobel, B. J.; Talbert, J.T. 1984. Applied Forest Tree Improvement. John Wiley & Sons, New York, NY. p. 274, 461.

Zobel, D.B. 1979. Seed Production in Forests of *Chamaecyparis lawsoniana*. Canadian Journal of Forest Resources 9:327–335.

Zobel, D.B. 1986. Port-Orford-Cedar: A Forgotten Species. Journal of Forest History 30: 29–36.

Zobel, D.B. 1990a. *Chamaecyparis lawsoniana* (A. Murr.) Parl., Port-Orford-Cedar. *In:* Silvics of North America, Volume 1, Conifers. USDA-FS Agricultural Handbook 654, Washington, D.C. p. 88–96.

Zobel, D.B. 1990b. Effects of Low Temperature, Seed Source, and Seed Age on Germination of *Chamaecyparis lawsoniana*. Canadian Journal of Forest Resources 20:1053–1059.

Zobel, D.B.; Hawk, G.M. 1980. The Environment of *Chamaecyparis lawsoniana*. American Midland Naturalist 103(2):280–297.

Zobel, D.B.; Roth, L.F.; Hawk, G.M. 1985. Ecology, Pathology, and Management of Port-Orford-Cedar (*Chamaecyparis lawsoniana*). USDA-FS, Pacific Northwest Experiment Station General Technical Report PNW-184. 161 p.

Zobel, D.B.; Kitzmiller, J.; Sniezko, R.; [and others]. 2002. Range-wide Genetic Variation in Port-Orford-Cedar (*Cupressaceae, Chamaecyparis lawsoniana*): II. Timing of Height Growth. Journal of Sustainable Forestry 14: 33–49.

Zobel, D.B.; Kitzmiller, J.H.; Sniezko, R.A.; [and others]. 2003. Variation in Height Growth Phenology of Port-Orford-Cedar Seedlings. Journal of Sustainable Forestry. [*In press*]

Zobel, D.B.; Riley, L.; Kitzmiller, J.H. [and others]. 2001. Variations in Water Relations Characteristics of Terminal Shoots of Port-Orford-Cedar (*Chamaecyparis lawsoniana*) Seedlings. Tree Physiology 21:743–749.

References Online

http://jersey.uoregon.edu/~mstrick/AskGeoMan/geoQuerry23.html

http://jersey.uoregon.edu/~mstrick/GeoTours/Josephine%20Ophiolite/JoOphiolite.html

http://www.ga.usgs.gov/gis/iag.html

http://www.nwr.noaa.gov/

http://www.Sonoran.org [Sonoran Institute and USDI-BLM, Economic Profile System, (Tables and Graphs)]

http://www.fs.fed.us/r6/nr/fid/health/con-rpt-02.shtml

http://www.nwr.noaa.gov/

http://www.boe.ca.gov/proptaxes/pdf/caltimberharv 91-00.pdf [California State Board of Equalization, 1991–2001 California Timber Harvest by County]

http://www.odf.state.or.us/divisions/resource_policy/resource_planning/Annual_Reports [Oregon Department of Forestry Annual Western Oregon Harvest Reports, 1991–2001]

http://www.blandon.co.uk/forestry/species/hinoki.htm [2003, Japan's Forest Industry]

Glossary

Acre ~ A land area measurement based on horizontal plane; 43,560 square feet; 1/640th of a square mile; approximately 0.4 hectares; if square, nearly 209 feet on a side.

Adaptive management ~ A continuing process of action-based planning, monitoring, researching, evaluating, and adjusting with the objective of improving implementation and achieving the goals of the standards and guidelines.

Adaptive Management Areas ~ Land allocation under the Northwest Forest Plan; areas designated for development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives.

Administratively Withdrawn Areas ~ Areas removed from the suitable timber base through agency direction and land management plans.

Allele frequency ~ Frequency of alleles in a population. An allele is one of a pair (in diploid individual) or series (in a population) of genes located at the same locus in homologous chromosomes and controlling the same character.

Allozyme ~ Refers to segregating electrophoretic variants of enzymes.

Alluvium ~ Stream sediments and organic materials moved and deposited by the action of flowing water.

Alternative ~ One of several policies, plans, or projects proposed for making decisions.

Amphibians ~ Cold-blooded vertebrates, including frogs, toads, salamanders, and newts, having four limbs and glandular skin; tied to moist or aquatic habitats for all or at least part of their life cycle.

Angular canopy density ~ The quality of shade, determined by the position of the sun during the day and the influence of vegetation blocking the incoming radiation.

Arcuate ~ Having the form of a bow; curved.

Autecology ~ The branch of ecology that deals with the biological relationship between an individual organism or an individual species and its environment.

Biological evaluation ~ A documented FS review of activities in sufficient detail to determine how an action or proposed action may affect any threatened, endangered, proposed, or sensitive species.

Biological diversity ~ The variety of life and its processes.

Breeding ~ The science or art of changing the genetic constitution of a population of plants or animals.

Breeding block ~ A breeding block designates the geographic area which envelops a number of breeding zones.

Breeding zone ~ A breeding zone designates a unit of land in which an improved population of a species is being developed. Progeny testing and/or breeding activity is conducted to obtain an "improved" population (for one or more traits of interest) over time. The boundaries of a breeding zone may or may not coincide with seed zones. In many instances, a breeding zone covers multiple seed zones.

Buffer ~ In Alternatives 3 and 6, all lands within the currently uninfested 6th or 7th field watersheds (respectively) except stands containing POC (see Chapter 2).

Bureau assessment species ~ Plant and animal species on List 2 of the Oregon Natural Heritage Data Base, or those species on the Oregon List of Sensitive Wildlife Species (OAR 635100040), which are identified in BLM Instruction Memo No. OR9157, and are not included as Federal candidate, state listed, or Bureau sensitive species.

Bureau sensitive species ~ Plant or animal species eligible for Federal listed, Federal candidate, state listed, or state candidate (plant) status, or on List 1 in the Oregon Natural Heritage Data Base, or approved for this category by the State Director.

Candidate species ~ Those plant and animal species that, in the opinion of the USFWS or NOAA-NMFS, may qualify for listing as endangered or threatened. The USFWS recognizes two categories of candidates: Category 1 candidates are taxa for which the USFWS has on file sufficient information to support proposals for listing; Category 2 candidates are taxa for which information available to the USFWS indicates that proposing to list is possibly appropriate, but for which sufficient data are not currently available to support proposed rules.

Canopy cover ~ See *percent cover.*

Catchment ~ A delineated hydrologic unit depicting the location of a drainage area that is typically 1,000 to 10,000 acres in size; the 7th division level of the Nation's drainages; represented by extending the hydrologic unit code to 14 digits (*Source:* http://www.reo.gov/gis/projects/watersheds/Data_Standards2.htm). Also called *7th field watershed*.

Chronic ~ Marked by long duration or frequent recurrence.

Channel morphology ~ The form and arrangement of stream channels in watersheds.

Checkerboard ~ The land ownership pattern derived from having granted railroad rights to every other section for many miles either side of proposed railroad lines.

Cline ~ A geographic gradient, which is often associated with adaptive genetic response to the gradients.

Clone ~ For POC, a group of identical genotypes propagated by traditional method of rooted cuttings. Rooted cuttings are used to establish a containerized seed orchard and for root dip resistance testing.

Coarse woody debris ~ Portion of a tree that has fallen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter.

Common garden study ~ As the name implies, a common garden study is designed to compare variation patterns of a few to relatively large numbers of genetic identities (such as provenances, open-pollinated or controlled pollinated families, and clones), all grown in at least one, but frequently several, uniform test sites, or "gardens".

Compaction ~ See *soil compaction*.

Complete resistance (for POC) ~ POC seedlings or trees show no significant sign or symptom of infection after exposure to PL. In greenhouse root dip testing there is no visible sign of measurable root infection upon examining roots; in field tests tree survival is near expected levels and inconsistencies may be due to undetermined causes of mortality that occur. The underlying resistance mechanism(s) for complete resistance are unknown at this time, but preliminary analysis indicates this type of resistance shows major gene inheritance. The durability of complete resistance in POC will depend upon the particular type of resistance and attributes of the pathogen. There is no evidence to date of a virulent strain that overcomes complete resistance in POC. Normal infection is through the root tips, and it is possible that wounded roots would provide a different entry point for the pathogen.

Confined channel ~ A stream that is vertically contained, by incisement or hillslopes, and does not spread appreciably with increasing streamflow.

Congressionally Reserved Areas ~ Areas that require congressional enactment for their establishment, such as national parks, wild and scenic rivers, national recreation areas, national monuments, and wilderness. Also referred to as Congressional Reserves. Includes similar areas established by Executive order such as national monuments.

Conifer ~ Any of a group of needle- and cone-bearing evergreen trees.

Conservation genetics ~ The use of genetics to preserve species as dynamic entities that can evolve to cope with environmental change and thus minimize their risk of extinction.

Conservation agreement ~ A formal written document agreed to by USFWS and/or NOAA-NMFS and another Federal agency, Tribe, state agency, local government, or the private sector to achieve the conservation of candidate species through voluntary cooperation. It documents the specific actions and responsibilities for which each party agrees to be accountable. The objective of a conservation agreement is to reduce threats to a candidate species and/or its habitat. An effective conservation agreement may lower listing priority or eliminate the need to list a species.

Core ~ In Alternative 3 and 6, stands with POC within the currently uninfested 6th or 7th field watersheds (respectively) (see Chapter 2).

Cumulative effect ~ The impact which results from identified actions when they are added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Deme ~ a local group of interbreeding individuals.

Dendrochronology ~ A method of dating trees and natural events by examining the ages and ring patterns of forest trees and snags.

Discretionary roads ~ Roads not covered by reciprocal right-of-way agreements or other binding reservations preventing the agencies from unilaterally closing or otherwise preventing others from full use. See Encumbered Forest Roads section in Chapter 3&4.

Disease ~ An abnormal, injurious physiological condition brought about by a continuous irritation. Plant disease usually involves a complex relationship between a susceptible host, a conducive environment, and a causal agent called a pathogen.

Disjunct stands or populations ~ Stands or populations of trees that are separated in location and are not contiguous.

Diurnal ~ Day to night change, as with temperature.

Drainage ~ see *watershed*.

Dry season ~ From the Pathology section, generally between June 1 and September 30, when conditions are dry and temperatures typically exceed 68 degrees F.

Duff ~ An organic surface soil layer below the litter layer in which the original form of plant and animal matter cannot be identified with the unaided eye.

Ecological amplitude ~ The breadth of the biological and environmental requirements of a species such as temperature, moisture, soil types, hosts, and stand ages.

Ecosystem approach ~ A strategy or plan to manage ecosystems to provide for all associated organisms, as opposed to a strategy or plan for managing individual species.

Effective population size ~ The number of individuals that would give rise to the calculated sampling variance, or rate of inbreeding, if they bred in the manner of the idealized population; where idealized population is defined as one in which mating is random, migration is excluded, no mutation, generations are distinct, and no selection applied.

Effects ~ *Effects*, *impacts*, and *consequences* are synonymous. Effects may be either *direct*, which are caused by the action and occur at the same time and place; *indirect*, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable; or *cumulative*. Effects may fall in one of these categories: aesthetic, historic, cultural, economic, social, health, or ecological (such as effects on natural resources and on the components, structures, and functioning of affected ecosystems).

Effects ~ Analysis of environmental consequences of a proposed action.

Endangered species ~ Any plant or animal species in danger of extinction throughout all, or a significant portion of its range.

"Endangered Species Act" (ESA) ~ A law passed in 1973 to conserve species of wildlife and plants determined by the Director of the USFWS or the NOAA-NMFS to be endangered or threatened with extinction in all or a significant portion of its range. Among other measures, ESA requires all Federal agencies to conserve these species and consult with the USFWS or NOAA-Fisheries on Federal actions that may affect these species or their designated critical habitat.

Endemic or endemism ~ Unique to a specific locality or the condition of being unique to a specific locality.

Environment ~ The aggregate of physical, biological, economic, and social factors affecting organisms in an area.

Environmental analysis (EA) ~ An analysis of alternative actions and their predictable short-term and long-term environmental effects, incorporating physical, biological, economic, and social considerations.

Environmental impact statement (EIS) ~ A statement of the environmental effects of a proposed action and alternatives to it required for major Federal actions under Section 102 of the NEPA, and released to the public and other agencies for comment and review. It is a formal document that must follow the requirements of NEPA, the Council on Environmental Quality guidelines, and directives of the agency responsible for the project proposal.

Ephemeral stream ~ A channel that only flows water during and shortly after storm events.

Epidemic ~ A disease outbreak.

Epidemiology ~ Factors affecting outbreak and spread of an infectious disease.

Eradication ~ Removal of live POC around a PL infestation to keep PL from spreading.

Evolution ~ Long-time changes in gene frequency and phenotypic characteristics of a population or group of populations.

Evolutionary force ~ Processes which change gene frequencies over time; usually referenced as mutation, migration, and selection.

Ex situ conservation ~ Saving genes and genotypes offsite such as in the form of seed and clonal propagation, in order to preserve the genetic material over time.

Federal candidate taxa ~ A classification category for those threatened, endangered, and sensitive plants or animals listed in the *Federal Register*, and other plants recommended for addition to the Federal candidate list.

Fen ~ A wetland of slow moving, often alkaline water with sedge (not sphagnum) peat underfoot.

Field water potential ~ An integration of the net effect of plant water relations' characteristics and their interaction with the environment. Often evaluated by inserting plant tissue into

an enclosed chamber and measuring the amount of pressure (expressed in milli-pascals, or MPa) required to just begin to force moisture from the severed stem. Commonly assessed at pre-dawn, when the plants are least stressed by the environment and again at mid-day when stresses are usually higher.

Fire management plan ~ A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land or resource management plan.

Floodplain ~ That area along stream channel margins that can be inundated during flows that are greater than the normal channel dimensions; sometimes called the *floodprone* area.

Flora ~ Plants.

Fluvial erosion ~ The action of stream bank or bed removal by the forces of flowing water.

Forb ~ A herbaceous plant that is not a graminoid.

Forest Ecosystem Management Assessment Team (FEMAT) ~ An interagency, interdisciplinary team of scientists, economists, and sociologists led by Dr. Jack Ward Thomas and chartered to review proposals for management of Federal forests within the range of the northern spotted owl. The team produced a report assessing ten options in detail, which were used as a basis for developing the Northwest Forest Plan.

Founder effects ~ When a species colonizes a new area, the founding members are referred to as the founders of the new population. If the founding number of individuals are few, a substantial amount of genetic drift can occur.

Full-sibs ~ Trees with both parents in common.

Gene flow ~ The spread of genes through crossing.

Genecology ~ A combination of ecology and genetics.

Genetic drift ~ Change in gene frequency and population structure due to chance rather than by selection, and usually more pronounced in small populations.

Genetic structure ~ The relative pattern of genetic variation and differentiation among populations or segments of the genome. Change in genetic structure can be summarized by the changes in allele frequencies, heterozygosity, and genetic variances and covariances. Genetic variation/structure is most often measured indirectly by the use of molecular markers and quantitative genetic assessments. Changes in structure can be measured indirectly over time by the above methods, or can be inferred by population and quantitative genetics theory.

Graminoid ~ All grasses and grass-like plants, including sedges and rushes.

Ground-based logging system ~ Tractor or cable partial suspension (as opposed to cable full suspension or helicopter).

Growth phenology ~ The timing of periodic phenomena such as growth initiation, growth cessation, especially as related to seasonal changes in temperature, moisture, and photoperiod.

Habitat ~ The sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

Habitat type ~ An aggregation of all land areas potentially capable of producing similar plant communities at climax stage.

Half-sibs ~ Trees with one parent (usually the female) in common.

Headwaters ~ Uppermost contributing drainage area in a watershed; also refers to the start of visible streamflow in a channel.

Heavy equipment ~ Wheeled or tracked equipment other than highway vehicles, used for construction, road maintenance, logging, pipe-laying, and similar work; some examples are backhoes, Bobcats®, skidders, yarders, and graders.

Heterozygosity ~ A measure or reference to the amount of heterozygous condition of populations or species. The proportion of loci that are polymorphic (that is, more than one form) among the loci tested. The average heterozygosity refers to the frequency of heterozygotes averaged over the loci tested.

Hierarchical model ~ One or more sampling units are represented within the experiment. The units are ordered and variation among the sampling units is assessed. The general ordering or listing of units is referred to as the hierarchy in the model formulation and subsequent statistical analysis.

High-risk site ~ Low-lying wet areas (infected or not) that are located downslope from already infected areas or below likely sites for future introductions, especially roads; they include streams, drainage ditches, gullies, swamps, seeps, ponds, lakes, and concave low-lying areas where water collects during rainy weather.

Host ~ A living plant that affords subsistence to a parasite.

Hypha ~ One of the strands or filaments that make up the mycelium of a fungus or fungus-like organism.

Impact ~ A spatial or temporal change in the environment caused by human activity.

Inbreeding ~ Mating between close relatives; often associated with mating in a population consisting of a few individuals.

Infected ~ Refers to the attack of a living organism by a pathogen (the pathogen enters and establishes a pathogenic relationship with its host).

Infested ~ Refers to soil or other substratum that is occupied by a pathogen (used in the sense of "contaminated").

Inoculate ~ To bring a pathogen into contact with a host plant or plant organ.

Inoculum ~ (1) The substance, generally a pathogen, used for inoculating; (2) to put a micro-organism or virus, or a substance containing one of the aforementioned, into an organism or substratum. Also, pathologists use these terms to apply both to inoculations conducted by humans and to inoculations that occur in nature.

In situ conservation ~ Management of populations onsite to conserve the gene pool in the context of the natural evolutionary processes that occur over time.

Interdisciplinary team (ID team) ~ A group of individuals with varying areas of specialty assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately analyze the problem and propose action.

Intermittent stream ~ A channel whose base level is above the water table and has a duration of streamflow greater than 30 days, but less than all year. Normally, this type of channel has enough streampower to cause scour or deposition of sediments.

Isohyet ~ A line drawn on a map connecting points that receive equal amounts of rainfall.

Issue ~ A point, matter, or question of public discussion or interest to be addressed or decided through the planning process.

Land management ~ Intentional process of planning, organizing, programming, coordinating, directing, and controlling land use actions.

Land Use Allocations (LUAs) or Land Allocations ~ Use in this SEIS is limited to the seven designations of management emphasis identified in land and resource management plans for each administrative unit as a result of the 1994 "Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl." The seven land allocations are Congressionally Reserve, Late-Successional Reserve, Adaptive Management Area, Managed Late-Successional Areas, Administratively Withdrawn, Riparian Reserve, and Matrix.

Landscape ~ A heterogeneous land area with interacting ecosystems repeated in similar form throughout.

Large woody debris ~ Wood in a stream channel larger than 6 inches in diameter and 10 feet long.

Late-successional forests ~ Forest stands consisting of trees, structural attributes, supporting biological communities, and processes associated with old-growth and/or mature forests. Forest seral stages that include mature and old-growth age classes. Age is not necessarily a defining characteristic but has been used as a proxy or indicator in some usages. Minimum ages are typically 80 to 130 years, depending on the site quality, species, rate of stand development, and other factors.

Late-Successional Reserve ~ Land allocation under the Northwest Forest Plan with the objective to protect and enhance conditions of late-successional and old-growth forest ecosystems that serve as habitat for late-successional and old-growth forest-related species, including the northern spotted owl. Limited stand management is permitted, subject to review by the Regional Ecosystem Office.

Line officer ~ In the BLM and FS, the individual managers in the direct chain of command.

Locus ~ The fixed position of a gene on its chromosome.

Low-risk site ~ A site with characteristics unfavorable for spread and infection by a particular pathogen.

Maintenance ~ The retention of Port-Orford-cedar.

Managed Late-Successional Areas ~ Land allocation under the Northwest Forest Plan; similar to Late-Successional Reserves, but identified for certain owl territories in the drier provinces where regular and frequent fire is a natural part of the ecosystem. Certain silvicultural treatments and fire hazard reduction treatments are allowed to help prevent large-scale disturbance such as fires of high intensity or severity, disease, and insect epidemics.

Management indicator species ~ A species selected because its welfare is presumed to be an indicator of the welfare of other species sharing similar habitat requirements. A species of fish, wildlife, or plants, which reflect ecological changes caused by land management activities.

Mating systems ~ Refers to the crossing event or prevalent breeding method within a species. Mating systems can usually be defined as predominately selfing, predominately outcrossing, or mixed-selfing and outcrossing. Conifers are general outcrossing, but selfing also occurs to variable degrees within a respective species.

Matrix ~ Federal lands outside of reserves, withdrawn areas, managed Late-Successional Areas, and Adaptive Management Areas.

Mature forest ~ A subset of late-successional forests. Mature forests are characterized by the onset of slowed height growth, crown expansion, heavier limbs, gaps, some mortality in larger trees, and appearance of more shade-tolerant species or additional crown layers. In Douglas-fir west of the Cascades, this stage typically begins between 80 and 130 years, depending on site conditions and stand history.

Microclimate ~ The suite of climatic conditions measured in localized areas near the Earth's surface. Microclimate variables important to habitat may include temperature, light, wind speed, and moisture.

Migration ~ The movement of genes from one population to another population; usually referenced as the proportion of new immigrants which move to another population in any one generation.

Mitigation measures ~ Modifications of actions taken to: (1) avoid impacts by not taking a certain action or parts of an action; (2) minimize impacts by limiting the degree or magnitude of the action and its implementation; (3) rectify impacts by repairing, rehabilitating, or restoring the affected environment; (4) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or, (5) compensate for impacts by replacing or providing substitute resources or environments.

Mollusks ~ Invertebrate animals (such as slugs, snails, clams, or squids) that have a soft unsegmented body usually enclosed in a calcareous shell.

Monitoring ~ A process of collecting information to evaluate if objectives and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

Monitoring and evaluation ~ The evaluation, on a sample basis, of management practices to determine how well objectives are being met, as well as the effects of those management practices on the land and environment.

Mutation ~ A sudden change in genotype; usually a gene mutation (change in single gene) is inferred.

Mycelium ~ The mass of hyphae that makes up the body of a fungus or fungus-like organism.

Mycorrhiza ~ Underground fungi that provide a close physical association between the fungus and the roots of a plant, from which both the fungus and plant appear to benefit. A mycorrhizal root takes up nutrients more efficiently than one not associated with mycorrhiza. Mycorrhizal fungi (also known as ectomycorrhizal) are essential for host plant nutrient uptake and play important roles in nutrient cycling in many forests. Studies from the Pacific Northwest indicate that forest management activities can reduce populations of mycorrhizal fungi and forest regeneration success.

"National Environmental Policy Act" (NEPA) ~ An Act passed in 1969 to declare a national policy that encourages productive and enjoyable harmony between humankind and the environment, promotes efforts that prevent or eliminate damage to the environment and biosphere, stimulates the health and welfare of humanity, enriches the understanding of the ecological systems and natural resources important to the nation, and establishes a Council on Environmental Quality.

"National Forest Management Act" (NFMA) ~ A law passed in 1976 as an amendment to the "Forest and Rangeland Renewable Resources Planning Act," requiring preparation of forest plans and the preparation of regulations to guide that development.

Non-vertebrate species ~ A species that does not have a backbone.

Northwest Forest Plan ~ Coordinated ecosystem management direction incorporated into land and resource management plans for lands administered by the BLM and the FS within the range of the northern spotted owl. In April 1993, President Clinton directed his cabinet to craft a balanced, comprehensive, and long-term policy for management of over 24 million

acres of public land within the range of the northern spotted owl. A Forest Ecosystem Management Assessment Team (FEMAT) was chartered to develop a series of options. These options were modified in response to public comment and additional analysis and then analyzed in a final SEIS. A record of decision was signed on April 13, 1994, by the Secretaries of the Department of Agriculture and the Department of Interior to adopt "Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl." The record of decision, including the "Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl" is referred to as the Northwest Forest Plan. The Northwest Forest Plan is not a plan in the agency planning regulations sense; the term instead refers collectively to the 1994 amendment to existing agency land and resource management plans or to the specific standards and guidelines for late-successional species incorporated into subsequent land and resource management plans.

Noxious weed ~ A plant species that is highly injurious or destructive and has a great potential for economic impact; a plant species that is listed as noxious by the State of Oregon.

Off-highway vehicle ~ Any motorized vehicle capable of, or designed for, travel on land, water, or natural terrain. The term will be used in place of *off-road vehicle* to comply with the purposes of Executive Orders 11644 and 11989 (although the definition for both terms is the same).

Old-growth forest ~ An ecosystem distinguished by old trees and related structural attributes. Old growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include tree size, accumulations of large dead woody material, number of canopy layers, species, composition, and ecosystem function. More specific parameters applicable to various species are available in the 1993 "Interim Old Growth Definitions" (USDA-FS Region 6). The Northwest Forest Plan SEIS and FEMAT describe old-growth forest as a forest stand usually at least 180- to 220-years old with moderate-to-high canopy closure; a multi-layered, multi-species canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground.

Pathogen ~ A parasite able to cause disease in a particular host or range of hosts.

Percent cover ~ Usually the percent of the ground overtopped by the crowns of trees or other plants.

Perennial stream ~ A stream that flows all year.

Planning area ~ All of the lands within a Federal agency's management boundary addressed in land management plans. In this case, the portions of the Coos Bay, Medford, and Roseburg BLM Districts and the Siskiyou NF that lie within the natural range of POC.

Plant association ~ A plant community type based on land management potential, successional patterns, and species composition.

Plant community ~ An association of plants of various species found growing together in different areas with similar site characteristics.

Pourpoint ~ Upper extent of streamflow in a drainage system. This point can vary depending upon antecedent soils moisture conditions and prevailing weather.

Prescribed fire ~ Any fire ignited by management actions to meet specific objectives.

Prevent ~ As in *prevent new infections*: An objective, not a requirement.

Propagules ~ Any of various usually vegetative portions of a plant, such as a bud or other offshoot, that aid in dispersal of the species and from which a new individual may develop.

Proposed species ~ Any plant or animal species that is proposed by the USFWS and or NOAA-NMFS in a *Federal Register* notice to be listed as threatened or endangered.

Putative ~ Generally regarded as such; supposed.

Range of the northern spotted owl ~ Area generally comprised of lands in western portions of Washington, Oregon, and northern California.

Rare ~ A rare taxon can be (1) broadly distributed, but never abundant were found; (2) narrowly distributed or clumped, and abundant were found; or (3) narrowly distributed or clumped, and not abundant were found.

Record of decision ~ A document separate from, but associated with, an environmental impact statement that: (1) states the management decision; (2) states the reason for that decision, (3) identifies all alternatives including the environmentally preferable and selected alternatives; and (4) states whether all practicable measures to avoid environmental harm from the selected alternative have been adopted, and if not, why not.

Reforestation ~ The natural or artificial restocking of an area with forest trees.

Reserves ~ Congressionally Reserved Areas (such as wilderness) and land allocations that were designated under the Northwest Forest Plan, including Late-Successional Reserves, Riparian Reserves, and Managed Late-Successional Areas. Reserves help to protect and enhance conditions of late-successional and old-growth forest ecosystems. Stand management actions are either prohibited or limited within these allocations. The likelihood of maintaining a connected viable late-successional ecosystem was found to be directly related to the amount of late-successional forest in reserve status.

Resistant ~ Possessing qualities that hinder the development of a given pathogen.

Restoration ~ Planting disease and nondisease-resistant Port-Orford-cedar.

Restricted road ~ A NF road or segment, which is restricted from a certain type of use or all uses during certain seasons of the year or yearlong. The use being restricted and the time period must be specified. The closure is legal when the Forest Supervisor has issued and posted an order in accordance with 36 CFR 261.

Riparian ~ Pertaining to areas of land directly influence by water. Riparian areas usually have visible vegetative or physical characteristics reflecting this water influence. Streamsides, lake borders, or marshes are typical riparian areas. Vegetation bordering watercourses, lakes, or swamps; it requires a high water table. In this SEIS, sometimes used as substitute for "high-risk sites," although the two are not synonymous (see text of respective sections).

Riparian area ~ The shoreline zone including floodplains, along a stream or lake, affected by varying levels of subsurface water storage conditions; favoring water tolerant plants and forest vegetation. This linear geographic area is oftentimes extended upslope to include the direct influence of forest trees or to a transitional area between aquatic and terrestrial communities.

Riparian Reserves ~ Areas along live and intermittent streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. Riparian Reserves are important to the terrestrial ecosystem as well, serving as dispersal habitat for certain terrestrial species.

Sanitation ~ Removal of POC from infested areas along roads, trails, or around uninfested POC to prevent spores from being generated and reaching nearby uninfested stands, or roads where they could be picked-up by passing traffic. Also removal of POC from uninfested areas along roads, trails, or around infested areas to prevent spores falling off vehicles or originating from the nearby infested areas from reaching a host and thereby spreading the disease.

Seed zone ~ A seed zone is an area where seed can be moved from a source or seed collection location to a planting location. General adaptation over the long term is inferred within the movement or seed transfer within the respective zone. Most seed zones have a set geographic area where movement is restricted to specific elevation bands (300 meters).

Selection pressure ~ The strength of the tendency to eliminate undesirable genotypes or phenotypes, usually expressed in terms of a selection differential or as a total of the proportion of total trees which are selected.

Sensitive species ~ Those species that: (1) have appeared in the *Federal Register* as proposed for classification and are under consideration for official listing as endangered or threatened species; (2) are on an official state list; or, (3) are recognized by the implementing agencies as needing special management to prevent their being placed on Federal or state lists. Also see *special status species*.

Seral stages ~ The series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage.

7th field watershed ~ A delineated hydrologic unit depicting the location of a drainage area that is typically 1,000 to 10,000 acres in size; the 7th division level of the Nation's drainages; represented by extending the hydrologic unit code to 14 digits (*Source:* http://www.reo.gov/gis/projects/watersheds/Data_Standards2.htm). Also called *catchment.*

6th field watershed ~ A delineated hydrologic unit depicting the location of a drainage area that is typically 10,000 to 40,000 acres in size (it can be as small as 3,000 acres); the 6th division level of the Nation's drainages; represented by extending the 10-digit hydrologic unit

code to 12 digits (*Source:* http://wwwga.usgs.gov/gis/iag.html and http://www.reo.gov/gis/projects/watersheds/Data_Standards2.htm). Also called *subwatershed*.

Soil compaction ~ An increase in bulk density (weight per unit volume) and a decrease in soil porosity resulting from applied loads, vibration, or pressure.

Serpentine ~ A group of common rock-forming minerals such as olivine and pyroxens which are rich in iron, magnesium, and silicate oxides. Serpentines are always secondary minerals and are found in both igneous and metamorphic rocks.

Snag ~ A standing dead tree.

Species ~ A class of individuals having some common characteristics or qualities. In these Standards and Guidelines, synonymous with taxon, which may include subspecies, groups, or guilds.

Special status species ~ As used in this SEIS, refers only to the following species categories that are included under agency species conservation policies: Oregon/Washington BLM—Bureau tracking, Bureau assessment, and Bureau sensitive (BLM Manual 6840; Instruction Memorandum No. OR-2003-054; Instruction Memorandum No. OR-91-57); California BLM—Bureau sensitive (BLM Manual 6840; Manual Supplement 6840.06, Plant Management); Forest Service Region 5—sensitive (Forest Service Manual 2670); Forest Service Region 6—sensitive (Forest Service Manual 2670).

Spore ~ A general term for a reproductive structure in fungi, bacteria, oomycetes, and cryptogams (analogous to the seed of a green plant).

Stand (tree stand) ~ An aggregation of trees occupying a specific area and sufficiently uniform in composition, age, arrangement, and condition to be distinguishable from the forest in adjoining areas.

Standards and guidelines ~ The rules and limits governing actions, as well as the principles specifying the environmental conditions or levels to be achieved and maintained; synonymous with *measures* and *management direction*.

Stochastic ~ The presence of a random variable (for example, the probability of large storms occurring in weather patterns).

Stream order ~ A system of numbering stream channels, where the highest channels in a watershed are labeled order +1, the joining of two like +1 is a +2 Order, the joining of two like +2 is a +3 Order and so forth. The main stream is always the highest order.

Substrate ~ Any object or material on which an organism grows or is attached.

Subwatershed ~ A delineated hydrologic unit depicting the location of a drainage area that is typically 10,000 to 40,000 acres in size (it can be as small as 3,000 acres); the 6th division level of the Nation's drainages; represented by extending the 10-digit hydrologic unit code to 12 digits (*Source:* http://wwwga.usgs.gov/gis/iag.html and http://www.reo.gov/gis/projects/watersheds/Data_Standards2.htm).

Succession ~ A series of dynamic changes by which one group of organisms succeeds another through stages leading to a potential natural community or climax. An example is development of a series of plant communities (called seral stages) following a major disturbance.

Supplemental environmental impact statement (SEIS) ~ As defined by NEPA, a supplement to an existing EIS is prepared when: (1) the agency makes substantial changes to the proposed action that are relevant to environmental concerns; (2) there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts; or, (3) the agency determines that the purposes of NEPA would be furthered by doing so.

Surfaced roads ~ Rocked or paved roads.

Survey and manage ~ Mitigation measure adopted as a set of standards and guidelines within the Northwest Forest Plan record of decision and replaced with standards and guidelines in 2001 (record of decision) intended to mitigate impacts of land management efforts on those species that are closely associated with late-successional or old-growth forests whose long-term persistence is a concern. This mitigation measure applies to all land allocations and requires land managers to take certain actions relative to species of plants and animals, particularly some amphibians, bryophytes, lichens, mollusks, vascular plants, fungi, and arthropods, which are rare or about which little is known. These actions include: (1) manage known sites; (2) survey prior to habitat-disturbing activities; and (3) conduct extensive and general regional (strategic) surveys.

Susceptible ~ Lacking the inherant ability to resist disease or attack by a given pathogen (not immune).

Talus ~ The loose accumulation of fragmented rock material on slopes, such as at the base of a cliff.

Threatened species ~ Any species defined through the "Endangered Species Act" as likely to become endangered within the foreseeable future throughout all or a significant portion of its range and published in the *Federal Register*.

Tracking species ~ A special status species category established by Oregon/Washington BLM. The purpose of tracking species is to enable an early warning for species which may become threatened or endangered in the future. BLM districts in Oregon and Washington are encouraged to collect occurrence data on species for which more information is needed to determine status within the state or which no longer need active management. Until status of such species changes to Federal or state listed, candidate of assessment species, tracking species will not be considered as special status species for management purposes.

Ultramafic ~ Igneous rocks composed chiefly of mafic minerals such as augite or olivine. A general name for plutonic rocks with color index M greater than or equal to 90, including, among others, dunite, peridotite, and pyroxenite.

Unconfined channel ~ A stream that can access the floodplain when flows are greater than the normal channel dimensions.

Understory ~ The trees and other woody species growing under the canopies of larger adjacent trees and other woody growth.

Upland ~ Out of (above) the riparian zone.

Viability ~ Ability of a wildlife or plant population to maintain sufficient size to persist over time in spite of normal fluctuations in numbers, usually expressed as a probability of maintaining a specific population for a specified period.

Viable population ~ A wildlife or plant population that contains an adequate number of reproductive individuals appropriately distributed on the planning area to ensure the long-term existence of the species.

Watershed ~ That land area that is separated from other land areas by a divide, contributing water or snowmelt, organic material, sediments and nutrients to a stream; synonymous with catchment.

Well-distributed ~ Distribution sufficient to permit normal biological function and species interactions, considering life history characteristics of the species and the habitats for which it is specifically adapted.

Wet season ~ From Pathology section, typically from October 1 until May 31, when soils are usually wet and temperatures are 50 to 68 degrees F or below.

Wetlands ~ Areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, wet meadows, river overflows, mud flats, and natural ponds.

Width/depth ratio ~ The width of a stream, divided by its mean depth.

Wilderness ~ Areas designated by congressional action under the 1964 "Wilderness Act." Wilderness is defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; include at least 5,000 acres, or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecological and geologic interest.

Wildland fire ~ Any non-structure fire, other than prescribed fire, that occurs in the wildland.

Wildland fire suppression ~ An appropriate management response to wildland fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire.

Wildland fire use ~ The management of naturally-ignited wildland fires to accomplish specific pre-stated resource management objectives in pre-defined geographic areas outlined in fire management plans.

Distribution List

County and State Entities

Association of Oregon Counties
Association of O&C Counties
California Conservation Corps
California State Parks, Redwood Coast
Coos County Commissioners
Curry County Commissioners
Douglas County Board of Commissioners
Humboldt State University, Department of Biological Sciences
Humboldt State University, Department of Forestry
Josephine County Board of Commissioners
Montana State University
Oregon Department of Fish and Wildlife
Oregon Department of Forestry
Oregon State University, Botany and Plant Pathology
Redwood National & State Parks
Roseburg City Council
University of California, Department of Environmental Studies

Elected Officials

U.S. Representative Peter DeFazio (Oregon)
U.S. Senator Gordon Smith (Oregon)
U.S. Senator Ron Wyden (Oregon)
Oregon State Representative Wayne Krieger
Oregon State Representative Susan Morgan
Oregon State Representative Joanne Verger
Oregon State Senator Jason Atkinson
Oregon State Senator Ken Messerle

Federal Agencies

U.S. Department of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management
  - Roseburg District, Oregon
  - Arcata Field Office, California
  - Coos Bay District, Oregon
  - Eugene District, Oregon
  - Medford District, Oregon
- National Park Service
  - Redwood National Park
- Office of the Solicitor (Pacific Northwest Region)
- U.S. Fish & Wildlife Service
  - Roseburg Field Office

U.S. Attorney's Office, District of Oregon
U.S. Environmental Protection Agency, Region 10

U.S. Department of Agriculture
- Forest Service
  - Chico Genetic Resource Center
  - Dorena Genetic Resource Center
  - J. Herbert Stone Nursery
  - Klamath National Forest
  - Natural Resource Information System-Terra
  - Pacific Northwest Regional Office
  - Pacific Southwest Redwood Sciences Lab
  - Pacific Southwest Regional Office
  - Shasta-Trinity National Forest
  - Siskiyou and Rogue River National Forests
    - Chetco Ranger District
    - Gold Beach Ranger District
    - Powers Ranger District
  - Siuslaw National Forest
    - Oregon Dunes National Recreation Area
  - Six Rivers National Forest
    - Smith River National Recreation Area
  - Umpqua National Forest
- Office of General Counsel
- National Oceanic and Atmospheric Administration-Fisheries

Libraries

Ashland Public Library
Bandon Public Library
Chetco Public Library
Coos Bay Public Library
Coquille Public Library
Curry County Public Library
Del Norte County Library
Douglas County Library
Flora M. Laird Memorial Library
Humboldt State University Library
Jackson County Library System
Jacksonville Public Library
North Bend Public Library
Southwestern Oregon Community College Library
Southern Oregon University Library

Organizations and Businesses

American Forest Resources Council
Barnes & Associates, Inc.
C&D Lumber Company
California Native Plant Society
Californians for Alternatives to Toxins
Douglas Timber Operators
Environmental Protection Information Center

Juniper Ridge Western Wild Goods
Kalmiopsis Audubon Society
Klamath Forest Alliance
Klamath Siskiyou Wildlands Center
Lost Coast 4X4s
Menasha Forest Products
Northcoast Environmental Center
Northwest Environmental Defense Center
Northwest Trail Riders
Oregon Natural Heritage Program
Oregon Natural Resources Council
Plum Creek Timber Company
Public Lands Foundation
Rose City Archery
Siskiyou Project
Southern Oregon Timber Industry Association
The Nature Conservancy of Oregon
The Wilderness Society
Umpqua Valley Audubon Society
Umpqua Watersheds
Wildwood Consulting

Tribes

Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians
Coquille Indian Tribe
Hoopa Tribe
Round Valley Indian Tribes
Yurok Tribe

Others

Thomas Amaroli
Candy Anderson
J. Bogrett
Ronald A. Brown
Mary L. Cammann
Bruce Campbell
Sylvia Cardella
David Carter
Eloise Casavan
Stephanie Christopher
Lori Cooper
Jerry Dawson
Betty Denton
Dane Durham
Francis Eatherington
Doug Fischer
Ken Fitch
Narada Golden

Mariam B. Graham
Bob Gunther
Everett Hansen
Melody Henderson
Dan E. Hill
Bud Hockstra
Libby Ingalls
Shirley Jantz
Thomas Jimerson
Erik Jules
Matt Kauffman
Larry Kellogg
Ted Kennel
Hugh Kern
John Kohler
Frank Lang
Tim LaVerne
Philip Lewin
Tryphena Lewis
Leigh Ann Lipscomb-Kern
Gretchen Lohry-Smith
Paul Lufkin
Caroline MacDougall
Peter Matteson
Kim Mattson
Jim Maurer
Stephanie McKnight
Richard McNamara
David Mildrexler
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Sam Milo
Rich Nawa
James E. Nielsen
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Tim Scullen
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Eric Stone
Meera Subramanian
Curt Townsend
Joan Tyler
Barbara Ullian
Ann Vileisis
Kristin Vogel
Kurt Volckmar
Roland Weidenkeller
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Donald B. Zobel
Carrie Zoll

Index

Areas of Critical Environmental Concern ..... 2-20, 3&4-140, A-75, A-78, A-167
Assumptions ..... 2-33, 3&4-1, 3&4-3, 3&4-16, 34-18, 3&4-47, A-46, A-90, A-94, A-123, A-125–130, A-137, A-161
Biscuit Fire ..... 1-4, 2-36, 3&4-28, 3&4-31, 3&4-60, 3&4-73, 3&4-126, 3&4-128–129, 3&4-160, A-1, A-89, A-111, A-13, A-164, A-165, A-174
Breeding zones ..... 2-11, 2-26–27, 2-46, 3&4-18, 3&4-74, 3&4-103, 3&4-109, 3&4-110, 3&4-117, 3&4-120–123, 5-30, A-46, A-93, A-161–163
Buffers ..... 2-10–11, 2-23, 2-24, 2-27–28, 2-30, 3&4-93, 5-30, A-111, A-153, A-164
Checkerboard lands ..... 374-10, 3&4-15, 3&4-23, 3&4-29, 3&4-129, 3&5-158, 5-30, A-106, A-109, A-116–117
Clorox bleach ..... 2-17, 2-20, 2-22, 3&4-92, 3&4-100, A-1, A-40–43, A-71, A-171–174
Cores ..... 2-10, 2-23–24, 2-27–30, 3&4-50, 3&4-74, 3&4-93, 3&4-104, 3&4-124, 5-31, A-111–112, A-114, A-153, A-164
Court decisions S-1, 2-5–6, A-87, A-93, A-96, A-117, A-123
Cumulative effects ..... 1-4, 2-5–6, 2-10, 3&4-1, 3&4-5, 3&4-7, 3&4-75, 3&4-97, 5-31, A-36, A-72, A-93, A-123, A-141, A-156
Current vegetation survey (CVS) ..... 3&4-12, 3&4-32, 3&4-52, A-133–134, A-143, A-175
Genetic diversity ..... 2-16, 2-19, 2-26, 3&4-50, 3&4-63, 3&4-106, 3&4-110, 3&4-112–114, A-26, A-86, A-113, A-145, A-160
Geographical information system (GIS) ..... 3&4-1, 3&4-29, 3&4-52, A-28, A-131, A-133, A-134
Jobs ..... 3&4-161, A-169
Mining ..... 1-6, 2-5, 2-35, 2-38, 3&4-2, 3&4-51, 3&4-154–155, A-75, A-95, A-106, A-138, A-142, A-171
Monitoring ..... S-7, 2-3–4, 2-10, 2-13, 2-15, 3&4-39, 3&4-70, 3&4-157, 3&4-159, 5-38, A-26, A-33, A-38–39, A-44–45, A-49, A-96, A-135, A-147, A-156, A-161, A-172, A-174, A-175
National parks and monuments ..... 2-10, 2-14, 3&4-8, 3&4-26, A-123
Oregon Dunes National Recreation Area ..... 2-6, 3&4-8, 3&4-23, A-173
Pacific yew ..... 3&4-4, 3&4-35, 3&4-105–106, A-32, A-37, A-159–160
Planning area ..... 2-7, 3&4-7, 5-39
Probable sale quantity (PSQ) ..... 2-37, 3&4-2, 3&4-9, 3&4-147–152, 3&4-162, A-124
Reciprocal rights-of-way ..... 2-19, 3&4-1, 3&4-15–16, 3&4-94, A-109, A-117–118
Research natural areas ..... 2-20, 3&4-24, 3&4-29, 3&4-114, 3&4-141, A-29, A-167
Resistance breeding ..... 2-3, 2-10–11, 2-14, 2-16, 2-25, 2-46, 3&4-2, 3&4-4, 3&4-103, 3&4-116, 3&4-159, A-25, A-93, A-121–122, A-145, A-160
Roadless areas ..... 2-19, 2-35, 3&4-51, 3&4-128, 3&4-147, A-106, A-119
Sensitive species ..... 3&4-72, 3&4-74–75, 5-41, A-59–60, A-62, A-66, A-69, A-148
Special status species ..... 3&4-74–75, 3&4-77, 5-42, A-58–59, A-64–65, A-124, A-148–149, A-159
Sudden oak death ..... 2-14, 2-39, 3&4-17, 3&4-71, 3&4-120, A-97
Ultramafic soils ..... 1-1, 3&4-19, 3&4-26, 3&4-52–53, 3&4-58–59, 3&4-64, 3&4-68–69, 3&4-79, 3&4-84–86, 3&4-95–96, 5-43, A-73–74, A-144, A-146, A-148, A-150–152, A-154, A-157–158
Washing ..... 2-16–17, 2-20–22, 3&4-40–41, 3&4-73, 3&4-100, A-25, A-28, A-107–108, A-172, A-191

Appendices —

Changes Between Draft and Final

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.

Changes/edits were made to:

- Describe how direction in Appendix 3 relates to the alternatives;
- add additional information about Clorox including a description of fish-killing spills that happened during the Biscuit Fire in 2002 to Appendix 4;
- replace the direction for developing a resistance seed deployment strategy in Appendix 6 with a "planting assumption" describing the amount and location of expected resistant seedling planting and describing how it is expected to grow;
- add the draft Biological Assessment for "Endangered Species Act"-listed fish to Appendix 7;
- add Appendix 10 to respond to substantive public comments;
- add Appendix 11 to display the letter received from government agencies;
- add Appendix 12 to list the uninfested watersheds for Alternatives 3 and 6;
- add Appendix 13 to include an updated equipment cleaning checklist.

Appendix 1: Port-Orford-Cedar Management Guidelines

The "Port-Orford-Cedar Management Guidelines" (1994) are included here because they are part of current management direction for the Roseburg, Medford, and Coos Bay Bureau of Land Management (BLM) Districts referenced in the description of Alternative 1 in Chapter 2. The document was retyped in its entirety during the preparation of the draft supplemental environmental impact statement (SEIS), and any differences between this version and the original are editorial only. Note that the Table of Contents page numbers for these Guidelines have been changed to reflect formatting for insertion into this document. Note also that the reprinted Guidelines have their own appendices (Appendix 1–4), that should not be confused with the appendices (Appendix 1–11) for this SEIS.

PORT-ORFORD-CEDAR MANAGEMENT GUIDELINES

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

September 1, 1994

Prepared by:

Frank Betlejewski
Forester
Medford District

[Note: This document was retyped during the preparation of the draft Port-Orford-Cedar Supplemental Environmental Impact Statement. Any differences between this version and the original are editorial/formatting only.]

PORT-ORFORD-CEDAR MANAGEMENT GUIDELINES

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

TABLE OF CONTENTS

I. INTRODUCTION ..... [A-4]

II. *PHYTOPHTHORA LATERALIS* AND PORT-ORFORD-CEDAR ..... [A-4]

III. *PHYTOPHTHORA LATRERALIS* AND PACIFIC YEW ..... [A-5]

IV. MANAGEMENT OBJECTIVES FOR PORT-ORFORD-CEDAR ..... [A-5]

V. IMPLEMENTATION STRATEGY TO ACHIEVE PORT-ORFORD-CEDAR MANAGEMENT OBJECTIVES ..... [A-6]

A. Proactive management: limit the spread of *Phytophthora lateralis* and reduce the number of infected areas ..... [A-6]
B. Retain Port-Orford-cedar as a species, identify resistant individuals, and incorporate them into a tree improvement program ..... [A-7]
C. Incorporate *Phytophthora lateralis* control strategies as management objectives in Riparian Reserves, Late-Successional Reserves, and in the Matrix ..... [A-9]
1. Riparian Reserves ..... [A-9]
2. Late-Successional Reserves ..... [A-10]
3. Matrix ..... [A-11]
D. Provide Port-Orford-cedar as a primary forest product ..... [A-12]
E. Public Involvement ..... [A-12]
F. Develop a budget and implementation schedule for the Port-Orford-Cedar Program ..... [A-12]

VI. MITIGATION MEASURES FOR TIMBER SALE AND SERVICE CONTRACTS ..... [A-13]

APPENDICES ..... [A-15]

Appendix 1: Synopsis of Region 5 and 6 Port-Orford-Cedar Coordinating Group Action Plan ..... [A-15]
Appendix 2: General Specifications for a Washing Station ..... [A-17]
Appendix 3: Equipment Cleaning Checklist ..... [A-18]
Appendix 4: Project Analysis and Implementation ..... [A-19]

ACKNOWLEDGEMENTS ..... [A-20]

PEER REVIEWERS ..... [A-20]

REFERENCES ..... [A-22]

I. INTRODUCTION

POC (*Chamaecyparis lawsoniana* [A. Murr.] Pari) (abbreviated hereafter as POC) is a minor but valuable component of the forests of southwester Oregon and northwestern California. It is usually found as scattered individuals in a stand but can also occur in continuous stands. Population distribution inland is usually associated with drainages, particularly in the southern portion of its range (Atzet, 1993). The species occurs primarily at low-to-mid elevations but has been found up to approximately 7,000 feet in northern California (Greenup, 1992a). The greatest concentration of POC is in Oregon in the northern third of its range, on the coastal hills and terraces from Coos Bay to Port Orford and in the adjacent southern edge of the Coast Range, including the drainages on the middle and south forks of the Coquille River (Zobel, 1985). Secondary concentrations occur in land at moderate-to-high elevations near the Oregon/California border and in the watersheds of Grayback Creek and Deer Creek in southeastern Josephine County, Oregon (Atzet, 1979; Hawk, 1977). Throughout its range, the species is under attack by the fatal fungal pathogen *Phytophthora lateralis* (*P. lat.*), which causes POC root disease (Kliejunas, 1981). Forest management activities such as road construction, timber harvest, site preparation, and fuels treatment can increase the risk of spreading the disease by introducing the pathogen to uninfested areas.

POC spans the floristic transition one between the vegetation of California and the Pacific Northwest (Harrow and Harrar, 1969). POC occurs in five plant series in the Klamath Province: white fir (A*bies concolor* Gord. & Glend.), western hemlock (*Tsuga heterophylla* [Raf.] Sarg.), POC, tanoak (*Lithocarpus densiforus* [Hook and Arn.], Rehd.), and Jeffrey pine (*Pinus jeffreyi* Grev. And Balf.) (Atzet and Wheeler, 1984). Tree associates range from Sitka spruce (*Piceal sitchensis* [Bong.] Carr.) in the northern part of the POC range to incense-cedar (*Calocedrus decurrens* [Torr.] Florin) at the lower latitudes. Other common tee species associated with POC include Douglas-fir (*Psuedotsuga menziesi monticola* Dougl.), sugar pine (*Pinus lambertinana* Dougl.), and red alter (*Alnus rubra* Bong.) (Harlow and Harrar, 1969). In addition, the range of POC overlaps an area of high plant diversity containing many other endemic species.

POC is limited to areas with relatively high ratios of precipitation to evaporation (Zobel et al., 1985). POC is opportunistic, and it can establish itself in quantity during early seral stages, after disturbance in stands and under an intact forest canopy. The species is shade tolerant and also grows well in the open. Zobel (1990) found that POC reached breast height in 5 to 11 years in clearcuts; and under a forest canopy, it took 14 to 31 years. Good seed crops can occur as often as every 4 or 5 years but generally not for 2 years in a row (Zobel, 1979).

II. *PHYTOPHTHORA LATERALIS* AND PORT-ORFORD-CEDAR

The first external evidence of the root disease is a slight discoloration of the foliage which, within a few weeks to months, depending on the weather conditions and tree size, gradually takes on a yellow wilted appearance. The color changes from yellow to bright red, then to red-brown, and finally brown. Trees usually lose all foliage 2 to 3 years after death. POC root disease is best identified by the cinnamon-colored inner bark and cambium that abruptly joins the creamy white, healthy inner bark in roots and lower boles. Just prior to tree death, the discolored zone may extend 2 to 5 feet above ground (Hadfield et al., 1986).

An infection of *P. lat.*, possible and introduced pathogen, was first reported in an ornamental POC near Seattle, Washington, in 1923. It was fond in southwestern Oregon in 1952 (Roth et al., 1987). There is no proven resistance to *P. lat.* with POC although occasional POC remain alive after surrounding POC have been killed (Hansen et al., 1989). Whether this survival is due to some degree of resistance or lack of exposure of the pathogen remains unclear.

P. lat. is a root-inhabiting fungus transmitted via soil and/or water. The pathogen enters through root grafts or directly through the tips of fine roots (Gordon and Roth, 1976). Damage from this moisture- and low-temperature-dependent fungus peaks during the cool, wet season; but crown symptoms lag behind due to abundant atmospheric moisture. As moisture stress builds in late spring and summer, the damaged root system is unable to meet the evapotranspiration requirements of the tree. This results in the simultaneous death of the crown (Zobel et al., 1985). While seedlings and small POC quickly succumb to the pathogen, large POC may take a year or more to die.

The resting spores (chlamydospores) develop in rootlets and are released into soil as the roots deteriorate. The dormant chlamydospores form fruiting bodies (sporangial) in saturated soil, which in turn release motile zoospores. Zoospores required flowing water to travel any distance. The fungus survives as chlamydospores in soil without a host for up to 4 years in northwestern California (Kliejunas, 1992). Spore survival, without a host, in the Coos County forest and at Oregon State University has reached 6 years and 7 years, respectively. At both sites, chlamydospore population levels are on a downward trajectory (Hansen, 1994).

Chlamydospore survival rates decline during periods of summer drought, which is a normal occurrence in portions of the range of POC. A significant decrease in spore survival occurred when isolated organic matter, and organic matter in soil containing *P. lat.* spores, was stored in sealed plastic bags and heated to 68 degrees Fahrenheit for a period of 18 weeks. At this same temperature, survival of *P. lat.* inorganic matter was favored in moist soil, but not in saturated soil. Naturally infested organic matter in clay soil stored in sealed plastic bags did not show a decreased survival in moist soil (0.3 bars tension), but did show decreased survival in saturated soil (0 bars tension). In slightly dried soils (approximately 25 bars tension), *P. lat.* survived at only very low levels after 16 weeks at 68 degrees Fahrenheit (Ostrofsky et al., 1977).

Spore transport occurs via a variety of mechanisms. Logging equipment, vehicles, humans, and animals (particularly elk) can transport infested soil (Zobel et al., 1985). It can be transmitted by surface water in streams or ditches. Disease transmission can also occur via root grafts and, in some rare instances, through rain splashed spores (Gordon, 1974). Trees in close proximity to the stream channel downstream from infected areas have the best chance of contracting the disease. Upslope spread is more difficult, occurring through root grafts and possibly by disease movement from infected to uninfected POC roots that are in close proximity to each other (Gordon, 1974).

If soil infested with chlamydospores is transported to uninfested areas, new infections can occur. This requires a precise sequence of events: chlamydospores must reach POC root tips; germination must occur; and the root tips must be penetrated to initiate infection. *P. lat.*, while fatal to POC, may not be the sole cause of death in a given tree. Microsite conditions such as moisture stress, mechanical damage, or insects can contribute to mortality.

Once a tree becomes infected, mortality is frequently rapid. However, when infestation occurs in an area, it is rare for all of the POC to become infected. Surveys done in areas where the pathogen has been present for 30 years have shown that not all POC were killed (Schoeppach, 1991). Whether this phenomenon is due to resistance, isolation, unknown factors, or a combination of these, is not clear.

III. *PHYTOPHTHORA LATERALIS* AND PACIFIC YEW

Recently, it has been documented that Pacific yew (*Taxus brevifolia* Nutt.) is also susceptible to *P. lat.* (DeNitto and Kliejunas, 1991; Greenup, 1992). Pacific yew contains taxol, a compound which has shown promise as an ovarian cancer treatment. The Pacific yew mortality only occurred in areas where there are also infected POC. No mortality due to *P. lat.* has been documented on BLM lands.

Pacific yew infected with *P. lat.* show the same symptoms as those seen on infected POC. Crown discoloration and cambium stain occur. It appears that the resistance to *P. lat.* within Pacific yew is more variable than that seen in POC (Greenup, 1992a).

IV. MANAGEMENT OBJECTIVES FOR PORT-ORFORD-CEDAR

POC requires special protection because it is an important component of some forest ecosystems, it is economically valuable, and it is vulnerable to an introduced pathogen that is spread primarily through human activities.

A. Proactive management – limit the spread of *P. lat.* and reduce the number of infested areas.

B. Retain POC as a species, identify resistant individuals, and incorporate them into a tree improvement program.

C. Incorporate *P. lat.* control strategies as management objectives in Riparian Reserves (RRs), Late-Successional Reserves (LSRs), and Matrix.

D. Provide POC as a primary forest product.

E. Promote public involvement in POC management.

F. Develop a budget and implementation schedule for the Port-Orford-Cedar Management Program.

V. IMPLEMENTATION STRATEGY TO ACHIEVE POC MANAGEMENT OBJECTIVES

A. Proactive management – limit the spread of *P. lat.* and reduce the number of infected areas.

The intent is to stop the spread of *P. lat.* into POC and Pacific yew populations, and to design and implement management strategies that decrease the number of disease locations in a manner consistent with objectives identified in district resource management plans. At present, no documentation exists that indicates a successful eradication of *P. lat.*, on a specific site has been accomplished. A management strategy for an area may include POC eradication and preventing POC regeneration until the inoculum present on the site dies out. The ultimate goal is to reestablish POC into those areas where the pathogen had previously existed.

An accurate inventory of POC and *P. lat.* is essential for the development of a management strategy. Populations of POC should initially be mapped geographically by plant series and associations. Areas where POC is found should then be subdivided according to seed zones and elevation bands. Areas where timber harvest has occurred that still contain POC populations must be examined for the occurrence of *P. lat.* Areas with POC present, and where no harvest activities have occurred, should receive the same analysis.

The inventory of POC and *P. lat.* areas will be ongoing as the POC management strategy is implemented. At a minimum the inventory should include the following:

1. Determine which POC areas also have populations of Pacific yew.

2. Track all occurrence of POC populations and *P. lat.* infestations in MICRO*STORMS (M*S) and Geographic Information Systems (GIS).

3. Analyze the relationships between infested and uninfested areas (i.e., what is the probability of the uninfested stand becoming infested?) Further analysis should examine if *P. lat.* infested sites are expanding, stable, or decreasing, the relationship of *P. lat.* population trends to land management activities, and the specific reasons for the impacts to *P. lat.* populations.

4. Monitor for occurrence of *P. lat.* and the effectiveness of management of the pathogen and disease control. Monitoring projects will need to continue for at least 5 years in the drier portions of the range of POC and for longer periods where climatic conditions are wetter.

This information should be consolidated in an annual report.

All entries into POC areas should be coordinated with the district POC program lead and the resource area silviculture group(s). The forest development program should incorporate POC objectives in reforestation, timber stand improvement, and the development of silvicultural prescriptions. Strategies to meet road construction, renovation, maintenance, and road management objectives need to include POC goals. Existing timber sales that do not address POC should be modified to include consideration for POC management. Entries are not just those for timber sales or silvicultural activities. They include, but are not limited to, such things as firewood cutting, hunting, and any other actions within POC areas.

There are at least three key risk indicators regarding the introduction of *P. lat.* to uninfested sites. The first is the potential for infested soil to be transported upstream of uninfested POC areas due to an increase in exposure points such as steam crossing or roadwork (new construction, renovation, maintenance, or decommissioning). Recreational activities such as horseback riding, off-road vehicle traffic, or even mountain bike riding could also increase the chances of *P. lat.* infection. The second factor Is the duration of the increased risk; that is, the number of trips by logging trucks, logging machinery, etc. The more trips, the greater the potential for infection. The third risk indicator is the season in which activities occur in POC areas. Activities that occur during the wet season have a greater potential to move infested soil to areas that presently do not contain *P. lat*. A risk analysis procedure has been developed by the USFS and is presented as Appendix 4 is this paper. This appraisal should be conducted for all areas containing POC.

POC, *P. lat.*, and Pacific yew mapping will be the key to success of the Interregional POC Coordinating Group, of which BLM is an active participant. This group was established in 1987 to ensure a coordinated, interregional, interagency effort to manage the root disease. The group structure has recently been reorganized into two areas: a policy oversight team and a technical team. The policy oversight team will include a representative from: (1) Forest Pest Management in USFS Region 5, (2) Forest Insects and Diseases Group in Region 6, (3) the Forest Supervisors, and (4) the Oregon/Washington State Office and Medford District Office of the BLM.

B. Retain POC as a species, identify resistant individuals, and incorporate them into a tree improvement program.

The goal is to join with the USFS in its research program to identify genetic resistance to *P. lat*. Resistance is defined as slowing the rate of a pathogen's advance in diseased tissue, rather than immunity. No trees have been identified that have the potential to stand up indefinitely in areas of extreme inoculum exposure. However, though a breeding program, the possibility of producing stock with a high level of resistance certainly may exist (Martinson, 1994). As with Douglas-fir, POC has a wide tolerance for variations in environment (probably related to genetic variability) that allows it to compete successfully in a wide range of environmental conditions (Millar et al., 1991). This great ecological amplitude of POC is believed to reflect a geographic concentration of genetically-based characteristics that had developed in a much larger geographic range (Edwards, 1983).

In the past, ornamental varieties of POC have been grafted to root stocks of *P. lat.*-resistant members of the family Cupressaceae with varied success (Torgeson et al., 1954). Research continues regarding POC and *P. lat*. Currently, the Pacific Southwest Research Station is conducting a rangewide genetics study on POC. Under contract with the USFS, researchers at Oregon State University are evaluating the survival of potentially resistant parent trees, collecting seed and vegetative material from parent trees for propagation, and screening seedlings and rooted cuttings for resistance (Greenup, 1992b). With the exception of the Coos Bay District, BLM has not been actively involved with these programs in the past. However, there are opportunities to support upcoming studies on POC. Specific actions include, but are not limited to, identification of resistant POC, cone collections from suspected resistant individual trees, and outplanting of seedlings grown from collected seed to test resistance. These research opportunities should be anticipated and aggressively pursued. Management objectives and practices will need to be reviewed and updated as additional research is published.

Current searches for resistance are in highly-infested areas where selection pressure has been present for some time. Single trees that have survived in areas of sever mortality may be resistant. Harvesting or precommercial thinning of POC in infected areas should be preceded by evaluation of the POC population for resistance. All trees should not be tested, as this is biologically unnecessary as well as financially impractical. Even the most ambitions sampling schemes cannot test all trees within a given population. The probability of removing a tree with some level of resistance is extremely low in areas that have not seen extensive mortality (Greenup, 1992a).

The current screening process for POC with resistance has been underway for over 10 years. The screening criteria was developed by Dr. Lewis Roth and Dr. Everett Hansen of Oregon State University, Don Goheen of the Southwest Oregon Forest Insect and Disease Technical Center et al. Screening includes POC stem inoculation with *P. lat.*, soil inoculation with *P. lat.* and transplanting POC into the infested soil, and immersing the root of seedlings and rooted cuttings in a water suspension of *P. lat.* zoospores (Hansen et al., 1989). Over 200 selected trees are currently being evaluated for resistance. Discussions with USFS geneticists and pathologists indicate an extremely low potential for loss of resistance by harvesting or other removal of POC (Greenup, 1992a). Timber sales involving green POC should be evaluated for resistance candidates prior to harvesting.

Guidelines for selecting trees in the wild for resistance:

1. Select trees that appear to have been exposed to the fungus. Selected trees should retain green crowns and be in close proximity to those exhibiting symptoms of *P. lat*.

2. Select trees in previously infested areas that stay wet for long periods of time.

3. Selected trees that are not elevated on rises above existing infected trees. Roots should be wet or have been subjected to the same water flow as infected trees.

4. The candidate tree should have root disease killed trees above and below it on the same slope.

5. Trees should have normal-looking green foliage and should have been exposed at the time the existing dead trees were exposed.

6. POC roots graft with roots of other POC. In wet areas, the pathogen will involve the entire area.

7. Trees occurring on the edges of visibly infested sites can be selected for resistance testing if they meet the probably exposure criteria (Greenup, 1992a).

Some POC populations occur on lands set aside for uses other than timber production. It will be necessary to ascertain which seed zones and elevation bands containing uninfected POC colonies are not represented in the set aside areas. Additional uninfected POC populations may need to be reserved for maintenance of POC gene pool diversity. Populations that are reserved should be selected by plant series and associations. POC genetic diversity appears to increase with decreasing elevation and soil diversity (Millar and Marshall, 1991). In general, BLM lands are lower in elevation than those administered by the USFS. Therefore, POC populations on BLM lands may have a greater genetic diversity that that currently known to exist.

C. Incorporate *P. lat.* control strategies as management objectives in RRs, LSRs, and in the Matrix.

There are some specific situations involving POC management that deserve distinct consideration: management actions in infested RRs, LSRs, within the Matrix, or other special management areas that contain *P. lat.* or uninfected POC. These areas will require application of site-specific procedures. With careful consideration, an integrated strategy can be developed where more than one resource value can be enhanced. Any action(s) taken must be consistent with the management objectives identified in the district RMO for these areas.

1. Riparian Reserves

Riparian areas may contain diseased POC. In some areas, it may be possible to remove POC while at the same time maintaining riparian quality. To realize the full benefits for the riparian management area, consult with the wildlife biologist, fisheries biologists, hydrologists, and other resource specialists to identify the specific objectives for that riparian area, and how POC management can assist in attaining these goals. POC management within RRs must conform to the Aquatic Conservation Strategy (USDA and USDI, 1994).

Live trees showing signs of infection, but needed to increase the dead wood component in riparian areas, could be girdled and left to fall or felled intentionally if additional down woody material is required immediately. The presence of snags and logs in most environments make them particularly valuable to amphibians (Oliver, 1992). One contribution from POC management that could provide immediate and future benefits is the status of the coarse woody material component of the riparian area. Determine whether the riparian area's present and predicted future requirements for large woody material are being and will continue to be met. If additional material is required, specialists can use geometric and empirical equations based on tree size and distance from the stream to identify POC that can provide large woody material recruitment (Robinson and Beschta, 1990). Because of their resistance to decay, POC snags and logs are long-lived components of riparian habitat (Jimerson and Creasy, 1991).

Riparian area containing dead or diseased POC must be surveyed to determine whether an adequate amount of snags and down logs exist. Girdled trees would create snags and future sources of coarse woody debris. If existing levels of down wood are less than desired, POC could be felled; either to provide down logs outside the stream or to crate an in-channel structure. POC logs also provide organic input as well as structure to streams where anadromous fish spawn.

Preliminary work has been done in determining these figures. USFS data for both the POC and Tanoak series give some indications of the snag component for these forest communities where little human disturbance has occurred (Atzet and McCrimmon, 1992). Unfortunately, data for down coarse woody material has yet to be developed; but the case can be made that is the natural snag component is maintained over time, coarse woody debris requirements will also be maintained. Snags and other woody debris need not, and should not, be recruited solely from POC; but dead POC does present an opportunity to provide a habitat component that may be lacking.

Since the disease can move via root grafts, monitoring would be required to determine if root contact between uninfested POC and the infection center has been broken. There is little information available regarding the development of POC root systems. The only detailed description of POC root systems is for a 50-year-old dense stand in coastal Coos County. In this stand, 0.6 percent of the major roots extended beyond 6.7 meters from the bole of the tree (Gordon, 1974; Gordon and Roth, 1976). Based on this work, treating an area infected with *P. lat.* could include green POC adjacent to the infection site and currently showing no sign of *P. lat*. This could involve the removal of the live host (green trees that show no sign of infection) adjacent to the infection site. Again, removal could involve girdling, cutting and leaving the tree, or even harvesting the green POC. Elimination of live POC adjacent to infection sites would further reduce the potential for *P. lat.* propagation. This strategy has been implemented on the Gold Beach Ranger District, Siskiyou National Forest (Gee, 1993). In this case, all POC within a distance equivalent to five times the crown radius of the infected tree(s) have been removed.

There will often be portions of the RR infested with *P. lat.* that have POC too small to be girdled. One management approach could be to girdle POC greater than six

inches dbh, slash smaller POC (down to 1 inch in diameter at 1 foot), and use prescribed fire to kill POC that are too small to slash. The prescribed fire treatment utilized could be a broadcast burn, underburn, swamper burn, or whatever application of fire best fits the objectives for the riparian management area. Of course, this would only be applicable where prescribed fire is consistent with RR objectives. Due to the sensitivity surrounding the use of herbicides, it is recommended that they not be utilized in removing POC.

No commodity extraction of POC should occur prior to a watershed analysis. After a watershed analysis is complete commodity extraction could occur if it is consistent with objectives identified in the watershed analysis.

2. Late-Successional Reserves

A second area of concern are areas containing *P. lat.* that are within LSRs. Management objectives for LSRs are to protect and enhance conditions of late-successional and old-growth forest ecosystems which serve as habitat for late-successional and old-growth-elated species, including the northern spotted owl (USDA-USDI, 1994). In those areas where POC provides a significant portion of the forest canopy, *P. lat.* could, over time, contribute to canopy loss and be detrimental to maintaining quality LSR habitat. Treating the pockets of *P. lat.* that occur within LSRs will have some short-term impact on canopy cover and species diversity; but by isolating or eliminating the diseased area or areas, POC may be retained inside the LSRs and contribute to overall species diversity.

As stated above under RRs, considerations for snags, down woody material, and their associated resource values are necessary in LSRs. Consultation with wildlife biologists and other resource specialists will determine management opportunities. Creative management can reduce *P. lat.*, enhance the amount of snags and down woody material, ensure snag and down woody material recruitment, and perhaps even provide some timber volume for commodity production.

The intent is to isolate *P. lat.*-infested areas and to reduce the potential for spread of the pathogen via root grafts. This could be accomplished by removing green POC from around the periphery of disease centers. This would accomplish two objectives. POC populations would be separated into populations of infected and uninfected POC, and the possibility of locating resistant POC within the infested areas would be retained. The possibility exists that girdled POC or severed POC stumps may remain alive due to root grafting. However, it has been shown that most roots not directly involved with root grafts die (Bornamm, 1966). Therefore, even if the severed or girdled POC stumps remain alive, benefit can be achieved by reducing the receptive sites for *P. lat.* (Gordon, 1974).

The emphasis in LSRs is not on timber as a commodity. It is recommended that POC harvest or salvage occur only after realizing other resource objectives which might benefit from large woody material input from POC. Snags can serve a variety of purposes for wildlife including, but not limited to, nesting platforms, feeding substrates, and roosting sites. While the decay rate of POC snags is not clear, a related species, western red cedar, has been shown to be the most persistent snag in forests of Coast Range (Cline, 1977). While this may provide for long-term utilization of POC snags for the uses previously mentioned, slow decay rates may reduce the opportunity for cavity nesters to occupy POC snags. Wildlife use of POC snags appears not as high as that of pines or Douglas-fir, but this is likely partially offset by the longevity or the snags (Jimerson, 1989). The level of large woody material input from POC will have to be determined through an interdisciplinary analysis and occur on a site-specific basis.

Preliminary data from USFS ecology plots in the POC series shows that while stands have the potential to become dominated by POC, there are generally other conifers and hardwoods present that contribute to stand structure and canopy

closure (Atzet and McCrimmon, 1992). Data combined from all the plots in the POC series indicated that POC is normally not the dominant tree in those stands. If this situation exists, then removal of the live host of *P. lat.* may be possible without significant loss of canopy cover in the POC series that occur in spotted owl habitat.

3. Matrix

Most timber harvest and other silvicultural activities will be conducted in that portion of the Matrix with suitable forest lands (USDA-USDI, 1994). Stands in the Matrix can be managed for timber and other commodity production, but they also have an important role in maintaining biodiversity. Silvicultural systems for stands in the Matrix should provide for the retention of old-growth ecosystem components such as large trees, snags and down logs, and depending on site and forest type, a diversity of species (Thomas et al., 1993). Green tree retention is a significant component in the management of Matrix lands. Green trees can be retained, both as individuals and in well-distributed patches. Patches of green trees of various sized, ages, and specie swill promote species diversity and may act as refugia or centers of dispersal for many organisms including plants, fungi, lichens, small vertebrates, and arthropods (Esseen et al., 1992). Patches of green trees may also provide protection for special microsites such as seeps, wetlands, and rocky outcrops.

POC should be treated the same as any other commercial species in the Matrix. Special considerations for this species are identified later in the document (see following Mitigating Measures for Timber Sale and Service Contractors). Rather than girdling and leaving POC as mentioned above in the RRs and LSRs, merchantable POC can be removed for commodity production. It is recommended that areas of *P. lat.* be targeted for POC harvest. Residual uninfected POC can be left as part of the green tree retention previously described. Slashing of small POC and prescribed fire may be used to eliminate unmerchantable POC from infested areas. This removal of the host species could reduce the presence of *P. lat.*; and if POC is eliminated from a diseased site for more than 5 years, there is the potential for *P. lat.* to die out. This 5-year-time-period is for the drier portions of the POC range. More mesic sites, such as those found in the Coos Bay District, will require a longer period of POC absence in order for *P. lat.* to die out.

Monitoring will be essential to track the existence of *P. lat*. One potential monitoring technique is to plant small quantities of POC in areas suspected of still being infested. This could be done as a cluster plant with other species not susceptible to *P. lat*. If the disease is still present, mortality in the POC would show up quickly and could be documented in stocking surveys at the end of the first growing season. If no POC mortality occurs, the excess conifers resulting from the cluster plant could be removed (Viets, 1993).

D. Provide POC as a primary forest product.

POC can be exported as whole logs from Federal lands. A species can be exported if it can be shown that domestic use of the timber is absent or minimal (Land, 1992). Hinoki *(Chamaecyparis obtusa)* is used in the construction of homes and temples in Japan. Due to decreasing populations of hinoki, the demand for POC has increased. Five dollars per board foot or $5,000 per thousand have been paid for POC (Brattain and Stuntzer, 1994).

Matrix lands infested with *P. lat.* should be targeted for salvage operations as soon as possible. Reserves should be considered for salvage only after the appropriate analysis has been completed (watershed analysis for RRs or management plan for LSRs). It is recommended that mortality salvage operations occur within 3 years of the death of any POC in the Matrix, and as soon as possible in other areas as long as the salvage is consistent with management objectives. The export value of POC was reduced after 3 years due to a decrease in grade (Zobel et al., 1985). This contrasts with POC killed by fire. Fire-killed trees can retain their merchantability for a longer period of time due to exterior

charring. In addition to salvage, green POC should be removed from around the infested area to reduce the possibility of disease transmission via root grafts. The distance for removal of POC would have to be determined on a site-by-site basis.

Areas not infested by *P. lat.* need not be off limits to timber harvest. However, steps must be taken to reduce the probability of initial infection. Mitigating measures for timber sale and service contracts are listed in Section VI below. It is anticipated that a helicopter would frequently be the logging system of choice, but conventional systems could also be used when they are consistent with management objectives for the area.

E. Public Involvement

Public education and media involvement should be incorporated into our guidelines. Groups such as the Oregon Natural Resource Council, the Western Environmental Law Center, Inc., the Siskiyou Regional Education Project, the Nature Conservancy, and the Sierra Club have indicated interest in POC management. Involvement and coordination with private landowners and other neighbors will provide better awareness of *P. lat.* problems, reduce the potential for new *P. lat.* infections, and help organize the management of POC and *P. lat.* across ownerships. Upon adoption of a rangewide POC management plan, a news release could be issued to the media. There has already been interest shown by members of the press as the information regarding Pacific yew susceptibility to *P. lat.* has become more widely known. Educational signs identifying road closures for POC and *P. lat.* management should be posted in all areas containing POC. Lectures to interested groups could also enhance the image of the BLM POC management program. A brochure similar to the USFS pamphlet, Port-Orford-Cedar Root Disease (FPM Report #294), should also be developed by BLM.

F. Develop a budget and implementation schedule for the POC Program.

POC areas should be mapped, and lists of the Operations Inventory Units containing POC should be developed. The next step is to develop lists of infested and uninfested areas containing POC.

Without an accurate inventory of POC and *P. lat.* occurrence, successful management of POC and *P. lat.* has little chance of success. The suggested procedure is as follows:

Inventory	General survey for POC and *P. lat*. Determine the extent of the POC and *P. lat.* (Are all POC infected?). Map areas with and without *P. lat*.
Implementation Plan Develop	M*S and GIS: Input data into MICRO*STORMS and GIS. Development GIS maps of POC and *P. lat.* areas and input recommended treatments into M*S database.
Plan Monitoring, Ongoing Adaptive management, and Modification	

Future needs will focus on developing site-specific management plans for all areas containing POC, and monitoring POC areas to see if the disease has been isolated or eliminated from infected areas and fprevented from spreading into disease-free areas.

VI. MITIGATING MEASURES FOR TIMBER SALE AND SERVICE CONTRACTS

It appears that when areas of POC and *P. lat.* are accurately mapped and mitigation measures are implemented, the successful spread and establishment of the disease into new watersheds is a rare event. The use of effective mitigation measures, combined with a low risk of establishment following the spread of the disease, has prevented the spread of the disease into uninfested watersheds in California (Kliejunas, 1991).

A. Restrict road building and log hauling to the dry season unless the contract calls for cleaning the vehicles to prevent/reduce import or export of the root disease. This will lessen the

chance of infested soil adhering to equipment and vehicles and consequently from being transported to uninfested areas.

B. Road design: When feasible, outslope the roads or use crushed rock to keep the soil in place. A slight outslope is best as the soil landing on the fill slope has a low probability of ending up in streams. Insloped roads will cause soil to end up in the ditch and eventually enter into streams, placing downstream POC populations in jeopardy. Culvert and waterbar placement should also divert water from areas where POC exists.

C. In POC areas, do not allow blading into road ditches upstream from the uninfested areas. Blade to the fill slope only. Do not allow sidecasting where sidecast material could reach the stream channel.

D. Wash with chlorine bleach and water or require steam cleaning or high pressure water treatment for all machinery and vehicles prior to entry into the uninfested project areas. Require the same washing and cleaning for machinery and vehicles prior to departure from infested sites. The ration of chlorine bleach and water for vehicle washing is 12 ounces of bleach per 1,000 gallons or water. Charge the vehicle cleaning to the timber sale or whatever activity requires entry into the POC area. See Appendix 2 for additional information.

E. Gate or barricade roads in areas containing POC, both uninfested and infested, when consistent with other resource objectives. This prevents vehicle introduction of *P. lat.* into uninfested areas and the transport of *P. lat.* out of infested areas. Lack of access also reduces the potential for theft and can be incorporated into the resource area road closure policy designed to benefit resources other than timber such as terrestrial wildlife, fisheries, and other values identified as part of the Aquatic Conservation Strategy.

F. In timber sales containing infested and uninfested areas, harvest uninfested areas first so that the equipment does not become contaminated and the contamination moved to uninfested areas.

G. Use chlorine bleach and water or steam cleaning to wash chokers and equipment if a helicopter yarding system is used.

H. Have an interdisciplinary team review and make recommendations to the area manager on all activities in POC areas. Fisheries projects, riparian enhancement, and recreation site development are examples of undertakings that should have interdisciplinary team review.

I. Remove the belly plate from all tractors that have worked in infested areas, and steam clean or wash the tractors with chlorine bleach and water prior to leaving the site. In uninfested areas, steam clean or wash all skidding, yarding, and hauling equipment prior to entering the site. See Appendix 3 for specific vehicle parts that may require cleaning.

J. Do not allow POC bough cutting until the following steps are completed:

1. Inventory for POC and *P. lat.*
2. Determine if bough cutting is consistent with management objectives for the area.
3. Only allow bough cutting in small areas where administration and law enforcement have easy access.

K. Develop monitoring plans for all POC areas. This could include such things as checking contract diaries for rainfall events during logging and activities outside of the scope of the contract.

L. Coordinate with the USFS, state and county forestry departments, private groups, and individuals that have an interest in POC management.

M. Require roadside brushing: (all distances are slope distances)

1. Upslope: Cut all POC within 20 feet of the road edge; if cut slopes are greater than 5 feet in height, remove POC only between the road edge and the top of the cut slope.

2. Downslope: All POC within 50 feet of the road edge, downslope from the stream crossing, and all POC that have roots within the stream channel should be killed where the stream channel intersects the road right-of-way.

These disturbances are used as examples and can be modified to fit a particular situation. In addition, this is not mandatory and should only be used when there is a high likelihood of importing *P. lat.* into a project area where other mitigating measures have low potential for success.

N. Reforestation: Plant POC at 25-foot spacing or in approximately 10-tree clusters at 100 to 150 foot spacing. This does not apply to planting mentioned above where presence of *P. lat.* is being determined.

O. Precommercial thinning: Allow for adequate spacing between POC in precommercial thinning contracts. This will lessen the chance of root grafting and potential pathogen transmission. Use 25 feet as a spacing guideline in precommercial thinning.

P. Commercial thinning: Allow for adequate spacing between POC in commercial thinning contracts. Use 50 feet as a spacing guideline in commercial thinning sales. This will lessen the chance of root grafting and potential pathogen transmission.

Q. Thinning can also be designed so that POC is left in tight clusters 100 to 150 feet apart. The intent is to minimize the potential for root grafting between clusters of POC.

R. Endhauling/slide removal: Prior to removing soil and other material, determine is either the source of the destination of the material is infested with *P. lat.*

APPENDIX 1

SYNOPSIS OF REGIONS 5 AND 6 PORT-ORFORD-CEDAR COORDINATING GROUP ACTION PLAN

A. INVENTORY AND MONITORING

Goal: Develop a standard inventory and monitoring system for regional use.

Action items/objectives:

1. Inventory to establish POC locations.
2. Inventory to establish current boundaries of infection.
3. Monitor to establish the rate of spread, locally and species-wide.
4. Evaluate the effects of mitigating measures.

B. RESEARCH AND ADMINISTRATIVE STUDY

Goal: Develop a coordinated and prioritized approach to administrative studies and encourage research by other parties that is responsive to the management of POC.

Action items/objectives:

1. Test strategies of control for efficacy.
2. Encourage research units to initiate studies on identified research needs in the following priority:
    a. Develop methods to detect the pathogen in soil and water.
    b. Determine the requirements of the pathogen for survival and dispersal.
    c. Study measures to eliminate the fungus from areas of incipient infection.
    d. Investigate the existence of resistance to the pathogen within the range of POC.
    e. Determine to what extent genetic variation exists in POC.

C. PUBLIC INVOLVEMENT AND EDUCATION

Goals: Develop a coordinated regional effort to keep the public informed of the progress of POC management and incorporate public involvement in the process.

Action items/objectives:

1. Keep interested groups up-to-date on the progress of POC management.
2. Provide opportunities for interested groups and individuals to contribute to the coordinating team.

D. MANAGEMENT

Goals: Develop an agreed-upon and coordinated program to manage POC in the presence of root disease and generate criteria and mechanisms to determine the risk of spread.

Action items/objectives:

1. Continue to refine and update the risk assessment model used in evaluating projects.

2. Develop strategies for the management of the following activities:

    a. Timber sales

    b. Road construction and management

    c. Reforestation and stand management

    d. Other activities that have potential for earth-moving activities (such as quarry development) in stands containing POC.

3. Develop a system or method for sharing information.

APPENDIX 2

GENERAL SPECIFICATIONS FOR A WASHING STATION

Purpose: The purpose of the washing station is to remove as much soil and organic matter from vehicles as possible to prevent/reduce the spread of *P. lat*. Vehicles and equipment should be sanitized prior to entering uninfested areas and prior to departure from infested areas. The intent is to reduce the spread of *P. lat.* into uninfested areas. Sanitation can be accomplished with a mixture of chlorine bleach and water or by steam cleaning. The ration of chlorine bleach to water is 12 ounces of bleach per 1,000 gallons of wash water.

When locating and constructing a washing station to clean vehicles and equipment, we need to minimize the chance that a “clean” truck will be re-exposed to infested material near the washing site. There are two ways this can happen. One is if the truck travels through an area where “unclean” trucks are also traveling. This can be minimized by proper location of the washing station. If some common travel ways are used, efforts need to be made that will reduce the chance of picking up soil. This can be accomplished by rocking the common road surface or hardening it in some other fashion. Reducing the amount of water used for dust abatement will lessen the amount of mud which may also prove useful.

The second way a “clean” truck could become a carrier again is by traveling through wash water and mud at the washing station. Proper construction of the site will eliminate this risk. Runoff of the wash water needs to drain away from the wash site and away from the travel route to and from the site. Wash water must not be allowed to drain into stream channels. The actual washing site needs to be elevated so that the trucks are not sitting in mud and wash water. This could be accomplished by ramps or by building a sufficiently high rocked surface on which the trucks can travel. The length of the rocked surface wash area should be at least 1.5 times the length of the trucks that will be using it. This will allow the trucks to travel on a non-contaminated surface for a short distance after being washed and reduce the chances of picking up infested soil from the washing. The gravel used for rocking should be of sufficient size to allow good percolation of water and soil into the subsurface. Accumulations of water and soil on the surface should be avoided. This last point also affects the depth of the rocked road surface. The amount of washing and the number of trucks using the site will also influence the depth.

The type of equipment used for washing needs to be sufficient to remove all soil and organic matter that is clinging to the trucks. The actual water pressure required can best be determined on the site. Each time a truck enters an uninfested site, it needs to be washed.

APPENDIX 3

EQUIPMENT CLEANING CHECKLIST

The purpose of this checklist is to provide guidance to contract administrators in the enforcement of equipment cleaning contract provisions for *P. lat.* control. This is a guide to direct administrators to specific areas on equipment that are likely to accumulate soil and should be check. Onsite judgments still need to be made about overall equipment cleanliness. This will be a new procedure for many purchasers and they need to be convinced of the seriousness of the situation prior to beginning the contract. Effective enforcement procedures (such as shutdowns) must be available to the contract administrator.

Does the equipment appear to have been cleaned?

Is the equipment clean of clumps of soil and organic matter?

RUBBER-TIRES VEHICLES	TRACK-LAYING VEHICLES
Tires	Tracks
Wheel Rims (underside and outside)	Road Wheels
Axles	Drive Gears
Fenders	Sprockets
	Roller Frame
	Track Rollers/Idlers

ALL VEHICLES AS APPROPRIATE

Frame or Undercarriage
Belly Pan (inside)
Stabilizers (jack pads)
Grapple and Arms
Dozer Blade or Bucket and Arms
Ripper
Brush Rake
Winch
Shear Head
Log Loader
Water Tenders (empty or with treated water)

APPENDIX 4

PROJECT ANALYSIS AND IMPLEMENTATION
(from the USFS POC Action Plan)

Threshold of Concern:

	RISK		
% of POC	Low	Medium	High
Low (0 to 5%)	No concern	No concern	High concern
Moderate (5 to 20%)	No concern	High concern	High concern
High (>20%)	High concern	High concern	High concern

Defining Risk:

Low	Below roads: No POC within 500 feet. Above roads: No POC within 50 feet.
Moderate	Below roads: POC may be within 100-500 feet of the road. Above roads: No POC within 50 feet.
High	Below roads: POC within 100 feet. Above roads: POC within 50 feet.

Objective A: Prevent/reduce the import of disease into uninfected areas.

Objective B. Prevent/reduce the export of disease to uninfected areas.

Objective C: Minimize increases in the level of inoculum or minimize the rate of spread in areas where the disease is endemic. If possible, identify the probable mechanism of spread; whether by introduction of spores or by root grafting.

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REFERENCES

Atzet, T.A. 1979. Description and classification of the forests of the upper Illinois River drainage of southwestern Oregon. Ph.D. Dissertation, Oregon State University, Corvallis. 211 p.

Atzet, T.A. 1993. Personal communication. Siskiyou National Forest, Grants Pass, OR.

Atzet, T.A. and L. McCrimmon. 1992. Preliminary Snag Distributions for the Port-Orford Cedar and Tanoak Series. USDA-FS, Siskiyou National Forest, *unpublished data on file*, Grants Pass, OR.

Atzet, T.A. and D.L. Wheeler. 1984. Preliminary Plant Associations of the Siskiyou Mountain Province. USDA-FS Pacific Northwest Region, Siskiyou National Forest, Grants Pass, OR. 315 p.

Bormann, F.H. 1996. The Structure, Function, and Ecological Significance of Root Grafts in *Pinus strobus* L. Ecological Monographs 36:1–26.

Brattain, D. and R.E. Stuntzer. 1994. The Port-Orford Cedar Alliance: A Response to the ONRC's Proposal to List POC. Smith River, CA. 144 p.

Cline, S.P. 1977. The Characteristics and Dynamics of Snags in Douglas-Fir Forests of the Oregon Coast Range. M.S. Thesis, Oregon State University, Corvallis. 106 p.

DeNitto, G. 1991. Evaluation of Sanitation of Port-Orford-cedar Along Grayback Road, Happy Camp Ranger District. USDA-FS, Pacific Southwest Region Technical Report N91-7. 3 p.

Denitto, G. and J.T. Kliejunas. 1991. First Report of *Phytophthora lateralis* on Pacific Yew. Plant Disease 75(9):968.

Edwards, S.W. 1983. Cenozoic History of Alaskan and Port-Orford *Chamaecyparis* Cedars. Ph.D. Dissertation, University of California, Berkeley, CA. 271 p.

Gee, E. 1993. Personal communication. USDA-FS Siskiyou National Forest, Gold Beach Ranger District, OR.

Gordon, D.E. 1974. The Importance of Root Grafting in the Spread of *Phytophthora* Root Rot in an Immature Stand of Port-Orford Cedar. M.S. Thesis, Oregon State University, Corvallis. 116 p.

Gordon, D.E. and L.F. Roth. 1976. Root Grafting of Port-Orford Cedar: An Infection Route for Root Rot. Forest Science 22(3):276–278.

Greenup, M. 1991–92a. Personal communications. USDA-FS Siskiyou National Forest, Grants Pass, OR.

Greenup, M. 1992b. Port-Orford Cedar Plan Status Report for Fiscal Year 1991. USDA-FS Siskiyou National Forest, Grants Pass, OR.

Hadfield, J.S., Goheen, D.J., Filip, G.M., Schnitt, C.L., and R.D. Harvey. 1986. Rot Diseases in Oregon and Washington Conifers. USDA-FS Pacific Northwest Region, Forest Pest Management, Portland, OR.

Hansen, E.M. 1994. Personal communication. Oregon State University, Department of Botany and Plant Pathology, Corvallis, OR.

Hansen, E.M., Hamm, P.B., and L.F. Roth. 1989. Testing Port-Orford Cedar for Resistance to *Phytophthora*. Plant Disease 73:791–794.

Harlow, W.M. and E.S. Harrar. 1969. Textbook of Dendrology. Fifth Edition. McGraw-Hill, New York, NY. 512 p.

Hawk, G.M. 1977. A Comparative Study of Temperate *Chamaecyparis* Forests. Ph.D. Dissertation, Oregon State University, Corvallis, OR.

Jimerson, T.M., and R.M. Creasy. 1989. A Preliminary Classification for Port-Orford Cedar in Northwest California. USDA-FS Six Rivers National Forest, Eureka, CA.

Jimerson, T.M. and R.M. Creasy. 1991. Variation in Port-Orford Cedar Plant Communities Along Primary Environmental Gradients in Northwest California. USDA-FS, Six Rivers National Forest, Eureka, CA.

Kliejunas, J.T. 1991. Court Testimony, Northcoast Environmental Center and California Native Plant Society vs. Barbara Holder, F. Dale Robertson, USFS, Blue Lake Forest Products, Inc., and Murphy Creek Lumber Company; Civil #S-91-0078-EJG; United States District Court for the Eastern District of California.

Kliejunas, J.T. 1992. Personal communication. USDA-FS, San Francisco, CA.

Lang, Frank. 1992. Port-Orford Cedar: Nature Notes (transcript). Jefferson Public Radio, Ashland, OR.

Martinson, S. 1994. Personal communication. USDA-FS, Portland, OR.

Millar, C.I., Delaney, D.A., Westfall, R.D., Atzet, T., Greenup, M., and T.M. Jimerson. 1991. Ecological Factors as Indicators of Genetic Diversity in Port-Orford Cedar: Applications To Genetic Conservation. USDA-FS, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA. 3 p.

Millar, C.I. and K.A. Marshall. 1991. Alozyme Variation of Port-Orford Cedar (*Chamaecyparis lawsoniana*): Implications for Genetic Conservation. Forest Science 37(4):1060–1077.

Ollivier, L.M. 1992. Habitat Relationships of Aquatic Amphibians in the Smith River Drainage. Master's Thesis, Humboldt State University, Arcata, CA. 155 p.

Ostrofsky, W.D., Pratt, R.G., and L.F. Roth. 1977. Detection of *Phytophthora lateralis* in Soil Organic Matter and Factors That Affect its Survival. Phytopathology 67:79–84.

Robison, G.E. and R.L. Beschta. 1990. Identifying Trees in Riparian Areas That Can Provide Coarse Woody Debris to Streams. Forest Science 36(3):790–801.

Roth, L.F., Harvey, R.D., and J.T. Kliejunas. 1987. Port-Orford Cedar Root Disease. Forest Pest Management Report Number 294. USDA-FS Pacific Northwest Range and Experiment Station, Portland, OR.

Schoeppach, W. 1991. Personal communication. USDA-FS Klamath National Forest, Happy Camp Ranger District, CA.

Thomas, J.W. and Raphael, M.G. 1993. Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. The Report of the Forest Ecosystem Management Assessment Team, Portland, OR. 848 p.

Torgeson, D.C., Young, R.A., and J.A. Milbrath. 1954. *Phytophthora* Root Rot Diseases of Lawson Cypress and Other Ornamentals. Bulletin 537, Oregon State College Agricultural Experiment Station, Corvallis, OR. 18 p.

USDA-FS and USDI-BLM. 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. Portland, OR. 1066 p.

Viets, R. 1993. Personal communication. USDI-BLM, Medford District, Medford, OR.

Zobel, D.B. 1979. Seed Production in Forests of *Chamaecyparis lawsoniana*. Canadian Journal of Forest Research 9:327–335.

Zobel, D.B. 1990. *Chamaecyparis lawsoniana*: Port-Orford Cedar. In: Burns, R.M., Honkala, B.H., technical coordinators. Silvics of North American: Volume 1, Conifers. USDA-FS Agricultural Handbook 654, Washington, D.C. 88–96 p.

Zobel, D.B., Roth, L.F., and Hawk, G.M. 1985. Ecology, Pathology, and Management of Port-Orford Cedar (*Chamaecyparis lawsoniana*). General Technical Report PNW-184, USDA-FS Pacific Northwest Range and Experiment Station. 161 p.

Appendix 2: Summary of Agency Actions for Fiscal Years 2001 and 2002 Under the Existing Direction for Port-Orford-Cedar

This information is presented to help guide assumptions about how the No-Action Alternative is expected to be implemented. Although the No-Action Alternative generally relies on site-specific analysis to select management actions from a menu of possible actions to meet an overall objective, a reasonable assumption about the future level and intensity of management actions can be made by examining what the Agencies have done under this direction in the past. The effects of the No-Action Alternative (Alternative 1) described in Chapter 3&4 and summarized in Chapter 2 are based in part on recent accomplishments noted in this appendix, and an expectation that a similar scope and intensity of management practices will continue.

Overview of Current Port-Orford-Cedar Program Implementation

In May 1987, and interregional Port-Orford-cedar (POC) Coordinating Group was formed by the BLM and FS. This group continues to serve as a programmatic technical coordination team composed of the BLM POC Coordinator, FS POC Manager, pathologists, ecologists, and geneticists, as well as administrative unit representatives from Oregon and California.

The existing POC program is basically made up of five efforts on the part of the Federal agencies: (1) decreasing the spread of the disease, (2) increasing the survival of the host, (3) producing valued by-products from its treatment, (4) considering potential impacts on other forest activities resulting from implementing *Phytophthera lateralis* (PL) mitigations, and (5) monitoring and communication.

1. Decreasing Spread of the Disease

A. Roadside Sanitation: The removal of roadside POC is a technique to prevent/reduce new infections along roads in currently uninfested areas, or if already infested, minimizing the amount of inoculum available to be transported to other uninfested road segments. Both agencies are currently using this tool in certain, site-specific forest projects. Treatment width varies in its application.

B. *Phytophthora lateralis* Eradication: By using a combination of treatments (such as removing the host, opening a stand to direct sunlight, using fire to lessen the amount of PL in soil, and planting different replacement species), PL may be eliminated from treatment areas eventually allowing POC to reestablish. Because its effectiveness has not been proven over the long term, neither agency is currently utilizing this technique.

C. Improve Roads to Decrease Risk, Especially within Key Habitats: Both agencies attempt to upgrade roads on a site-specific project basis to minimize movement of the pathogen on forest roads. Available funding, however, frequently limits this technique.

D. Water Sources: Water is frequently used in many forest activities, including road construction, dust abatement, and fire control. Water sources, however, may be contaminated with PL and the pathogen may be spread across the forest environment by the

movement of water. Federal agencies have recommended and widely implemented treating such water with chlorine bleach and have largely mapped possible contaminated water sources within the range of POC. However, keeping maps of uninfested water sources current is not always possible with limited resources.

E. Road Design and Maintenance: Few forest roads are being built within the range of POC on Federal lands because of listed fish species and the decline in timber harvest levels. New road design specifications for sloping and surfacing have been implemented using recommended transportation management objectives when feasible. Existing Federal forest roads are continually being evaluated on a project basis for various treatments including upgrading surfacing, gating, or closing.

F. Road Use Restrictions: Although not always desirable or possible, closing or gating roads are effective methods for limiting the introduction of the disease.

G. Washing Vehicles: Even though washing can be a successful treatment for lessening the amount of PL spread across forest environments, it is difficult to apply efficiently. Realistic locations for installing washing stations are often not available, and control of use (who and when) is not always an option because of right-of-way permit requirements.

H. Restricting the Sale of Forest Products: Some administrative units have noticed a correlation between the sale and harvest of POC boughs and the spread of PL. These units have restricted or discontinued the sale of POC boughs.

2. Increasing Survival of the Host

A. Resistance Breeding: Based upon general forest resource management objectives to promote and sustain forest health, biodiversity, and productivity, the FS and BLM have both committed time and funding to a resistance breeding program currently underway at the FS Dorena Genetics Resource Center located at Cottage Grove, Oregon. Related research is also being conducted at Oregon State University in Corvallis. A 5-year memorandum of understanding was recently signed between the two Agencies to continue interagency support for the POC breeding program (see additional details below).

B. Plant Spacing: Because so few reforestation projects were done in the past, spacing of POC seedlings was not a consideration. But with large reforestation stock needs resulting from large fires such as the Biscuit Fire, seedling needs will increase. Individual POC seedlings are planted at a 25-foot spacing or in clusters 100- to 150-feet apart.

C. Precommercial and Commercial Thinning Spacing: Provisions of precommerical thinning contracts usually include requirements for leaving POC as leave trees whenever possible and creating wide distances between them. Federal commercial thinnings have also been implemented using recommended spacing guidelines, or have been used to remove POC growing adjacent to roads in or on the perimeter of treatment areas.

3. Producing Valued By-Products from Treatments

A. Bough Sales When Sanitizing: Harvesting boughs from POC trees that have already

been cut during roadside sanitation treatments is currently being conducted only on the Medford District of the BLM.

B. Snag/Coarse Woody Debris Retention: Both agencies are following general snag and coarse woody debris retention direction of the "Northwest Forest Plan" (1994). POC is not specifically identified as a species targeted for retention.

C. Non-Port-Orford-Cedar Special Use Permits and Other Collections: Both Agencies issue and promote special use permits for the harvesting of other special forest products. Some examples include the sale of non-POC boughs, beargrass, and the collection of cones. The actual harvest of these commodities, however, sometimes involves using forest roads during wet periods and, if not closely regulated, may take place in infested areas. Agency responses have typically been to prohibit special use permits on infested sites on a seasonal basis. It should be noted that noncompliance of the conditions of the special use permits and limited law enforcement abilities or contract oversight frequently allow the opportunity for spread of PL on forest roads. Aggregate material is also routinely sold by both agencies, sometimes where the material may be contaminated with PL.

4. Potential Impacts on Other Forest Activities Resulting from Implementing *Phytophthora lateralis* Mitigations

A. Mining: Activities likely to cause significant disturbance of surface resources require a plan of operation, leading to Agency requirements for reasonable terms and conditions. Mining operators can be required to follow the same mitigation techniques as the Agencies require of themselves, contractors, and pemittees.

B. Incorporating Port-Orford-Cedar Concerns When Planning Other Projects: The geographic information system (GIS) is the basic planning tool used for identifying currently known locations of both POC and PL in relation to proposed project locations. Other ongoing programs, such as the issuance of special use permits, consider these actions and the possible spread of the disease. POC concerns are also identified in agency transportation management plans and are considered in relation to possible road management activities, including road construction, maintenance, and use.

5. Monitoring/Education

A. Monitoring: Within the FS, implementation and effectiveness monitoring of POC projects are conducted in accordance with respective land and resource management plans. Elements of FS monitoring programs may include conducting annual surveys for identifying new locations of POC root disease, estimating overall trends of rates of spread of the disease, evaluating the risk of spread for proposed projects and follow-up after project completion, and collecting data to estimate intensity of infested areas. For the three BLM districts, resource management plans require all projects to conform to the "Port-Orford-Cedar Management Guidelines" (1994). These Guidelines state that when inventorying POC and PL areas, effectiveness of management of the pathogen and disease control should be monitored for at least 5 years in the drier portion of the range of POC and for longer periods where climatic conditions are wetter. Both agencies have sometimes not met timing recommendations for reinventorying locations of POC and PL.

B. Public Education: The FS and BLM have prepared a POC communication plan. The plan identifies specific methods for possible education efforts including press releases, posters and pamphlets; public field tours; presentations to user groups; a POC Newsletter; coordination with Tribal groups; creating POC internet websites; conducting public symposiums; preparing and installing information signs on trailheads, gates, and other closures; holding coordination meetings with industrial and small woodland landowners; and supplying maps of road closures. Actual implementation of these tasks varied widely depending on available staff time, budget, or legal constraints.

Existing Programmatic Actions

Interagency Port-Orford-Cedar Breeding Program

The FS and BLM are supporting an ongoing program at the FS Dorena Genetic Resource Center in Cottage Grove, Oregon, to identify the amount and type of genetic resistance in natural populations of POC to the introduced PL pathogen. Wild, individual trees are selected to test for genetic resistance, with the goal to produce resistant seed to restore and sustain POC and its function in the ecosystem. First priority for resistant seed are Federal and cooperating agencies, but some seed has recently been made available to other growers.

With assistance from Oregon State University, work is continuing to develop durable resistance (that is to survive long term) while retaining the broad genetic diversity within the species. Over 11,000 field selections throughout the POC range have been made. Using a stem inoculation technique, limbs (approximately 12-inches long) are collected from each of the trees and six of these branches are then screened for resistance to PL; the trees highest rated with this technique are now being retested by a root inoculation technique using rooted cuttings or seedlings grown from seed collected from the candidate tree to help refine the results of the initial screening.

Other elements of the POC program involve propagation; growing, cultivating, and maintaining containerized trees; breeding; seed production; evaluation using validation plots; analysis; data management; record keeping; and technology transfer.

Because POC bears cones at age 4 or 5 when intensively managed, the program is advancing quickly from resistant orchard trees and the opportunity now exists to use this seed in some breeding zones. Resistant seed is being sown in early 2003 to be used to restore areas burned in the Biscuit Fire on the Siskiyou National Forest (NF).

Agency Wildfire Management Implications

Firefighting activities have commonly involved the use of water for suppression purposes and the use of vehicles to transport people and equipment within and around the fire perimeter. Prior to the fire season, the FS and BLM have both inventoried and updated possible water sources and have identified potentially infested water sources. When a wildfire breaks out, this information has been communicated to fire resource advisors and, when safely possible, the use of either uninfested or treated water has been encouraged. If present, propagules of the pathogen can be killed in contaminated water by treating it with chlorine bleach. Frequent and strategic washings of fire vehicles and equipment have also been recommended.

Updating Mapping of Port-Orford-Cedar/*Phytophthora lateralis* Locations

From 1990 to 1996, the FS and BLM took up the substantial task of initially mapping range-wide on federally-administered lands with known and recently observed locations of both POC and PL. Utilizing existing data, road surveys, aerial photo interpretation, and annual aerial surveys, maps were compiled and transferred to GIS and are now available at both the administrative-unit and range-wide scale. In Fiscal Years 2001 and 2002, changes have been noted and geographic information system layers have been revised as needed. This spatial and temporal information is now routinely used for project planning.

Specific Actions by Administrative Unit

Siskiyou National Forest. The Siskiyou NF recently issued a POC policy that recommended to employees, contractors, and the general public, when in areas within the range of POC, to use a range of mitigation actions to reduce the risk of import, export, or spread of PL. Actions recommended included washing vehicles prior to entering any areas of uninfected POC on NF lands, avoiding use of roads closed or gated for POC protection, and cleaning footwear when work is completed in infested areas.

In Fiscal Year 2001, the Siskiyou NF reported programmatic funding of approximately $238,000 for a POC manager to serve all NFs within the range of POC, as well as district or zone POC coordinators, printed educational materials, and other supplies.

The Forest tracks individual projects that were active within the range of POC and, by each respective activity, reports implementation of disease control efforts and their success in discouraging the spread of the disease. Broad categories used are engineering and road management, timber harvest, and stand management actions.

Firefighting operations on the Biscuit Fire that occurred on the NF in the summer of 2002 included efforts to minimize spread of the root disease. Management actions taken, when safely possible, included daily washing of vehicles and equipment, and treating water with chlorine bleach. Approximately 26,700 gallons of chorine bleach were used on the fire and subsequent rehabilitation efforts.

Six Rivers National Forest. A biannual aerial detection flight conducted in Fiscal Year 2001 discovered a new root disease location and the road was closed and access restricted. No other new infections were reported.

In Fiscal Year 2002, the Six Rivers NF conducted a presuppression assessment ($20,000), closed a road, built a trail and moved a trail, and conducted surveys to move other trails into three natural resource areas ($32,310), and removed POC growing alongside forest roads ($8,000).

The Six Rivers NF also has a common garden study site located at the Humboldt Nursery facility, and the Forest has actively relocated trails and trailheads because of PL concerns, instituted an active roadside sanitation program, installed a wash station at Orleans, California, developed a public education program, and installed and maintained POC resistance trials at two sites.

As on the Siskiyou NF, firefighting operations on the Biscuit Fire that occurred in 2002 included efforts to minimize spread of the root disease. Management actions taken, when safely possible, included daily washing of vehicles and equipment, and treating water with chlorine bleach.

Shasta-Trinity National Forest. POC root disease was confirmed to be on the Shasta-Trinity NF in 2001. The Forest incorporates POC management considerations into all of its management activities. Eradication treatments are scheduled to take place in 2003. Routine actions, when vegetation management is practiced where POC occurs, include detections, evaluation, and control of pest-caused damage. As an example, in Fiscal Year 2002, the Forest relocated and improved many road crossings ($20,400) as part of an active program to identify and address sites that are at high risk for introduction of PL. The Cedar Basin Research Natural Area is also actively managed to exclude the pathogen—inland POC populations there are genetically and ecologically distinct from coastal populations.

A large common garden study site on the Shasta-Trinity NF near Weaverville, California, is maintained and evaluated by the Forest to determine the physiological and genetic variation traits of the species.

Klamath National Forest. PL does not currently occur on lands administered by the Klamath NF, although there are many stands of POC. In Fiscal Year 2002, the Klamath NF provided $4,000 for field collections of vegetative material in support of the POC genetics program. The Klamath NF instituted and maintains roadside sanitation zones along Grayback Road and other areas, maintains an active disease monitoring program, and incorporates POC management considerations into all of its management activities.

Coos Bay BLM. Because the disease has been present on these federally-administered lands for the longest period of time (50 years) and its presence is pervasive across the Coos Bay District, effectively controlling the spread of the disease is especially difficult. Also, because of the BLM's system of existing reciprocal right-of-way agreements with private parties, road treatments and control are often not possible. The Coos Bay District implemented some road treatments in Fiscal Year 2001 which included roadside sanitation when practical, washing of vehicles (seasonally), closing selected roads, summer hauling on dirt roads, and prohibiting the cutting of POC boughs.

Because the disease has been present in this location for a long period of time, individual wild trees have also had the greatest opportunity to express genetic resistance (usually indicated by healthy POC surrounded by dead or dying POC). A large number of such trees from this District have tested positively for resistance and are now represented in the genetics program.

It is estimated that 80 percent of all green, living POC trees on the Coos Bay District are scattered and well-distributed away from streams and roads where mitigation measures are not needed. In these areas of low risk for infection, POC trees are expected to maintain their population. The District planted 2,000 nonresistant POC seedlings on acres of low-risk sites in Fiscal Year 2001, and 1,000 nonresistant POC seedlings on 150 acres of low-risk sites in Fiscal Year 2002.

Medford BLM. Management for POC during Fiscal Year 2001 and 2002 on the Medford

BLM District were in two broad categories. The first category involved the collection of information, monitoring of sites infested with PL and its spread, and the continuation of efforts involving resistance to the root disease represented by selecting and testing individual POC trees.

The second category of POC management was the physical management of stands. Projects included treatments such as roadside treatments that removed POC, pre-commercial thinning treatments where POC was thinned to a wide spacing to reduce the spread of the root disease through root grafts, restrictions (such as seasonal gates), limited bough collection from uninfested areas, and the creation of POC snags. Other projects, such as trail construction, were designed to avoid POC locations.

Roseburg BLM. The Roseburg District continues to implement a series of management actions including washing vehicles and seasonal-use restrictions on certain roads, and prohibiting such activities as bough collecting at certain times of the year.

In Fiscal Year 2001, other associated District programs included an active program of mapping new locations of the disease, removal of hosts next to roads, continued identification of genetically resistant trees, and pursuing a proposed land exchange that would protect a serpentine plant community with POC.

In 1997, a 10-acre site on the District was planted to study POC range-wide silvicultural and genetic characteristics. The site is continually maintained and the POC, which originated from varying locales from Oregon and California, are being evaluated.

Appendix 3: Port-Orford-Cedar Standards and Guidelines in the Land and Resource Management Plans in Region 5 (SEIS Cooperating Agencies) and the Siuslaw National Forest

For reasons described in the Background section, management direction for the Klamath, Six Rivers, Shasta-Trinity, and Suislaw NFs is not being considered for change at this time. The current direction for these forests is held constant across all of the alternatives in the SEIS, and is only considered in the cumulative effects discussions in Chapter 3&4. The current POC management direction for these NFs is displayed in this appendix for reference.

Existing Direction — Six Rivers National Forest

The following is from the "Six Rivers National Forest Land and Resource Management Plan" (1995).

TREES WITH SPECIAL MANAGEMENT CONSIDERATION

[Page II-7] Strategies for reducing the risk of infection or spread of the disease will be integrated into all levels of planning and analysis for all areas that contain Port-Orford-cedar (POC). A risk analysis will be completed for all projects in watersheds containing POC. The Forest is utilizing disease control strategies.

[Page III-16] POC will be managed according to the Forest plan Standards and Guidelines that should provide an opportunity to prevent the spread of the root disease. Opportunities may occur to reestablish POC in plant associations which have been altered by root disease.

[Page III-16] The Forest Service implements an integrated pest management approach to dealing with forest pests (such as root diseases) which includes prevention, detection, evaluation, suppression, and monitoring. Pest management goals are directed toward reducing pest-related losses to levels that maintain a healthy forest environment.

<u>Standards and Guidelines</u>

[Page IV-51] *Pest Management*

1. No management action should be taken against endemic insects or Forest pathogens unless it can be determined that their occurrence has been exacerbated by human activities or spread would significantly compromise the integrity of the [Special Interest Area].

2. In order to reduce the spread of POC root disease, a risk analysis will be completed for all projects in watershed containing POC.

3. Access and/or projects proposed in uninfected watersheds which have potential risk for infection shall have a risk analysis performed.

Transportation and Facilities

[Page IV-53] 7. To prevent the introduction of POC root disease into uninfested areas of the North Fork

Smith River Botanical Area, close Road 18N13 to vehicle access. Vehicle access into remaining areas (Road 18N09 and associated spur roads) is prohibited pursuant to 36 CFR 261.50; the prohibition exempts officials pursuant to 36 CFR 261.50(d)(4) and persons with a permit, special-use authorization, or operating plan, as defined in 36 CFR 261.2, issued by the District Ranger or higher-ranked authorized official. Access shall not be allowed during the wet season and during periods of heavy rain in the summer. If monitoring determines that these measures are not effective, additional mitigation measures will be considered and analyzed.

MANAGEMENT AREA 11-SPECIAL REGENERATION

Pest Management

[Page IV-54] 1. In order to reduce the spread of POC root disease, a risk analysis will be completed for all projects in watersheds containing POC.

FOREST-WIDE DIRECTION — PEST MANAGEMENT

Pest Management Program

[Page IV-129] *Goals:* Minimize resource damage from insects, disease, plants, and animals to help achieve resource objectives. Where this damage causes undesirable changes in vegetation, minimize resource damage through integrated pest management.

Direction: Of special concern to this Forest is POC root disease, *Phytophthora lateralis*. Special practices and monitoring are being implemented to maintain the viability of POC in the forest for genetic diversity, as well as economic and American Indian contemporary uses. Management is intended to be site specific, consistent, and visible to the public. Any activity that has a potential for spreading the root diseases fungus will require a formal analysis and prescription for controlling the spread of the fungus. This process is also required when Pacific yew is intermingled with POC or within the same project area as POC.

Port-Orford-cedar Root Disease

20-6: POC will be managed as a long-term component of plant associations where it is present.

20-7: Strategies for reducing the risk to POC from infection of the root disease will be integrated into all levels of planning and analysis (NEPA documents, watershed analysis, late-successional reserve assessments, wild and scenic river management plans, transportation planning, recreation planning and other activities or strategies) in all watersheds where it is present.

Transportation plans will evaluate the risk of spread of POC root disease through road upgrades, seasonal closures, permanent closures, maintenance, and decommissioning or obliteration.

Recreation plans will also evaluate the risk to POC and address access, trail, and road use for recreational purposes.

20-8: In order to reduce the spread of POC root disease, a risk analysis will be completed for all projects in watersheds containing POC. Disease control strategies identified from experience and research will be applied on a site- or drainage-specific basis to prevent or if the disease is present, reduce the spread and severity of the disease.

[Page IV-130] 20-9: Information concerning POC root disease, its spread and prevention, will be provided to the public.

20-10: Proactive disease prevention measures such as road closures, road maintenance, and sanitation removal of roadside POC will be undertaken to help prevent the spread of the disease, especially to high-risk areas. Prevention measures would be identified at a site-specific or drainage-specific level through environmental analysis.

IMPLEMENTATION, MONITORING, EVALUATION, & AMENDMENT

Forest Pests & Diseases

[Page V-20] *Effectiveness monitoring questions:* Are applicable mitigations and management strategies preventing/minimizing significant damage or growth reductions from destructive insects or diseased on the Forest, including POC root disease?

Sampling methods and intensity: (1) Routine sampling during stand exams and reforestation surveys; and (2) biannual aerial detection surveys, plus intensive sampling of road systems infected by POC root disease.

Threshold of concern and responsible staff: (1) Pathogen or pest levels indicate potential for damage or growth loss in 15 percent of samples; (2) detected acceleration of POC root disease spread; and (3) SO [supervisor's office] and District silviculturists.

APPENDIX H

Pests: Port-Orford-cedar:

[Page H-9] *Monitoring purposes:* (1) Determine infected locations, rates of spread and overall trends of POC root disease; and (2) evaluate effectiveness of strategies to control spread of the disease.

Threshold of concern/Variability: Measured acceleration or deceleration of spread as an indicator of positive or negative effectiveness of control strategies.

Data collection: Conduct aerial photographic inventories to identify healthy and diseased stands. Intensively sample infected road systems to determine the extent and rate of spread of POC root disease along transportation routes. Regularly scheduled reforestation surveys after the first, third, and fifth growing seasons will indicate performance in plantations. Perform aerial detection surveys at least every two years to indicate spread along streams and roads and within forest stands. Research will be initiated to measure genetic diversity, develop disease-resistant trees, and evaluate methods of control.

Responsibility: Forest ecologist and Forest and District silviculturists.

APPENDIX K – PORT-ORFORD-CEDAR ACTION PLAN

[Page K-4] Control Strategy—Project analysis and Implementation

The following is an outline format to be used to complete a risk analysis for all projects in watersheds containing POC. Disease control strategies will be applied as appropriate on a site or drainage-specific basis to reduce the spread and severity of the disease.

		Risk (concern)		
	% of POC	Low	Moderate	High
IMPACT	Low (0–5)	Low	Low	High
	Moderate (5–20)	Low	High	High
	High (>20)	High	High	High

Defining Risk

Low—Below roads, no POC within 500 feet; above roads, no POC within 50 feet.

Moderate—Below roads, POC may be between 100 and 500 feet of the road; above road, no POC within 50 feet.

High—Below roads, POC within 100 feet; above roads, POC within 50 feet.

Potential Project Objectives

Objective A: Prevent the import of disease into uninfected areas (offsite spores picked up and carried into uninfected project area).

Objective B: Prevent the export of disease to uninfected areas (onsite spores moved to offsite uninfected area).

Objective C: Minimize increases in the level of inoculum or minimize the rate of spread in areas where the disease is endemic or infection is intermittent. If possible identify the probable mechanism of spread; whether by introduction of spores or by root grafting.

Threshold of Concern Assessment

The assessment will discuss the level of concern regarding the project, the causes for concern, specific areas of concern and possible treatments to preclude the level of risk. The following is a list of possible treatments.

Disease Control Strategies

Engineering and Road Management [E]

E-1: Road locations should be made, when possible, below cedar areas or on opposite sides of ridges.

E-2: Control drainage from roads so that it is dispersed to the maximum extent feasible through outsloping and/or frequent ditch relief. Where not feasible, drainage should be concentrated into existing stream channels.

E-3: Locate and design waste areas so they do not spread infection spores.

E-4: Limit road construction to the dry season.

E-5: Machinery and vehicles working and traveling on road prior to establishment of final drainage need to be washed before entering project.

E-5A: Machinery and vehicles working and traveling on road prior to establishment of final drainage need to be washed before entering project. Trucks end-hauling material to waste areas may be exempted provided no infected toads or sites are traveled between the project and the waste area.

E-6: Wash equipment before leaving infected areas.

E-7: Close roads with guardrails, physical blockages or "putting to bed." Maintenance and enforcement is included.

E-7A: Close roads with guardrails, physical blockades or "putting to bed" in order to restrict product utilization and management activities in the dry season (June 1 through September 30). Maintenance and enforcement are included.

E-8: Avoid dust abatement with potentially infected water or treat water with chlorine.

E-8A: Avoid dust abatement and compaction with potentially infected water or treat water with chlorine.

E-9: Maintenance activities should avoid spilling rock on outside or downslope side of the road. As needed, blading shall be kept within 2 feet of the road edge to better achieve this.

E-10: Where conditions permit, inslope the road template and establish berm on the outside edge of the road to prevent downslope flow of contaminated water.

E-10A: For maintenance purposes, where conditions permit, establish berm on the outside edge of road to prevent downslope flow of contaminated water.

E-11: Establish road rules to prevent timber haul during periods when spores will be spread widely.

E-12: Dump fill and debris from infested culverts and ditches in safe areas to avoid spreading the fungus.

E-13: Establish road surface blading requirements to maintain a specified road template during maintenance operations.

Timber Harvest [T]

T-1: Limit the operating season of timber sale operations to the drier months.

T-1A: Limit the operating season of timber sale operations to the drier months (June 1 to September 30); discontinue operations during periods of rain or wet weather (C6.315: Limited Operating Season).

T-2: Wash logging equipment before operating away from landings and roads.

T-3: Constrain timber haul so trucks do not travel from infected areas, contaminating the latter. Harvest the units in priority order to minimize the spread of spores to uninfected areas.

T-4: When feasible, plan downhill logging to avoid road construction above uninfected stand.

T-5: Use helicopter logging to protect high value cedar stands.

T-6: Use service contracts to harvest timber with more control of activities.

T-7: Wash logging equipment working in infested sites before it is moved off site.

T-8: Wash logging equipment, other than log trucks, prior to entering sale area.

T-9: Wash log trucks and other equipment when moving from infected to uninfected areas during wet weather.

Stand Management [S]

S-1: Identify low-risk areas and emphasize maintaining and/or introducing POC into the species mix.

S-2: Plant POC singly or in groups at a wide-spacing independent of other stocking.

S-3: Avoid planting POC within 50 feet of roads, streams, or wet areas.

S-4: During precommercial thinning [PCT] thin POC at a 25 foot spacing, independent of other crop trees, or space POC in groups 100 feet apart were possible.

S-5: As part of PCT, remove POC from areas adjacent to roads, streams, and other high-risk areas.

S-6: To insure the presence of POC through the rotation, leave all thrift cedar during commercial thinning.

S-7: Manage the cedar component of the stand on a longer rotation than the other associated conifers. Example: carry cedar through two or three fir rotations.

S-8: Plant container grown POC until bare root stock can be certified disease free at the nursery.

S-9: Indicate in stand records (TRI, etc.) that POC protection measures have been implemented.

S-10: Minimize management entries during wet meadow. Wash vehicles when such entries are made. Must be associated with formal road closure.

S-11: Where possible coordinate prevention/control activities with adjacent private landowners.

Other [O]

O-1: Administrative closure orders.

O-2: Coordinate other products utilizations with POC control needs and road closures. Examples: fuelwood cutting, cedar bough cutting.

POC Cumulative Effects Analysis

[Page K-7] Each project analysis will contain a discussion of potential cumulative effects. The assessment will use the following definitions and will use the analysis chart to help determine whether there are potential secondary or cumulative effects.

Definitions

Meaningful quantities of POC: Use 5 percent or greater cover. Consider and identify exceptional situations where less than 5 percent can be meaningful, such as small isolated stands near the edge of the species range.

Downslope/downstream: Consider all the forest land areas between the analysis area and the first occurrence of the root disease. If a proposed activity occurs on a ridgetop then analyze both drainages.

Introducing risk: Estimate the percent of the analysis area in which the risk of infection is increased as a result of the proposed management activity.

Meaningful levels of mortality: This is defined as a mortality rate of 25 percent of existing POC over the next 20 year period.

Cumulative Effects Analysis Chart	
Meaningful quantities of POC within or downslope/downstream of the analysis area?	*If no, then no secondary or cumulative effect.*
If yes, continue.	
Will the proposed project introduce risk to this cedar?	*If no, then no secondary or cumulative effect.*
If yes, continue.	
Following mitigation, is disease likely to infect a major amount of the analysis area?[1] [Ref: 40 CFR 1508.27]	*If no, then no secondary or cumulative effect.*
If yes, then there are potential secondary and cumulative effects.	

[1] Major is a relative term; it means great or large in relative importance to POC existence in the near proximity and over its range, notable or conspicuous in effect or scope (for instance, visually detracting), or poses a serious risk to the ecosystem, its neighbor POC, and the total population.

Existing Direction — Klamath National Forest

The following is from the "Klamath National Forest Land and Resource Management Plan" (1995).

Desired Future Condition of the Forest

The Forest in 10 Years

[Page 4-16] Management activities would be promoted than increase the populations of desirable plant species with limited distributions or low population levels. Species of concern include Brewer spruce, POC, Pacific yew, and sugar pine.

Standards and Guidelines

Biological Diversity

[Page 4-23] 6-13: Management activities should be designed to maintain or increase population levels of desirable native plant species that currently have low population levels, of desirable plant species with limited habitat distribution and of desirable plant species that have problems with disease. Examples include POC, sugar pine, Pacific yew, Brewer spruce, etc.

[Page 4-24] 6-15: All vegetative management practices should be designed to maintain a healthy forest. Conditions that promote the introduction and spread of disease, increase the risk of insect attack or promote unacceptable fire risk should be avoided.

Transportation and Facilities Management

[Page 4-51] 20-1: Transportation Planning analysis should: (4) Evaluate the risk of spread of POC root disease through road upgrades, seasonal closures, permanent closures, maintenance and decommissioning or obliteration.

Timber Management

[Page 4-59] 21-57: Maintain a healthy and resilient population of all species, including special interest species such as Pacific yew, brewer spruce, POC, Pacific silver fir, Baker cypress, and whitebark pine throughout their native range.

1. Projects with the potential to impact special interest species should be analyzed and the potential impacts documented through the EA process.

2. Mitigation for impacts should include provisions for planting or increasing local populations where desirable.

[Page 4-60] 21-61: Take measures that shall limit the spread of POC root rot, and increase populations of POC on the Forest. Prevent or reduce the risk of introducing the disease into uninfested areas. Strategies for reducing the risk to POC from infection by the root disease will be integrated into all levels of planning (NEPA documents, ecosystem analysis, LSR assessments, WSR management plans, transportation plans, recreation and other activities or strategies).

In order to reduce the spread of POC root disease, a risk analysis will be completed for all projects in watersheds containing POC. Disease control strategies identified from experience and research will be applied on a site or drainage-specific basis to reduce the spread and severity of the disease.

Existing Direction — Shasta-Trinity National Forest

The following is from the "Shasta-Trinity National Forests Land and Resource Management Plan" (1995).

CHAPTER 4, STANDARDS AND GUIDELINES

[Page 4-18] 10. Forest Pests

a. When conducting watershed/ecosystem analysis, consider the possible effects that Forest pests may have on management objectives and desired future conditions.

b. Implement an integrated pest management (IPM) program to maintain or reduce forest pest impacts to acceptable levels and to maintain or enhance forest health and vigor. Any decision to use pesticides will require site specific environmental analysis.

e. Take measures that limit the spread of POC root disease.

SUPPLEMENTAL MANAGEMENT AREA (MA) DIRECTION

[Page 4-102] MA 5 - Parks-Eddy: (16) Perform a POC risk analysis for any planned management activities in areas with that species. Implement appropriate mitigation measures to prevent the introduction of *Phytophthora lateralis* the cause of POC root disease.

[Page 4-105] MA 6 - Upper Trinity: (4) Perform a POC risk analysis for any planned management activities in areas with that species. Implement appropriate mitigation measures to prevent the introduction of *Phytophthora lateralis* the cause of POC root disease.

[Page 4-109] MA 7 - Weaverville/Lewiston: (3) Perform a POC risk analysis for any planned management activities in areas with that species. Implement appropriate mitigation measures to prevent the introduction of *Phytophthora lateralis* the cause of POC root disease.

[Page 4-115] MA 8 - Trinity Unit: (5) Perform a POC risk analysis for any planned management activities in areas with that species. Implement appropriate mitigation measures to prevent the introduction of *Phytophthora lateralis* the cause of POC root disease.

[Page 5-9] TABLE 5-1: MONITORING ACTION PLAN

Forest Pests

Activity, Practice or Effect: Forest pest activity levels (especially where they conflict with management objectives)

Techniques and/or Data Sources: Review project level plans for inclusion of possible pest effects

Intensity and Standard: Regional standards; selected project plans

Frequency of Measurement/Reporting: Annually, as changes occur

Expected Precision/Reliability: High

Variability in Standard Which Would Require Further Evaluation and/or Corrective Action: > 10 percent of project plans fail to consider pests

APPENDIX L, DESCRIPTION OF MANAGEMENT PRACTICES

[Page L-3] Integrated Pest Management

The decision-making process considers the ecology of the host and its pests throughout the rotation of the forests. It also considers management objectives and economic values of the resource, couples with monitoring data on pest populations and environmental factors that favor their increase. These data are required to decide for or against action to reduce excessive losses to the resource.

Action alternatives may be oriented toward prevention of losses or they may be in directs response to chronic or catastrophic losses. One or more approaches may be used. These approaches emphasize retention of natural system and include cultural, mechanical, biological, regulatory, and chemical tactics. A no-action alternative may also be appropriate.

Existing Direction — Siuslaw National Forest

The following is from the "Siuslaw National Forest Land and Resource Management Plan" (1990).

FOREST-WIDE STANDARDS AND GUIDELINES

[Page IV-58] FW-179: Pest Management - Use an Integrated Pest Management (IPM) approach, which recognizes pest management as an integral part of timber and other resource management, to prevent and reduce unacceptable pest-related damage. Under IPM, consider and analyze a full range of pest management alternatives, including cultural, biological, chemical, and mechanical methods, on a site-specific, project-level basis. Select specific treatment methods through an environmental analysis process which will consider environmental effects, treatment efficacy, and cost of each alternative on a case-by-case basis. Set up monitoring and enforcement plans to implement specific measures during this site- and project-specific analysis.

OREGON DUNES NATIONAL RECREATION AREA (NRA) MANAGEMENT PLAN, *Amendment to the Siuslaw Forest Plan (1994).*

Management of Habitats

[Page III-10] Plants – Management of plant habitats will be focused on globally significant communities included in Management Area [MA] 10(F), plants that are listed as sensitive, and native plant communities associated with the active-dune ecosystem. Management in globally significant communities will focus primarily on maintenance and protection and development of plant-based learning opportunities. Globally significant communities currently within MA 10(F) include:

Port Orford cedar/evergreen huckleberry community.

[Page III-42] Management Area 10(F) – Plant, Fish and Wildlife Habitats

Goals – To maintain, create, enhance or restore a variety of special plant, fish and wildlife habitats.

Desired Condition – Optimum physical and biological conditions necessary for target plant, fish or wildlife communities are present. Diverse habitats of various sizes are dispersed across the Oregon Dunes NRA. Even though management activities have taken place, the area is predominantly natural appearing. Human use and disturbance is low. There is an absence of ORVs (other than for administrative uses) and incompatible behaviors such as disturbing animals or harvesting plants. There are few trails or other facilities.

Following are descriptions of the desired condition for the specific components of this management area:

Forest Habitats – Forest stands have multiple vegetation layers except in communities where this would not naturally occur. Where present, the shrub layer is relatively undisturbed. Different plant communities and tree age groups are spread throughout the management area. Snags and down logs are present in numbers expected to occur naturally. There is an abundance of mushrooms and other decomposers.

Appendix 4: Clorox Use, Toxicity, Potential Environmental Effects, and Label Information

Introduction and Use

Ultra Clorox® Brand Regular Bleach (EPA Reg. No. 5813-50) is registered for POC root disease treatment use. The active ingredient in Ultra Clorox® is sodium hypochlorite. When used as directed, it is effective in killing PL in treated water. As described in other sections of this SEIS and suggested in the Standards and Guidelines of some of the alternatives, treating water prior to use helps control the spread of PL to uninfested areas. Water is commonly drafted from streams and fire ponds within forested areas to use in dust abatement on forest roads, equipment cleaning, and for fire suppression.

Label instructions (reproduced in this appendix) specify 1 gallon of Ultra Clorox to 1,000 gallons (~50 parts per million available chlorine) of drafted water. Prepare the mixture at least 5 minutes prior to application for dust abatement, fire suppression, and cleaning trucks, logging, road-building, and maintenance equipment.

This label has been in effect since March 5, 2001. The Biscuit Fire on the Siskiyou NF in 2002 burned 500,000 acres including 95,000 acres of POC. Suppression activities lasted over 4 months and restoration activities followed. Approximately 26,700 gallons of Ultra Clorox were used in accordance with the label to treat water used for fire suppression, dust abatement, to clean suppression equipment, and fire area rehabilitation. Although 2002 was an unusually severe fire year in the range of POC, such uses would be projected to continue to a lesser degree under the current direction.

Vehicle and other washing stations are always located where direct runoff will not enter streams. Water spread on roads or dropped onto fires develops into a fine to moderate spray in the air, and spreads on contact. Sodium hypochlorite is a strong oxidizing agent and quickly breaks down into water and chloride ions on contact with organic matter. Decomposition takes place within seconds in the presence of ammonium salts (National Fire Protection Association 1986).

Toxicity and Potential Environmental Effects

In 1986, based upon available data on Clorox's chemistry, toxicity, environmental fate, and ecological effects, the U.S. Environmental Protection Agency (EPA) concluded that any hazards associated its uses were relatively small (Chemical Fact Sheet 1986). Toxicity characteristics of Clorox were identified as follows:

Mallard duck	5,220 parts per million
Quail	5,620 parts per million
Rainbow trout	0.18 – 0.22 milligrams/liter
Daphnia	0.033 – 0.048 milligrams/liter

In 1991, the EPA determined that human risks from chronic and subchronic exposure to low levels of Clorox were minimal and without consequence to human health. Upon reevaluating the 1986 data, they also reaffirmed that currently registered uses of Clorox would not result

in unreasonable adverse effects to the environment. The EPA also stated they believed that the risk of acute exposure to aquatic organisms was sufficiently mitigated by, in part, its precautionary labeling (EPA 1991).

Sodium hypochlorite is highly toxic to aquatic organisms. The freshwater criteria for the protection of most aquatic species and their uses are 11 micro g/L TRC [total residual chlorine] as a 4-day average (0.011 parts per million) and 19 micro g/L as a 1-hour average (EPA 1984).

Toxicity values for several species of fish are as follow (EPA 1984):

	Species mean acute values (micrograms/liter)
Coho	74.79
Rainbow Trout	61.92
Cutthroat Trout	85.46
Brook Trout	117.4

Research into the control of zebra mussels (*Dreissena polymorpha*) showed it was an effective biocide at concentrations of 1 mg/L (1 parts per million) (Martin et al. 1993). Rainbow trout (*Salmo gairdneri*) exposed to a 30-minute dose showed an LC50 value of 0.43 mg/L at 20 C (0.43 parts per million) while triple exposures for 5 minutes resulted in a LC50 of 1.65 mg/L (Brooks and Seegert 1977).

As previously mentioned, 26,700 gallons of Ultra Clorox were used during the 2002 Biscuit Fire for fire suppression, dust abatement, to clean suppression equipment, and fire area rehabilitation. There were three fish kills thought to be attributable to Clorox bleach-treated water entering streams: all related to operations at fill sites. Two were the result of releases into impoundments behind blocked culverts in very small streams and resulted in mortality within the impoundment, but not downstream. The third release was the result of a water tender breaking down and releasing up to 3,500 gallons of treated water (3.5 gallons of Clorox bleach) into a medium-sized stream. A review of the site by FS and Oregon Department of Fish and Game biologists found 34 dead fish within 80 yards of the discharge site. Live fish were observed 180 yards downstream of the discharge site. Adding Clorox bleach after tanks have been filled and moved away from the fill site would likely avoid similar events in the future.

Non-human mammalian toxicity values are LD50 Rat oral 8.91 g/kg (Department of Transportation-U.S. Coast Guard 1984) and LD50 Mouse oral 5,800 mg/kg (Lewis 1996). There is inadequate evidence for the carcinogenicity of hypochlorite salts (IARC 1991).

Alternatives 1, 2, and 3

Use will continue at approximately existing rates, although 2002 was an unusually heavy fire year in the range of POC. Average annual fire use should be no more than 1,000 to 5,000 gallons, with other uses less than that.

Use of Ultra Clorox® for water decontamination will not result in aquatic exposure if it is applied in accordance with label instructions. When used in water dropped from helicopters,

dropping directly into visible water sources is avoided. Drops into smaller wet areas may happen, but water drops are generally only made directly on actively burning spots, so localized effects of dropping treated water is expected to be outweighed by the benefits of reducing the fire intensity. Water errantly dropped on somewhat larger streams may take yards or tens of yards to dilute to sub-toxicity levels, but again these drops occur in areas in the process of being burned.

Ultra Clorox® can cause severe but temporary eye irritation and can be a skin irritant (U.S. Coast Guard, Department of Transportation 1984). Use of the appropriate personnal protective equipment by those preparing the Ultra Clorox® treated water will avoid accidental exposure from splash to eyes or skin.

Alternatives 4 and 5

There are no POC management measures applied under these alternatives that would use Clorox.

Clorox Label Information

The following information copied verbatim from the Clorox label is pertinent to Port-Orford-cedar root disease control.

ULTRA CLOROX ® BRAND REGULAR BLEACH (EPA Reg. No. 5813-50)
FOR PORT ORFORD CEDAR ROOT DISEASE (*Phytophthora lateralis*) TREATMENT USE

When used as directed, this product is effective in controlling the spread of the fatal fungus *Phytophthora lateralis* [Port Orford Cedar Root Disease] in areas of California and Oregon where Port Orford Cedar (*Chamaecyparis lawsoniana*) grows.

Water is commonly drafted from streams and fire ponds within forested areas to use in dust abatement on forest roads, equipment cleaning, a nd for fire suppression. The water source can spread the root disease fungus to uninfested areas. Treating water prior to use helps control the spread of the fungus.

Directions for Use: Add 1 gallon this product to 1000 gallons (~50 parts per million available chlorine) of drafted water. Prepare the mixture at least 5 minutes prior to application for dust abatement; fire suppression; and cleaning trucks, and logging, road building, and maintenance equipment.

DILUTION TABLE

Approximate available Chlorine	Volume of Bleach	Volume of Water
50	16 drops	1 quart
	¾ tsp.	1 gallon
	1 Tbsp. (1/2 oz)	4 ½ gallons
	2 ½ Tbsp.	10 gallons

PRECAUTIONARY STATEMENTS: HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER: CORROSIVE
May cause severe irritation or damage to eyes and skin. Harmful if swallowed. Protect eyes when handling. For prolonged use, wear gloves. Wash after contact with product. Avoid breathing vapors and use only in a well-ventilated area.

FIRST AID IF IN EYES: Rinse with plenty of water for 15 minutes. Get prompt medical attention. **IF SWALLOWED**: Drink large amounts of water. DO NOT induce vomiting. Call a physician or poison control center immediately. **IF IN CONTACT WITH SKIN**: wash skin thoroughly with water.

PHYSICAL OR CHEMICAL HAZARDS: Product contains a strong oxidizer. Always flush drains before and after use. **Do not use or mix with other household chemicals**, such as toilet bowl cleaners, rust removers, acids, or products containing ammonia. To do so will release hazardous irritating gases. Prolonged contact with metal may cause pitting or discoloration.

For Institutional use only:
ENVIRONMENTAL HAZARDS: Do not discharge effluent containing this product into lakes, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge System (NPDES) permit and the permitting authority has been notified in writing prior to discharge.

STORAGE AND DISPOSAL: Store this product upright in a cool, dry area, away from direct sunlight and heat to avoid deterioration. In case of spill, flood areas with large quantities of water. Small quantities of spilled or unusable product should be diluted with water before disposal in a sanitary sewer. Do not reuse empty container, but rinse and place in trash or recycle where facilities accept colored HDPE bottles. Do not contaminate water, food, or feed by storage, disposal or use of this product. **Store away from children. Reclose cap tightly after each use.** Offer empty container for recycling. If recycling is not available, discard container in trash. DO NOT allow product [and/or rinsate] to enter storm drains, lakes, streams, or other bodies of water.

CLOROX CUSTOMER ASSISTANCE (800) 292-2200

Appendix 5: Monitoring Plans for Each Alternative

Alternative 1

Alternative 1 is covered by existing land and resource management plan monitoring plans.

Alternatives 2–6

To maintain POC as an ecologically and economically significant species on BLM- and FS-administered lands, management strategies (both actions and inactions) will be evaluated.

Implementation Monitoring — *Questions*

1) Have resistance breeding and genetic conservation requirements been met?

2) Are general requirements for maintaining and reducing the risk of PL infections being implemented? *Note:* For Alternative 2, these are listed under General Direction (which is incorporated into Alternatives 3 and 6).

3) Are project-specific management actions applied as required?

Implementation Monitoring — *Requirements*

1) The Agencies will address current accomplishments including levels of established conservation seedbanks in annual updates for the resistance breeding program.

2) The Coos Bay, Medford, and Roseburg BLM Districts will report in their annual program summaries, and the Siskiyou NF in its annual monitoring and evaluation report, the general activities accomplished for maintaining and reducing the risk of PL infections.

3) Administrative units will incorporate POC management actions into their existing project-specific implementation monitoring programs.

Effectiveness and Validation Monitoring — *Questions*

1) Is the genetic resistance program producing POC seedlings that survive long term under field conditions?

2) Are disease-controlling mitigation measures such as road use restrictions and closures, sanitation, and washing, effective as predicted, and is the risk associated with projects such as fire suppression at presumed or predicted levels?

3) Has the spread or non-spread of the disease significantly departed from the predictions made in this SEIS that were used to select a management strategy?

4) [Under Alternatives 3 and 6 only] Is the disease being kept out of the uninfested

watersheds and if not, have appropriate eradication treatments been tried and are they successful?

Effectiveness and Validation Monitoring — *Requirements*

1) The "Dorena Port-Orford-Cedar Interagency Agreement" will report annually survival results of validation studies that determine effectiveness of the genetic resistance program.

2) The USDA-FS Southwest Oregon Forest Insect and Disease Service Center will continue to evaluate and coordinate existing management techniques to reduce the occurrence of PL and retain healthy POC. Emphasis will be directed towards ongoing projects and monitoring their results. Actual monitoring will be split between the Service Center and the administrative units where management occurs. Additional (new) monitoring efforts will be a function of available budget and workforce. An example is whether prescribed fire heats the soil enough to be effective as an eradication treatment. In some cases, university research will be the appropriate vehicle to accomplish evaluations of management techniques.

3) As new inventory data (continuous vegetation survey and forest inventory and analysis) and local mapping becomes available, it will be evaluated for current levels (acres and/or number of trees) of infected and uninfected POC and corresponding trends. Inventory plots are typically reinventoried on a 3- to 10-year cycle, depending upon location.

4) [Alternatives 3 and 6 only] Road, aerial, or photo surveys of the uninfested watersheds will be done to identify new infestations at least once every 2 years.

Appendix 6: Resistant Port-Orford-Cedar Planting and Growth Assumptions

This appendix describes assumptions about the planting and growth of resistant stock under the various alternatives. This information is used, where identified, in the long-term projection of various secondary environmental effects described in Chapter 3&4.

Resistant Seed Availability

The year resistant seed is expected to become available for each seed zone is shown in the Genetics section on the Table 3&4-21. In general, resistant seed will become available for all seed zones in Oregon by the year 2010 under the accelerated program (Alternative 4), and under Alternatives 1, 2, 3, and 6 will become available in at least one elevation zone in each breeding block in Oregon by 2020, available for 99 percent of POC Federal acres in Oregon by 2030, and available for all areas in Oregon by 2045. Until resistant seed is developed for each breeding zone, it will be possible to utilize seed from adjacent breeding zones (especially from similar plant associations) to meet any immediate needs, as well as using local, nonresistant seed. In Alternative 5, resistant seed will be available for the approximately 201,000 acres in Oregon for which seed orchards are already developed.

Because resistant seed orchard trees can bear cones annually and prolifically if stimulated, seed could be available to meet any projected need-level, including reforestation following a large fire event, although seed collection, sowing, and growth to reach a plantable seedling size generally takes 2 to 3 years after an expected need for seedlings is identified. The potential availability of surplus Federal POC seed or seedlings for use by state and private landowners should also be considered.

Resistance Levels and Durability

As described in the Genetics section of Chapter 3&4, long-term (durable) resistance in a significant portion (more than half) of resistant seedlings is likely based on short-term greenhouse tests. Evidence for this conclusion includes nearly 100 percent survival of resistant seedlings after the first 2 years, the very narrow genetic variability of PL itself (having presumably come from a single introduction), and the very limited ability of PL to spread bisexually-developed spores. Allowing for mortality immediately after planting and some additional mortality during the life of the POC stand is not dissimilar to the way other species plantation are considered. Planting will provide double or more of the seedlings desired, and future thinning (to increase growth on remaining trees) will remove trees through the early life of the stand if random PL and other mortality does not remove them. In other words, if 20 to 30 large trees per acre are desired at age 100, planting 120 trees per acre and subsequent stand tending can be expected to produce that result even if 50 to 75 percent of planted trees are lost to PL.

Where Seedlings Should be Planted

A variety of ecological benefits and economic gains can be made by planting resistant seedlings, when available, outside of PL-mortality areas. POC will be included in planting suitable new sites within its natural range (as shown on Map 4) not previously occupied by

POC (both on public and private lands), and low-risk sites (especially upslope from infested sites so resistant genes can contribute to restocking). High-risk sites in the interior of the range of POC should especially be considered for with planting resistant stock. It is assumed resistant seedlings will be planted in all three of these cases, and become a part of the species mix when planting on potential POC sites.

POC may also be planted in infested areas to replace POC lost to PL or other causes, where an examination determines the value of replacing the killed POC outweighs the risk of maintaining PL on the site. In general, infested areas can be planted that are away from areas frequented by people and other PL-spread mechanisms. Planting should focus on replacing POC where its ecological function is most critical, such as along streams on ultramafic soils, and to replace stands lost to wildfire. If PL is eradicated from a given site, then POC, both resistant and nonresistant seedlings, should be considered for planting. It is assumed most nonwilderness wildfire-killed stands will be planted unless natural regeneration is determined likely to meet stocking objectives. It is also assumed planted resistant trees will eventually mitigate 50 percent of significant environmental loss resulting from PL mortality. For example, assume planting (or other ingrowth) will eventually replace at least 50 percent of shade loss along streams where PL-related mortality is causing temperature increases that threaten listed species.

If persistent POC are desired to contribute to pollen and seed shed for subsequent natural regeneration, and/or to reach large sizes for ecological and economic considerations within 50 to 100 years, specific regeneration cuts, site preparation, as well as continued tending may be needed. Three geographical areas within the natural range of POC illustrate different circumstances:

a. **Coastal Stands.** Where POC tends to occur across the landscape, without distinct distributional limits. In this environment, normal regeneration harvest techniques have shown to allow reestablishment of POC when outside the influence of PL. When established with other conifers, stand tending to favor POC will probably be needed to maintain its crown position.

b. **Serpentine.** Stands in these localities are often characterized by open-grown, widely-scattered overstory trees. Planting resistant POC will be relatively free to grow and, except for some brushy patches, may not need significant stand tending.

c. **Interior, Non-Serpentine.** Where POC is concentrated near streams, riparian competition from Douglas-fir, hemlock, pines, and hardwoods often restrict POC regeneration and growth without special regeneration or release cuts. In this portion of the POC's range, however, it is believed that it will survive and thrive when planted on upslope topographies, both where it grows naturally and beyond its natural occurrence. If POC is desired to be large in less than 100 years, regeneration cuts, such as shelterwood treatments, may be needed to allow it to grow. Precommercial and commercial thinning may also be necessary to maintain POC in the overstory. If maintained in stands in a dominant-codominant crown position, planted resistant POC should begin to contribute to pollen and seed shed in 25 to 30 years.

Where Seedlings Should Not be Planted

There is a risk that planting resistant seedlings on PL-infested sites will help maintain PL on those sites, even if all naturally occurring POC on the site have died. It is unclear whether resistant stock will support PL. Additionally, seedlings from planted stock, or POC seeding in from surrounding stands that are indistinguishable from planted stock, could carry PL. For these reasons, the planting of resistant stock should be avoided where there is reason to avoid the maintenance of PL on the site. Locations where seedlings should not be planted include (1) areas where eradication treatments are actively underway and PL has not died out from the site; (2) unstocked areas between infested and uninfested stands; and (3) in roadside and other sanitation areas, and in areas where foot, vehicle, or animal traffic is likely to move infested mud to other locations, such as along roads and trails, in campgrounds, at trailheads and boat launches, and along major game or stock trails connecting infested and uninfested areas or watersheds.

Acres to be Planted

For the purposes of this SEIS and for all alternatives except Alternative 5, assume the overall annual planting rate for POC will be at least 25 percent of the average annual mortality rate predicted outside of the North Coast Risk Region (see 100-year infestation prediction for Oregon by alternative in the Pathology section of Chapter 3&4), beginning when seedlings become available for each breeding zone. For example, in Alternative 4, 100-year mortality outside the North Coast Risk Region is predicted to be 41,700 plus 14,600, or 56,300 acres (from Table 3&4-10). Although actual mortality may be sporadic for a variety of reasons, the average is 563, and 25 percent is 140 acres per year. First priority for this planting is to replace ecologically significant POC lost to PL or other causes. Increases in fire-mortality or post-harvest planting could substantially increase these rates.

It is assumed plantations of resistant POC will be tracked in agency plantation records and made high priority for stand-tending treatments such as protection from browsing, release, and thinning, as needed to meet site growth objectives.

Assumptions of projected mortality are difficult to make because so much POC mortality is scattered in small pockets where the effect of POC loss will be at least partially negated by natural POC regeneration or growth of other species, or where it is not otherwise cost-efficient to mobilize planting and stand tending crews to replace them.

Predicted Growth Rates

POC is capable of moderately rapid growth, but it slows greatly if overtopped by other species. In natural stands following fire, POC grew quickly for 20 to 25 years until over-topped by Douglas-fir and other species (Hayes 1958). In relatively pure, natural stands near Coos Bay, the mean height of POC was 51 feet and 73 feet at ages 36 and 44 years. Planta-tion POC was as tall as 32 feet and 40 feet at 14 and 19 years (Hayes 1958).

Examination of the diameter-to-age ratios for all POC trees identified on CVS plots on Federal lands in Oregon shows a diameter at breast height range of 6 to 40 inches at 100 years, with 10 percent exceeding 24 inches, and no discernable difference between those on ultramafic soils (as indicated by the presence of Jeffrey pine on the same plot) and those on

nonultramafic sites. Since natural POC often spend 2 to 300 years overtopped, releasing only after surrounding Douglas-fir or other species die, growth with stand tending can be expected to match this 90th percentile. A diameter-to-age relationship compiled by Atzet (1996) for POC found on ecology inventory plots in southwest Oregon showed that unmanaged POC averaged 24 inches diameter at breast height at 120 years, with the 90th percentile at 100 years being over 30 inches diameter at breast height.

For planted resistant seedlings, it is reasonable to expect the size of at least the largest 8 to 12 tended POC per acre to exceed 100 feet in height and 24 inches in diameter at 100 years unless overtopped by other species. In such a case, however, at least part of the ecological function (such as streamside shade for fisheries) expected from large POC would generally be met by the overtopping tree species

Monitoring

It is assumed that field validation plantings and other host/pathogen studies will be continued at the appropriate levels for each respective alternative and adjustments, if needed, in both the POC breeding program and eventual deployment of resulting seed will be done.

Appendix 7: Biological Evaluations

Wildlife

Threatened and Endangered Species

Implementation of any of these alternatives would result in a *may affect*, *likely to adversely affect* on the northern spotted owl and marbled murrelet and a *may affect* on the critical habitats of the northern spotted owl and marbled murrelet.

Northern Spotted Owl (*Strix occidentalis caurina*) and its Critical Habitat

Management of the northern spotted owl and its habitat on federally-managed lands was an important consideration in the design of the Northwest Forest Plan. This species received extensive attention in the Northwest Forest Plan final SEIS and its supporting documents. Project-specific analysis/consultation will be conducted to mitigate site-specific impacts, where capable, and meet the intents of NEPA, the "Endangered Species Act," and planning regulations.

Environmental Consequences

Alternatives 1 and 2. Under the current strategy for managing POC and PL, very few activities affect the northern spotted owl. Habitat modifications and loss of POC in mid- and late-seral stages during roadside sanitation efforts may occur. There are approximately 9 acres of potential treatment area per 1 mile of road, although this is not all habitat. Much of the roadside sanitation area is within the original clearing limits of the road. The loss of the larger diameter POC would reduce the value of the habitat for species dependent upon large trees, depending on the proportion of such trees in the stand that are POC. Due to the spacing of very large trees it is unlikely that a substantial number of large-diameter trees would be removed by road sanitation in any one stand. The precise level of road treatments to occur is unknown, but it is expected to approximate that described in Appendix 2. Although snags are not removed during sanitation treatments, few snags of any species are left adjacent to roads due to safety concerns.

Road closures and seasonal use restrictions would reduce disturbance associated with road use and adjacent nesting habitat, benefiting northern spotted owls. Disturbances from road use may influence habitat use, nesting behavior and success, and foraging success. Detrimental impacts of road use can extend 65 to 100 yards into the stand (Tuss, C., *personal communication*). Many of the roads to be closed or seasonally restricted are low-use roads, so benefits may be relatively small. All provisions provided for the northern spotted owl in current resource management plans/land management plans would be implemented.

About 74 percent of the Federal landscape within the analysis area is within reserves other than riparian. The remaining 26 percent is Matrix/Riparian Reserve. The Northwest Forest Plan projected that less than 4 percent of the remaining late-successional forest would be harvested per decade. Actual harvest has been well below that rate. Based on the harvest rate in the last 8 years, late-successional forests have been harvested at less than 2.5 percent for the first decade. The reduced rate of harvest is due primarily to greater than expected

Riparian Reserve coverage, the effects of Survey and Manage mitigation measures, and legal challenges. Harvest of late-successional forests under both alternatives would not exceed the rate anticipated in the Northwest Forest Plan final SEIS.

Implementation of Alternatives 1 and 2 in 100 years would result in infestations covering approximately 17 percent of POC in the North Coast Risk Region, 20 to 23 percent in the Siskiyou Risk Region, and 24 to 29 percent in the Inland Siskiyou Risk Region. POC is currently a prominent component in 90,900 acres of forestland in Oregon. Impacts to POC loss is expected to be most severe in ultramafic plant associations (40 percent of the 90,900 acres where POC is a predominant component of the overstory) where it often constitutes up to 38 to 50 percent of the overstory cover. Loss of large-diameter-overstory trees could include loss of foraging structures, loss of nesting/roosting habitat, and possible disruption of dispersal. Prey species and their susceptibility to predation may be benefited by increases to the woody and herbaceous plant biomass in the lower strata. The direct impacts to the spotted owl should be isolated to individual POC trees and small patches. In the next 100 years, up to approximately 23,000 acres of uninfested POC could become infested (8 percent of the analysis area) (Table 3&4-10).

Prey species may also be negatively affected by loss of future woody biomass, although this effect is low for POC when compared with other tree species. The same wood chemistry characteristics that make POC a valuable commercial species may negatively impact its value to spotted owls and their prey as a snag. POC is highly resistant to rot and insects and may remain intact for decades (Jules et al. 2002). Jules et al. (2002) utilized increment cores from POC snags that indicated those trees died more than 100 years prior. Increment cores must be intact for accurate dating to occur. Research on yellow cedar (*Chamaecyparis nootkatensis*), a similar species, has found that cavity nesting is rare in snags, even 80 years after the trees died (Hennon et al. 2002). POC snags, like yellow cedar, possibly contribute very little to wildlife habitat components (DeMeo, T., *personal communication*; Jimerson, T.M., *personal communication*; Hennon et al. 2002). No work has look specifically at the wildlife contributions of POC snags/logs, but snags probably provide very little benefit to the northern spotted owl. Downed logs should provide hiding cover and travel corridors initially and improve as they progress into more decayed classes which should benefit spotted owl prey species.

In conclusion, Alternatives 1 and 2 could result in the loss of individual nesting structure, either through management to contain the spread of PL or through the natural progression of the infestation. Stands with POC may be degraded, but should continue to provide suitable spotted owl habitat. Where POC deaths result in the reduction of canopy below approximately 70 percent, stands may be downgraded from suitable habitat to dispersal habitat, but this should be the exception. Ecosystem recovery, primarily the recovery of the overstory canopy, will be highly dependent upon the ability of the stand to revegetate naturally or upon reforestation efforts as described in the Planting Assumptions and Appendix 6. The development of PL-resistant stock would help to restore the POC losses. Available for deployment in 0 to 40 years depending upon seed zone (see Table 3&4-21 in the Genetics and Resistance section), larger-diameter POC are expected to be in the landscape again 80 to 100 years later.

Alternative 3. This alternative creates a system of POC buffers and cores within 31 6th field watersheds that are currently uninfested with PL (494,000 acres; 32 percent of the Federal lands in the analysis area). Timber harvests would be eliminated on approximately 2,260

acres of Matrix/Adaptive Management Area lands, and additional acres of reserves, in the POC cores; this restriction does not preclude salvage options in the case of a stand-replacing event. Additionally, all POC would be removed along all roads within the POC cores. There are approximately 9 acres of treatment area per mile of road, although not all of this area is necessarily suitable spotted owl habitat. The loss of the larger-diameter trees could have some effect on ability of the stands to function as before. Due to the spacing of very large trees it is unlikely that a substantial number of large-diameter trees would be removed by road sanitation in any one stand. The loss of these trees would not affect the adjacent stands' functionality. Road closures and seasonal use restrictions would reduce disturbance associated with road use and adjacent nesting habitat and benefit northern spotted owls. Many of the roads to be closed or seasonally restricted are low-use roads, so benefits may be relatively small. Within POC buffer areas future infestation of PL would be eradicated.

Areas outside of the POC buffers and cores would be managed and the same as Alternative 2.

Implementation of Alternatives 3 in 100 years would result in infestations covering approximately 16 percent of the POC in the North Coast Risk Region, 17 percent in the Siskiyou Risk Region, and 19 percent in the Inland Siskiyou Risk Region. POC is currently a prominent component in 90,900 acres of forestland in Oregon. Impacts from POC loss are expected to be similar to those discussed for Alternatives 1 and 2. The direct impacts to the spotted owl should be isolated to individual POC trees and small patches. In the next 100 years, approximately 11,400 acres of uninfested POC could become infested (4 percent of the analysis area) (Table 3&4-10).

Alternatives 4 and 5. These alternatives allow for the progression of PL across the landscape. There are no active management actions planned that would cause the direct loss or modification of suitable nesting, roosting, foraging, or dispersal habitat. PL resistant stocks of POC would be used to restore POC to the landscape. Ecosystem recovery, primarily the recovery of the overstory canopy, will be highly dependent upon the ability of the stand to revegetate naturally or reforestation efforts described in the Planting Assumption. The development of PL-resistant stock would help to restore the POC losses—Alternative 4 more than Alternative 5. Available for deployment within 10 years in Alternative 4, and just for certain seed zones in Alternative 5 (see Table 3&4-21 in the Genetics and Resistance section), large-diameter POC could be in the landscape again 80 to 100 years later.

Implementation of Alternatives 4 and 5 in 100 years would result in infestations covering approximately 19 percent of in the North Coast Risk Region (compared to 15 percent today), 36 percent in the Siskiyou Risk Region (compared to 11 percent today), and 50 percent in the Inland Siskiyou Risk Region (compared to 9 percent today) to become infected with PL. POC is currently a prominent component in 90,900 acres of forestland in Oregon. Impacts to POC loss are expected to be similar to those discussed for Alternatives 1 and 2. The direct impacts to the spotted owl should be isolated to individual POC trees and small patches. In the next 100 years, approximately 45,900 acres of uninfested POC could become infested (17 percent of the analysis area) (Table 3&4-10).

Alternative 6. The effects of Alternative 6 are the same as Alternative 3 except as follows. Alternative 6 would provide additional protection for 162 7th field watersheds that are currently identified as being uninfested with PL (rather than the 6th field watersheds described in Alternative 3). Timber harvest would be prohibited in watersheds (Table 3&4-

24b) that have POC (POC cores), including 3,010 acres of Matrix and Adaptive Management Area that are currently available for regularly scheduled timber harvest and contribute to probable sale quantity.

Implementation of Alternatives 6 in 100 years would result in root disease infestations covering approximately 16 percent of the total area to contain infested POC in the North Coast Risk Region, 17 percent in the Siskiyou Risk Region, and 18 percent in the Inland Siskiyou Risk Region. POC is currently a prominent component in 90,900 acres of forestland in Oregon. Impacts to POC loss are expected to be similar to those discussed for alternatives 1 and 2. The direct impacts to the spotted owl should be isolated to individual POC trees and small patches. In the next 100 years, approximately 10,300 acres of uninfested POC could become infested (4 percent of the analysis area) (Table 3&4-10).

Marbled Murrelet (*Brachyramphus marmorata*) and its Critical Habitat

The management strategy for marbled murrelets in the Northwest Forest Plan includes two primary components: (1) protection and development of marbled murrelet nesting habitat inside the large reserves near the coast; and (2) retention of all current and future known marbled murrelet nest sites in all land allocations and protecting occupied habitat. POC contributes to the overall ability of the surrounding stand to function as marbled murrelet nesting habitat, but serves as an inferior nesting platform because of its limb structure.

Environmental Consequences: Under all alternatives, the level of protection for currently occupied marbled murrelet habitat would not be changed; all habitat-disturbing activities would have preproject surveys accomplished and known and future nest sites would be protected. All requirements of the land management plans/resource management plans and the "Endangered Species Act" would be fulfilled prior to implementation of specific projects.

Alternatives 1 and 2. Under the current strategy for managing POC and PL, very few activities have effects to murrelet habitat. Habitat modifications and loss of POC in mid- and late-seral stages during roadside sanitation efforts may occur. There are approximately 9 acres of potential treatment area per 1 mile of road, although this is not all habitat. Much of the roadside sanitation area is within the original clearing limits of the road. The loss of the larger-diameter POC would reduce the value of the habitat for murrelets depending on the proportion of such POC trees in the stand. Due to the spacing of very large trees it is unlikely that a substantial number of large-diameter trees would be removed by road sanitation in any one stand. The precise level of road treatments to occur is unknown, but it is expected to approximate that described in Appendix 2. Although snags are not removed during sanitation treatments, few snags of any species are left adjacent to roads due to safety concerns.

Road closures and seasonal use restrictions would reduce disturbance associated with road use and adjacent nesting habitat, benefiting marbled murrelet. Disturbances from road use may influence habitat use, nesting behavior and success, and foraging success. Detrimental impacts of road use can extend 65 to 100 yards into the stand (Tuss, C., *personal communication*). Many of the roads to be closed or seasonally restricted are low-use roads, so benefits may be relatively small. All provisions provided for the marbled murrelet in current resource management plans/land management plans would be implemented.

About 74 percent of the Federal landscape within the analysis area is within reserves other than riparian. The remaining 26 percent is Matrix/Riparian Reserve. The Northwest Forest Plan projected that less than 4 percent of the remaining late-successional forest would be harvested per decade. Actual harvest has been well below that rate. Based on the harvest rate in the last 8 years, late-successional forests have been harvested at less than 2.5 percent for the first decade. The reduced rate of harvest is due primarily to greater than expected Riparian Reserve coverage, the effects of Survey and Manage mitigation measures, and legal challenges. Harvest of late-successional forest under both alternatives would not exceed the rate anticipated in the Northwest Forest Plan final SEIS.

Implementation of Alternatives 1 and 2 in 100 years would result in approximately 2 percent of POC not currently infected with PL in the North Coast Risk Region, 9 to 12 percent in the Siskiyou Risk Region, and 15 to 20 percent in the Inland Siskiyou Risk Region to become infected with PL. POC is currently a prominent component of the overstory on 90,900 acres in Oregon. Impacts from POC loss are expected to be most severe in ultramafic plant associations (40 percent of those stands where POC is a predominant component of the overstory) where it often constitutes up to 38 to 50 percent of the overstory cover. Loss of large-diameter-overstory trees could include the modification of conditions affecting the nesting suitability of adjacent trees. The direct impacts to the marbled murrelet should be isolated to individual POC trees and small patches. In the next 100 years, up to approximately 23,000 acres of uninfested POC could become infested (Alternative 1) (8 percent of the analysis area) (Table 3&4-10). Ecosystem recovery, primarily the recovery of the overstory canopy, will be highly dependent upon the ability of the stand to revegetate naturally or upon reforestation efforts as described in the Planting Assumption and Appendix 6. The development of PL-resistant stock would help to restore the POC losses. Available for deployment in 0 to 40 years depending upon seed zone (see Table 3&4-21 in the Genetics and Resistance section), larger-diameter POC are expected to be in the landscape again 80 to 100 years later

Alternative 3. This alternative creates a system of POC buffers and cores within 31 6th field watersheds that are currently uninfested with PL (494,000 acres; 32 percent of the Federal lands within the analysis area). Timber harvests would be eliminated on 2,260 acres of Matrix/Adaptive Management Area, and additional acres of reserves, in the POC cores; this restriction does not preclude salvage options in the case of a stand-replacing event. Additionally, all POC would be removed along all roads within the POC cores. There are approximately 9 acres per mile of road. The loss of the larger-diameter trees could have some effect on ability of the stands to function as before. Due to the spacing of very large trees it is unlikely that a substantial number of large-diameter trees would be removed by road sanitation in any one stand. The loss of these trees would not affect the adjacent stands' functionality. Road closures and seasonal use restrictions would reduce disturbance associated with road use and adjacent nesting habitat, benefitting murrelet. Many of the roads to be closed or seasonally restricted are low-use roads, so benefits may be relatively small. Within POC buffer areas, future infestation of PL would be eradicated. Areas outside of the POC buffers and cores would be managed the same as Alternative 2.

Implementation of Alternative 3 in 100 years would still result in PL infestations covering approximately 1 percent of POC not currently infected with PL in the North Coast Risk Region, 6 percent in the Siskiyou Risk Region, and 10 percent in the Inland Siskiyou Risk Region. Impacts to POC loss are expected to be similar to those discussed for Alternatives 1 and 2. The direct impacts to the marbled murrelet should be isolated to individual POC trees

and small patches. In the next 100 years, approximately 11,400 acres of uninfested POC could become infested (4 percent of the analysis area) (Table 3&4-10).

Alternatives 4 and 5. Alternatives 4 and 5 allow for the natural progression of PL across the landscape. There are no active management actions planned that would cause the direct loss or modification of suitable nesting habitat. PL-resistant stocks of POC would be used to restore POC to the landscape. Ecosystem recovery, primarily the recovery of the overstory canopy, will be highly dependent upon the ability of the stand to revegetate naturally or reforestation efforts described in the Planting Assumptions. The development of PL-resistant stock would help to restore the POC losses—Alternative 4 more than Alternative 5. Available for deployment within 10 years in Alternative 4 and only for certain breeding zones in Alternative 5 (see Table 3&4-21 in the Genetics and Resistance section), large-diameter POC could be in the landscape again 80 to 100 years later.

Implementation of Alternatives 4 and 5 would still allow approximately 4 percent of POC not currently infected with PL in the North Coast Risk Region, 25 percent in the Siskiyou Risk Region, and 41 percent in the Inland Risk Region to become infected with PL. POC is currently a prominent component in 90,900 acres of forestland in Oregon. Impacts to POC loss are expected to be similar to those discussed for Alternatives 1 and 2. The direct impacts to the marbled murrelet should be isolated to individual POC trees and small patches. In the next 100 years, approximately 45,900 acres of uninfested POC could become infested (17 percent of the analysis area) (Table 3&4-10).

Alternative 6. The effects of Alternative 6 are the same as Alternative 3 except as follows. Alternative 6 would provide additional protection for 162 7th field watersheds that are currently identified as being uninfested with PL (rather than the 6th field watersheds described in Alternative 3). Timber harvest would be prohibited in the 49,675 acres (Table 3&4-24b) that have POC (POC cores), including approximately 3,010 acres of Matrix and Adaptive Management Area that are currently available for regularly-scheduled timber harvest and contribute to probable sale quantity.

Implementation of Alternatives 6 in 100 years would result in infestations covering approximately 16 percent of POC in the North Coast Risk Region, 17 percent in the Siskiyou Risk Region, and 18 percent in the Inland Siskiyou Risk Region. POC is currently a prominent component in 90,900 acres of forestland in Oregon. Impacts to POC loss are expected to be similar to those discussed for Alternatives 1 and 2. The direct impacts to the marbled murrelet should be isolated to individual POC trees and small patches. In the next 100 years, approximately 10,300 acres of uninfested POC could become infested (4 percent of the analysis area) (Table 3&4-10).

Bald Eagle (*Halieatus leucocephalus*)

The Agencies survey extensively for bald eagles. Management of the bald eagle includes preparation of site-specific management plans and providing protection zones and management areas, as needed, to the species and its habitat. All requirements of the land management plans/resource management plans and the "Endangered Species Act" would be fulfilled prior to implementation of specific projects.

Environmental Consequences:

Alternatives 1 and 2. Bald eagles utilize large-diameter snags and snag-topped trees for nesting and roosting along high order streams or within 1 to 2 miles of a high order stream. Under the current strategy for managing POC and PL, very few activities have effects to the bald eagle. Habitat modifications and loss of POC in mid- and late-seral stages during roadside sanitation efforts may occur. There are approximately 9 acres of potential treatment area per 1 mile of road, although this is not all habitat. Much of the roadside sanitation area is within the original clearing limits of the road. The loss of the larger diameter POC would reduce the value of the habitat for bald eagles dependent upon large trees, depending on the proportion of such trees in the stand that are POC. Due to the spacing of very large trees, it is unlikely that a substantial number of large-diameter trees would be removed by road sanitation in any one stand. The precise level of road treatments to occur is unknown, but it is expected to approximate that described in Appendix 2. Although snags are not removed during sanitation treatments, few snags of any species are left adjacent to roads due to safety concerns.

Road closures and seasonal use restrictions would reduce disturbance associated with road use and adjacent nesting habitat, benefiting bald eagles. Disturbances from road use may influence habitat use, nesting behavior and success, and foraging success. Many of the roads to be closed or seasonally restricted are low-use roads, so benefits may be relatively small.

Implementation of Alternatives 1 and 2 in 100 years would result in infestations covering approximately 17 percent of POC in the North Coast Risk Region, 20 to 23 percent in the Siskiyou Risk Region, and 24 to 29 percent in the Inland Siskiyou Risk Region. POC is currently a prominent component in 90,900 acres of forestland in Oregon. Impacts to POC loss are expected to be most severe in ultramafic plant associations (40 percent of those stands where POC is a prominent component of the overstory) where POC often constitutes up to 38 to 50 percent of the overstory cover. The death of large-diameter overstory trees could increase available nesting and roosting structure. The direct impacts to the bald eagles should be isolated to the loss of potential nesting and roosting structure due to infestation control treatments. Ecosystem recovery, primarily the recovery of the overstory canopy, will be highly dependent upon the ability of the stand to revegetate naturally or upon reforestation efforts as described in the Planting Assumptions and Appendix 6. The development of PL-resistant stock would help to restore the POC losses. Available for deployment in 0 to 40 years depending upon seed zone (see Table 3&4-21 in the Genetics and Resistance section), larger-diameter POC are expected to be in the landscape again 80 to 100 years later

Alternative 3. This alternative creates a system of POC buffers and cores within 31 6th field watersheds that are currently uninfested with PL (494,000 acres; 32 percent of the Federal lands within the analysis area). Timber harvests would be eliminated on approximately 2,260 acres of Matrix/Adaptive Management Area, and additional reserve acres, in the POC cores; this restriction does not preclude salvage options in the case of a stand-replacing event. Additionally, all POC would be removed along all roads within the POC cores. There are approximately 9 acres of treatment area per 1 mile of road, although not all of the treatment area would provide suitable eagle habitat. The loss of the larger-diameter trees could have some effect on ability of the stands to function as before. Due to the spacing of very large

trees it is unlikely that a substantial number of large-diameter trees would be removed due to road sanitation in any one stand. The loss of these trees would not affect the adjacent stands' functionality. Road closures and seasonal use restrictions would reduce disturbance associated with road use and adjacent nesting, benefitting bald eagles. Many of the roads to be closed or seasonally restricted are low-use roads, so benefits may be relatively small. Within POC buffer areas future infestation of PL would be eradicated. Areas outside of the POC buffers and cores would be managed the same as Alternative 2.

Implementation of Alternative 3 in 100 years would still result in approximately 16 percent of POC in the North Coast Risk Region, 17 percent in the Siskiyou Risk Region, and 19 percent in the Inland Siskiyou Risk Region being infested with PL (from 15, 11, and 9 percent, respectively, today). Impacts to POC loss are expected to be similar to those discussed for Alternatives 1 and 2. The direct impacts to the spotted owl should be isolated to individual POC trees and small patches. In the next 100 years approximately 11,400 acres of uninfested POC could become infested (4 percent of the analysis area) (Table 3&4-10).

Alternatives 4 and 5. Alternatives 4 and 5 allow for the natural progression of PL across the landscape. There are no active management actions planned that would cause the direct loss or modification of suitable nesting habitat. PL resistant stocks of POC would be used to restore POC to the landscape. Ecosystem recovery, primarily the recovery of the overstory canopy, will be highly dependent upon the ability of the stand to revegetate naturally or reforestation efforts described in the Planting Assumptions. The development of PL-resistant stock would help to restore the POC losses—Alternative 4 more than Alternative 5. Available for deployment within 10 years in Alternative 4, and only in certain breeding zones in Alternative 5 (see Table 3&4-21 in the Genetics and Resistance section), large-diameter POC could be in the landscape again 80 to 100 years later.

Implementation of Alternatives 4 and 5 would result in approximately 19 percent of POC in the North Coast Risk Region, 34 percent in the Siskiyou Risk Region, and 50 percent in the Inland Risk Region to become infected with PL (from 15, 11, and 9 percent today). POC is currently a prominent component in 90,900 acres of forestland in Oregon. Impacts from POC loss are expected to be similar to those discussed for Alternatives 1 and 2. The direct impacts to the bald eagle should be isolated to individual POC trees and small patches. In the next 100 years, approximately 45,900 acres of uninfested POC could become infested (17 percent of the analysis area) (Table 3&4-10).

Alternative 6. The effects of Alternative 6 are the same as Alternative 3 except as follows. Alternative 6 would provide additional protection for 162 7th field watersheds that are currently identified as being uninfested with PL (rather than the 6th field watersheds described in Alternative 3). Timber harvest would be prohibited in the 49,675 acres (Table 3&4-24b) that have POC (POC cores), including approximately 3,010 acres of Matrix and Adaptive Management Area that are currently available for regularly scheduled timber harvest and contribute to probable sale quantity.

Implementation of Alternatives 6 in 100 years would result in infestations covering approximately 16 percent of the POC in the North Coast Risk Region, 17 percent in the Siskiyou Risk Region, and 18 percent in the Inland Siskiyou Risk Region. POC is currently a prominent component in 90,900 acres of forestland in Oregon. Impacts to POC loss are expected to be similar to those discussed for Alternatives 1 and 2. The direct impacts to the eagle should be isolated to indi-

vidual POC trees and small patches. In the next 100 years, approximately 10,300 acres of uninfested POC could become infested (4 percent of the analysis area) (Table 3&4-10).

Vernal pool fairy shrimp (Branchinecta lynchi) and its Critical Habitat

This species does not require POC or forested habitats for critical components of its life history.

These alternatives will have no effect upon the habitat components of this species. Therefore, these alternatives have no affect to the vernal pool fairy shrimp.

Special Status Species

BLM Special Status Species

The BLM special status species policy is applied to actions requiring authorization or approval by the Bureau to insure they are consistent with conservation needs of these species and do not contribute to the need to list them under the provisions of the "Endangered Species Act."

BLM special status species are as follows: Federal endangered, threatened, proposed and candidate species; State endangered and threatened species; Bureau sensitive; Bureau assessment; and Bureau tracking. Those special status species occurring within the analysis area are listed in Table A7-1. None of the special status species listed in Table A7-1 are known to depend upon POC for habitat. Known sites for these species will continue to be managed as necessary to preclude the need to list them under the "Endangered Species Act" for all alternatives.

For Bureau sensitive or Bureau assessment species, the BLM requires review and assessment of potential effects, both beneficial and adverse, upon habitat considerations of each respective species. One or more of the following techniques may be used (BLM Instruction Memorandum No. OR-2003-054):

- Evaluation of species-habitat and presence of suitable or potential habitat;
- application of conservation strategies, plans, and other formalized conservation mechanisms;
- review of existing survey records, inventories, and spatial data;
- utilization of professional research, literature, and other technology transfer sources;
- use of expertise, both internal and external, that is based on documented, substantiated professional rationale; and/or
- complete pre-projects survey, monitoring, and inventory for species that are based on technically sound and logistically feasible methods while considering staffing and funding constraints.

Subsequently, the BLM requires conservation of Bureau sensitive or Bureau assessment species that are affected by their management actions. Options for conservation include but are not limited to:

Table A7-1.—*BLM special status [1] and FS sensitive [2] animal species that are documented or suspected to occur within the Coos Bay, Medford, and Roseburg BLM Districts and the Siskiyou National Forest*

Common name	Scientific name	Common name	Scientific name
American peregrine falcon	*Falco peregrinus anatum*	Brazilian free-tailed bat	*Tadarida brasiliensis*
Arctic peregrine falcon	*F. p. tundrius*	Columbian white-tailed deer [3]	*Odocoileus virginianus leucurus*
Bald eagle [3]	*Haliaeetus leucocephalus*	Fisher	*Martes pennanti*
Black-backed woodpecker	*Picoides articus*	Fringed myotis	*Myotis thysanodes*
Black-throated sparrow	*Amphispiza bilineata*	Townsend's big-eared bat	*Corynorhinus townsendii*
Common nighthawk	*Chordeiles minor*	Pacific pallid bat	*Antrozous pallidus pacificus*
Ferruginous hawk	*Buteo regalis*	Pacific shrew	*Sorex p. pacificus*
Lewis' woodpecker	*Melanerpes lewis*	California wolverine	*Gulo gulo*
Marbled murrelet [3]	*Brachyramphus m. marmoratus*		
Northern goshawk	*Accipiter gentilis*	Montane peaclam	*Pisidium ultramontanum*
Northern spotted owl [3]	*Strix occidentalis caurina*	Vernal pool fairy shrimp [3]	*Branchinecta lynchi*
Northern waterthrush	*Siurus noveboracensis*	Newcomb's littorine snail	*Algamorda subrotundata*
Oregon vesper sparrow	*Pooecetes gramineus affinis*	Fall Creek pebblesnail	*Fluminicola* sp. nov.
Purple martin	*Progne subis*	Keene Creek pebblesnail	*Fluminicola* sp. nov.
Streaked horned lark	*Eremophila alpestris strigata*	Toothed pebble snail	*Fluminicola* sp. nov.
Three-toed woodpecker	*Picoides tridactylus*	Klamath Rim pebblesnail	*Fluminicola* sp. nov. 1
Tricolored blackbird	*Agelaius tricolor*	Nerite pebblesnail	*Fluminicola* sp. nov. 11
White-headed woodpecker	*Picoides albolarvatus*	Diminutive pebblesnail	*Fluminicola* sp. nov. 3
White-tailed kite	*Elanus leucurus*	Oregon shoulderband	*Helminthoglypta hertleini*
Yellow-billed cuckoo	*Coccyzus americanus*	Sisters hesperian	*Hochbergellus hirsutus*
		Scale lanx	*Lanx klamathensis*
Black salamander	*Aneides flavipunctatus*	Rotund lanx	*Lanx subrotundata*
California slender salamander	*Batrachoseps attenuatus*	Green sideband	*Monadenia fidelis beryllica*
Cascades frog	*Rana cascadae*	Travelling sideband	*Monadenia fidelis celeuthia*
Del Norte salamander	*Plethodon elongates*	Crater Lake tightcoil	*Pristiloma articum crateris*
Southern Torrent Salamander	*Rhyacotriton variegatus*		
		Insular blue butterfly	*Plebejus saepiolus insulanus*
Foothill yellow-legged frog	*Rana boylii*	Mardon skipper butterfly [3]	*Polites mardon*
Northern red-legged frog	*Rana a. aurora*		
Siskiyou Mountains salamander	*Plethodon stormi*		
Tailed frog	*Ascaphus truei*		
Common kingsnake	*Lampropeltis getulus*		
Northwestern pond turtle	*Clemmy m. marmorata*		

[1] As defined in the Bureau's Special Status Species Policy, BLM Manual 6840; data sort of the BLM Oregon State Office's database [04 April 2003].
[2] As defined in FS Manual 2670 [Webb, L., *personal communication*].
[3] These species are protected under the "Endangered Species Act" [1973, as amended].

a. Modifying a project (such as timing, placement, intensity or dropping);
b. using buffers to protect sites; and/or
c. implementing habitat restoration actions (those that benefit a species).

For Bureau tracking species, species-oriented inventories, environmental analysis, monitoring, protection, mitigation, management, and USFWS technical assistance are optional.

For State listed species, species-oriented inventories, protection, mitigation, management, and USFWS technical assistance are optional (BLM Instruction Memorandum No. OR-91-57).

The BLM conducts preproject clearances surveys for many special status species. Where surveys are done, they have a reasonable probability of locating individuals and populations of these species.

Forest Service Sensitive Species

Forest Service policy is to not contribute to the need to list Forest Service sensitive species under the provisions of the “Endangered Species Act” and to conduct habitat examinations when proposed resource activities or uses would potentially make influential changes to

elements of their habitat. Such examinations are usually required for Forest Service sensitive species unless the habitat is assumed occupied or prior surveys of the area are adequate. Predisturbance surveys can have several objectives including:

- Assessing potential sensitive species habitat;
- searching suitable habitat for sensitive species occurrence;
- confirming known habitat is suitable; and
- refining knowledge of how habitat exists on the landscape and how species use their habitat. This could include travel corridors, relationships between cover and forage areas, human disturbances, and fragile habitat situations.

The Forest Service sensitive species program includes species for which there is a documented concern for viability within one or more administrative units within the species' historic range (FS Manual 2670.22, Washington Office Amendment 2600-95-7). The designation of sensitive carries a requirement to analyze the impacts of projects and, frequently, to conduct surveys (FS Manual 2670). Forest Service sensitive species in the analysis area are listed in Table A7-1.

None of the Forest Service Sensitive species listed in Table A7-1 are dependent upon POC for habitat. Under all of the alternatives, known sites for these species will continue to be managed as necessary to preclude the need to list them under the "Endangered Species Act."

The Forest Service conducts pre-project clearances for many Forest Service sensitive species. Where surveys are conducted, there is a reasonable probability of locating individuals and populations of these species.

Environmental Consequences

There are 57 special status/sensitive species identified in Table A7-1, including the northern spotted owl, marbled murrelet, bald eagle, and vernal pool fairy shrimp. The effects upon the threatened and endangered species have been analyzed above.

Queries of BLM and FS biologists have failed to yield information that would indicate that any species is specifically tied to POC (Dillingham 2003; Miller 2003; Webb 2003) or would be expected to be uniquely affected by the proposed alternatives. There are no known terrestrial wildlife species exclusively linked to POC. In general, the species found in the project area are tied more closely to habitat components. Impacts to these species are therefore similar to those analyzed for wildlife species, in general, in the Wildlife section in Chapter 3&4. The singular difference between the impacts to the wildlife species, in general, and special status/sensitive species are the provisions of the management direction which specifies survey requirements and special mitigation to lessen impact of management activities. Impact to special status/sensitive species should therefore be less than those analyzed in the general wildlife section.

The following references were used in the Wildlife section of Appendix 7.

Chappell, C.B.; Crawford, R.C.; Barrett, C.; [and others]. 2002. Wildlife Habitats: Descriptions, Status, Trends, and System Dynamics. *In:* Johnson, D.H.; O'Neal, T.A. 2002. Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis.

DeMeo, T. 2003. *Personal communication(s).* Regional Ecologist, USDA-FS Region 6, Portland, OR.

Dillingham, C. 2003. *Personal communication.* Ecologist, Vegetation Management Solutions, USDA-FS Enterprise Team.

Hennon, P.E.; McClellan; M.H.; Palkovic, P. 2002. Comparing Deterioration and Ecosystem Function of Decay-Resistant and Decay-Susceptible Species of Dead Trees. *In:* Laudenslayer; W.F., Jr.; Shea, P.J.; Valentine, B.E.; [and others]; *coords.*; Proceedings of the Symposium on the Ecology and Management of Dead Wood in Western Forests (November 2–4, 1999; Reno, NV.). General Technical Report PSW-GTR-181, USDA-FS Pacific Southwest Research Station, Albany, CA. 949 p.

Jimerson, T. 2003. *Personal communication(s).* Ecologist, USDA-FS Region 5, Arcata, CA.

Johnson, D.H.; O'Neal, T.A., *eds.* 2002. Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis. p 736.

Jules, E.S.; Kauffman; M.J.; Ritts, W.D.; [and others]. 2002. Spread of an Invasive Pathogen Over a Variable Landscape: A Nonnative Root Rot on Port Orford Cedar. Ecology 83(11):3167–3181.

Miller, R.C. 2003. *Personal communication.* Wildlife Technician, USDA-FS Illinois Valley Ranger District, Siskiyou National Forest.

Tuss, C. 2003. *Personal communication(s).* Field Supervisor, USFWS Roseburg Field Office, Roseburg, OR.

USDA-FS; USDI-BLM. 1994. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-successional and Old-growth Related Species Within the Range of the Northern Spotted Owl. Portland, OR. 322 p.

USDA-FS; USDI-BLM. 2000. Final Supplemental Environmental Impact Statement for Amendment to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Regional Ecosystem Office, Portland, OR.

USDA-FS; USDI-BLM. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Portland, OR. p. 130+.

USDA-FS; USDI-BLM. 2003. Survey and Manage Species Summary of Recommendations Regarding Category Placement and Range Changes from the 2002 Annual Species Review.

USDI-BLM. 1996a [updated 2002]. Western Oregon Districts Transportation Management Plan. Oregon/Washington State Office, Portland, OR. 36 p.

Webb, L.O. 2003. *Personal communication.* Forest Wildlife Biologist, USDA-FS Rogue River and Siskiyou National Forests, Grants Pass, OR.

Botany

This section discusses the expected effects to Federal endangered, threatened, proposed, and candidate plant species, where applicable, under the "Endangered Species Act" (ESA) of 1973, as amended, by the alternatives. This section also discusses the expected influential changes, if any, to habitat of BLM Bureau sensitive and Bureau assessment species and to Forest Service sensitive species by each alternative.

Threatened, Endangered, and Agency Sensitive Species

Implementation of any of these alternatives would result in a "No Effect" on these listed species:

- McDonald's rock cress *(Arabis macdonaldiana)*
- Gentner's fritillary (*Fritillaria gentneri*)
- Western lily *(Lilium occidentale)*
- Cook's lomatium *(Lomatium cookii)* (also known as agate desert-parsley)
- Kneeland Prairie pennycress *(Thlaspi californicum* [*montanum* var. *californicum*])

All requirements of the ESA would be fulfilled prior to implementation of specific projects.

The BLM requires the effects of a proposed action be assessed on Bureau Sensitive and Bureau Assessment species (BLM Instruction Memorandum No. OR-2003-054).

The Forest Service Sensitive Species program includes species for which there is a documented concern for viability within one or more administrative units within the species' historic range (FS Manual 2670.22; Washington Office Amendment 2600-95-7). Proposed projects that may impact Forest Service sensitive species must be analyzed and to develop conservation strategies where applicable (FS Manual 2670). This analysis satisfies the Forest Service biological evaluation requirement (FS Manual 2672.4).

Implementation of Alternatives 1, 2, 3, and 6 would have a "May Impact" on *Epilobium oreganum* individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause loss of viability for this species.

Implementation of Alternatives 4 and 5 would have a "May Impact" on *Epilobium oreganum*, *Gentiana setigera*, *Hastingsia bracteosa* var. *atropurpurea*, *Hastingsia bracteosa* var. *bracteosa*, and *Viola primulifolia* ssp. *occidentalis* individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause loss of viability for these species.

Implementation of Alternatives 1, 2, 3, and 6 would have a "No Impact" on all other sensitive plants.

Discussion of Alternatives

Alternative 1. This alternative is the current management direction for BLM districts and the Siskiyou NF. It seeks to reduce or prevent introduction of the pathogen into disease-free areas by closing roads into these areas during the wet season to prevent the spores being

carried from infested to uninfested areas, analyzing the risk of introduction to disease-free areas, developing mitigation measures at the project level, and informing the public about the reasons for these measures.

Across the range of POC, areas with the highest presence of rare plants are primarily free of infestation, with the conspicuous exceptions of Whiskey Creek, narrow bands on the lower portions of Josephine Creek, and on the Middle Illinois River. Seasonal road closures and vehicle washing, mitigations for this alternative, prevent the introduction of noxious weeds and restrict unauthorized off-highway vehicles, thereby indirectly benefiting rare plants.

Alternative 2. This alternative is similar to Alternative 1, except for two items. A risk key has been added for clarification of the environmental conditions that would trigger additional control or mitigation measures. Implementation of disease mitigating practices is expected to be more consistent because of the key. Also, for activities within 162 currently uninfested 7th field watersheds, the risk key is hardwired to generally lead to the application of mitigating management practices whenever activities would create a significant risk of spreading root disease.

The effects of Alternative 2 are similar to Alternative 1, in that implementation would reduce the rate of spread of the disease. Continued development of resistant POC stock would be available for timely replacement into important botanical habitats. Alternative 2 would assist in maintaining the long-term presence of POC in unique plant communities, which appear to be more abundant in high-risk areas.

Alternative 3. To the management actions of Alternative 2 (except for reference to 162 7th field watersheds), Alternative 3 adds additional protection measures to 31 uninfested 6th field watersheds with at least 100 acres occupied by POC. It divides these watersheds into POC cores and buffers and applies additional Standards and Guidelines to each to lessen introduction of infestation into those areas.

The effects of Alternative 3 are the same as Alternative 2, with the exception of effects within the 31 uninfested watersheds. In these watersheds, the prohibition of harvest and discretionary use in POC cores would help ensure a lasting presence of POC in unique plant communities, which appear to be more abundant in high-risk areas. Closing roads and lessening unauthorized off-highway vehicles may benefit rare plant communities throughout the watersheds by preventing disturbances, such as noxious weed introductions, throughout the watersheds.

Alternative 4. This alternative would remove all preventive measures that are in place, and will speed up the resistance-breeding program to more quickly replace POC killed by the disease with resistant seedlings.

The effects of Alternatives 4 and 5 are similar, differing in the mid term and long term where Alternative 4 would mitigate advancement of the disease by increasing the introduction of resistant stock.

Alternative 5. This alternative would remove existing preventative measures and discontinue the development of the resistant breeding program. Existing resistant seed orchard trees would continue to be used to reforest areas of mortality for which resistant stock is already

developed.

The effects of Alternatives 4 and 5 are similar, differing in the mid term and long term where Alternative 5 depends upon the natural, low-level disease resistance and range-wide distribution for the continued existence of POC.

Alternatives 4 and 5 would result in a substantial increase in the advancement of the disease when compared to the current direction. The effect of this high POC mortality on rare plants is unpredictable**.** POC is a large component of riparian habitats in areas where it is the largest tree species present. Loss of shade and stream bank stability that may result from the loss of POC could influence sensitive and rare plant communities adapted to stream microsites.

Alternative 6. This alternative would increase protection to 162 uninfested 7th field watersheds by minimizing entry for product collection, off-highway vehicle access, and timber harvesting. It also calls for roadside sanitation, eradication of infested areas as soon as discovered, and mapping PL-free water sources for firefighting.

Similar to Alternative 3, this alternative would reduce impacts to disease-free POC areas, and, by inference, impacts to rare plants and their habitat.

Threatened and Endangered Species

The BLM and the FS conduct surveys for listed and proposed-for-listing plant species in and adjacent to proposed project areas. These surveys are designed to have a high likelihood of locating populations of these plant species. Because surveys for listed or proposed plant species will discover, and subsequently result in protection for these species with mitigation measures, there would be no difference between the six alternatives.

All projects proposed on BLM- or FS-administered land must meet the Aquatic Conservation Strategy objectives of the Northwest Forest Plan. As proposed projects are designed and analyzed for effects to listed plants, needs of the plant species and habitat elements required to meet Aquatic Conservation Strategy objectives will be identified.

There are no known threatened or endangered species specifically dependent on Port-Orford-cedar as a species, or individual Port-Orford-cedar groves specifically, so there is no identifiable effect resulting from the differing levels of mortality predicted with the different alternatives (see Table A7-2).

BLM Bureau Sensitive or Bureau Assessment Species

The BLM special status species policy is applied to actions requiring authorization or approval by the Bureau to insure they are consistent with conservation needs of special status species, which include Bureau sensitive and Bureau assessment species, and do not contribute to the need to list them under the provisions of the ESA.

For Bureau sensitive or Bureau assessment species, the BLM requires review and assessment of potential effects, both beneficial and adverse, upon habitat considerations of each respective species. One or more of the following techniques may be used (BLM Instruction Memo-

Table A7-2.—*Threatened [T] or endangered [E] vascular plants within the range of Port-orford-cedar* [1]

Common name	Scientific name	BLM	FS
MacDonald's rockcress	*Arabis macdonaldiana* [2]	E	E
Gentner's fritillary	*Fritillaria gentneri*	E	E
Western lily	*Lilium ocidentale* [2]	E	E
Cook's lomatium	*Lomatium cookii* [2]	E	E
Kneeland Prairie penny-cress	*Thlaspi californicum* [*montanum* var. *californicum*]		E

[1] Species listed as threatened or endangered under the "Endangered Species Act" [1973, as amended]. The lists of species were provided by the various field offices of the USFWs, which have jurisdiction over the range of POC area. Websites maintained by the agency were checked to track current changes to list proposed, threatened, and endangered species, and proposed and designated critical habitat.
[2] Species that occur in close proximity to POC.

randum No. OR-2003-054):

- Evaluation of species/habitat and presence of suitable or potential habitat;
- application of conservation strategies, plans, and other formalized conservation mechanisms;
- review of existing survey records, inventories, and spatial data;
- utilization of professional research, literature, and other technology transfer sources;
- use of expertise, both internal and external, that is based on documented, substantiated professional rationale; and/or
- complete pre-projects survey, monitoring, and inventory for species that are based on technically sound and logistically feasible methods, while considering staffing and funding constraints.

Subsequently, the BLM requires conservation of Bureau sensitive or Bureau assessment species that are affected by their management actions. Options for conservation include, but are not limited to:

a. Modifying a project (such as timing, placement, intensity, or dropping);
b. using buffers to protect sites; and/or
c. implementing habitat restoration actions (to benefit a species).

The BLM conducts pre-project clearances surveys for many special status species. Where surveys are done, they have a reasonable probability of locating individuals and populations of these species. Because surveys for special status species will discover them and the Agency will subsequently protect them as needed, there are no differences between the alternatives. Bureau Sensitive and Bureau Assessment species listed in Table A7-3 will not be impacted by any of the alternatives.

Forest Service Sensitive Species

Forest Service policy is to not contribute to the need to list Forest Service sensitive species under the provisions of the ESA and to conduct habitat examinations when proposed resource activities or uses would potentially make influential changes to elements of their habitat. Such examinations are usually required for Forest Service Sensitive species unless the habitat is assumed occupied or prior surveys of the area are adequate. Pre-disturbance surveys can have several objectives including:

Table A7-3.—*Vascular plants listed as BLM Bureau sensitive/assessment and Forest Service sensitive documented or suspected within close proximity of Port-Orford-cedar*

Common name	Scientific name	BLM [1]	FS [2]
Siskiyou sedge	*Carex gigas*	BA	R6
Siskiyou Indian paintbrush	*Castilleja miniata* ssp. *elata*		R5
Clustered lady's slipper	*Cypripedium fasciculatum*	BS	R5/R6
Oregon willow-herb	*Epilobium oreganum*	BS	R5/R6
Siskiyou daisy	*Erigeron cervinus*	BA	R5/R6
Scott Mountain fawn lily	*Erythronium citrinum* var. *roderickii*		R5
Henderson's fawn lily	*Erythronium hendersonii*		R5
Waldo gentian	*Gentiana setigera*	BS	R6
Purple rush-lily	*Hastingsia bracteosa* var. *atropurpurea*	BS	R6
Large-flowered rush-lily	*Hastingsia bracteosa* var. *bracteosa*	BS	R6
Dudley's rush	*Juncus dudleyi*		R5
Parnasia	*Parnasia palustris*		R5
Del Norte butterwort	*Pingicula vulgaris* ssp. *macroseras*		R5
California sworfern	*Polystichum californicum*	BA	R6
Crested polentilla	*Potentilla cristae*		R5
Showy raillardella	*Raillardella pringlei*		R5
Del Norte willow	*Salix delnortensis*	BA	R6
Great burnet	*Sanguisorba officinalis*		R5
English Peak greenbriar	*Smilax jamesii*		R5/R6
Western bog violet	*Viola primulifolia* var. *occidentalis*	BS	R5/R6

[1] BS = Bureau sensitive; BA = Bureau assessment.
[2] Forest Service Regions: R5 = California; R6 = Oregon.

- Assessing potential sensitive species habitat;
- searching suitable habitat for sensitive species occurrence;
- confirming that known habitat is suitable; and
- landscape analysis to refine knowledge of existing habitat conditions and how species adapt. This could include relationships between cover and forage areas, human disturbances, and fragile habitat situations.

Within the range of POC, Table A7-3 lists Forest Service sensitive species in Regions 5 (California) and 6 (Oregon). The Forest Service sensitive species program includes species for which there is a documented concern for viability within one or more administrative units within the species' historic range (FS Manual 2670.22, Washington Office Amendment 2600-95-7). The designation of sensitive carries a requirement to analyze the impacts of projects and to conduct surveys if disturbance occurs (FS Manual 2670).

The FS conducts pre-project clearances for many FS sensitive species. Where surveys are conducted, there is a reasonable probability of locating individuals and populations of these species. Because surveys for FS sensitive species will discover them and the Agency will protect them as needed, there are no differences between the alternatives. FS sensitive species listed in Table A7-3 would not be impacted by any of the alternatives except a noted above.

There are no known Bureau sensitive, Bureau assessment, or FS sensitive species specifically dependent on POC as a species, or individual POC groves specifically; so there is no identifiable effect resulting from the differing levels of mortality predicted with the different alternatives. There are questions that have not been answered by current knowledge about the interactions in fen plant communities and their relationship. The latest fen survey results

indicate that *Epilobium oreganum* prefers habitats with grown trees and shrubs (Frost 2003).

The following references were used in the Botany section of Appendix 7.

Brian, N. 2003. *Personal communication.* District Botanist, USDI-BLM Coos Bay District, Coos Bay, OR.

Carter, S. 2003. *Personal communication*. District Botanist, USDI-BLM Roseburg District, Roseburg, OR.

Frost, E.; Bigg, W. 2003. Distribution and Environmental/Habitat Relations of Five Endemic Plants Associated with Serpentine Fens in Southwest Oregon and Northwestern California. [Developed for] the Siskiyou NF and Medford BLM District, [on file at] Siskiyou NF Supervisor's Office, Grants Pass, OR.

Hoover, L. 2003. *Personal communication.* Forest Botanist, USDA-FS Six Rivers National Forest.

Hickman, J.C. 1993. The Jepson Manual of Higher Plants of California. University of California Press, Berkeley. 1,400 p.

Kagan, J. 1990a. Draft Species Management Guide for *Epilobium oreganum* Greene. [Developed for] the Siskiyou NF and Medford BLM District, [on file at] Siskiyou NF Supervisor's Office, Grants Pass, OR.

Kagan, J. 1990b. Draft Species Management Guide for *Gentiana setigera* Wats. [Developed for] the Siskiyou NF and Medford BLM District, [on file at] Siskiyou NF Supervisor's Office, Grants Pass, OR.

Kagan, J. 1996. Draft Conservation Agreement for *Hastingsia bracteosa*, *H. atropurpurea*, *Gentiana setigera*, *Epilobium oreganum*, and *Viola primulifolia* var. *occidentalis* and Serpentine Darlingtonia Fens and Wetlands from Southwestern Oregon and Northwestern California. [On file at] Siskiyou NF Supervisor's Office, Grants Pass, OR.

Mousseaux, M. 2003. *Personal communication.* District Botanist, USDI-BLM Medford District, Medford, OR.

Nelson, J. K. 2003. *Personal communication.* Forest Botanist, USDA-FS Shasta-Trinity National Forest.

Oregon Natural Heritage Program. 1997. Oregon Natural Heritage Program Data Base, Portland, OR.

Segotta, D. 2003. *Personal communication.* Forest Botanist, USDA-FS Siuslaw National Forest.

Skinner, M.W.; Pavlik, M.; *eds.* 1994. California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California. Sacramento, CA.

USDA-FS. 2001. Sensitive Species Plant List, Region 6, U.S. Forest Service. [On file at] Siskiyou NF Supervisor's Office, Grants Pass, OR.

USDA-FS. 2001. Sensitive Species Plant List, Region 5, U.S. Forest Service. [On file at] Six Rivers NF Supervisor's Office, Eureka, CA.

USDA-FS. 1989. Siskiyou National Forest Land and Resource Management Plan. Siskiyou National Forest, Grants Pass, OR.

USDA-FS. 1999. Forest Service Manual: Wildlife, Fish, and Sensitive Plant Management (Section 2670), WO Amendment 2600-91-3 [effective 5/17/99].

USDA-FS. 1997. Sensitive and Endemic Plant Records and Plant Survey Records (1978–1997). [On file at] Siskiyou National Forest Supervisor's Office, Grants Pass, OR.

USDA-FS; USDI-BLM. 1994a. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-successional and Old-growth Related Species Within the Range of the Northern Spotted Owl. Portland, OR. 322 p.

USDA-FS; USDI-BLM. 1994b. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. Portland, OR.

USDA-FS; USDI-BLM. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines. Portland, OR. p. 130+.

Vorobik, L. 2002. *Personal communication.* Consulting Research Botanist, Lopez Island, WA.

Vorobik, L. 2002. Report and Attachment to Siskiyou National Forest Regarding Identification of *Arabis macdonaldiana* Specimens and Preferred Habitat. Consulting Research Botanist, Lopez Island, WA.

Fisheries

BLM Special Status and FS Sensitive Species

This fisheries biological evaluation addresses BLM special status and FS sensitive species:

- Chinook salmon (*Oncorhynchus tshawytscha*) — BLM and FS sensitive
- Steelhead trout (*Oncorhynchus mykiss*) — FS sensitive
- Coastal cutthroat trout (*Oncorhynchus clarkii*) — FS sensitive
- Chum salmon (*Oncorhynchus keta*) — FS sensitive

Implementation of Alternatives 1, 2, 3, or 6 is not likely to lead to a trend towards Federal listing of steelhead, coastal cutthroat trout, Chinook salmon, and chum salmon.

Implementation of Alternatives 4 or 5 may lead to a trend towards Federal listing of steelhead, coastal cutthroat trout, chinook salmon, and chum salmon.

BLM Special Status Species. The BLM special status species policy applies to all actions requiring authorization or approval by the Bureau to insure those actions are consistent with conservation needs of these species and do not contribute to the need to list them under the provisions of the "Endangered Species Act" (ESA). BLM special status species are as follows: Federal endangered, threatened, proposed and candidate species; state endangered and threatened species; Bureau sensitive; Bureau assessment; and Bureau tracking.

Chinook salmon is designated as Bureau sensitive. For Bureau sensitive or Bureau assessment Species, the BLM requires review and assessment of potential effects, both beneficial and adverse, of proposed actions. NEPA decision documents must disclose the effects of proposed actions on these species, and document that the decision would not contribute to the need to list under the ESA (BLM Instruction Memorandum No. OR-2003-054).

Forest Service Sensitive Species. This basic policy is to not contribute to the need to list Forest Service sensitive species under the provisions of the ESA, and to conduct habitat examinations when proposed resource activities or uses would potentially make influential changes to elements of their habitat. Examinations of suitable habitat are usually required for Forest Service sensitive species unless the habitat is assumed occupied or prior surveys of the area are adequate.

The Forest Service sensitive species program includes species for which there is a documented concern for viability within one or more administrative units within the species' historic range (Forest Service Manual 2670.22, Washington Office Amendment 2600-95-7). The designation of sensitive carries a requirement to analyze the impacts of projects and, frequently to conduct surveys (Forest Service Manual 2670).

Although coho salmon *(Oncorhynchus kisutsch)*, are federally threatened and are therefore, by definition BLM special status species, this biological evaluation does not address potential effects to coho salmon. The analysis and determination of effects specific to coho salmon is addressed through a separate biological assessment as required by the ESA through section 7 consultation with the National Marine Fisheries Service.

Existing Environment and Habitat Status

Of the four sensitive species, steelhead are the most abundant and widely distributed throughout the POC SEIS analysis area, and are present in streams ranging from small 2nd to 3rd Order tributaries to mainstem rivers. Cutthroat trout are also present in the same range of stream sizes, but are more abundant in the coastal regions of the analysis area. Chinook and chum salmon are relatively more abundant in low gradient gravel-rich channels associated with large tributaries and mainstem river valleys. Baseline habitat conditions are described in the Water and Fisheries section in Chapter 3&4 of this SEIS. Baseline habitat conditions are also summarized in the 1997 Rogue Valley Council of Governments report, "Southwest Oregon Salmon Restoration Initiative, Phase 1: A Plan to Stabilize the Native Steelhead Population in Southwest Oregon from Further Decline." This report identified six primary limiting factors for steelhead streams in the Rogue, Klamath, and South Coast (Prevost et al. 1997, *p. 12–13*) Due to general similarities in anadromous life histories and freshwater habitat requirements, these six factors to be applicable to cutthroat trout, Chinook salmon, and chum salmon:

1) Low stream flows limit summer rearing habitat, increase water temperatures, and increase competition and the risk of predation.

2) High water temperatures (over 21 degrees C), produced by insufficient cover, can foster disease and diminish food supply.

3) Inadequate riparian habitat exists. Stream canopy over side-channels and alcoves provides shade which helps reduce stream temperatures, stabilizes streambanks, serves as holding areas for fry and smolts, and provides a food source for aquatic life.

4) Inadequate levels of instream large woody debris exist. Large woody debris provides shelter for steelhead, creates pools, collects spawning gravel, helps reduce water velocity, and provides hiding habitat.

5) Sediment and erosion were limiting factors, as they affect spawning areas, fishery health, and water quality.

6) Fish passage at road crossings needs improvement.

Environmental Consequences

Because the relative importance of POC as woody debris for salmonid habitat depends on the proportion of POC in the headwaters, the potential impacts of the loss of POC will vary by watershed and basin. As wood source areas, ultramafic headwater POC-dominated and sparsely-vegetated areas would likely be the most affected by POC loss, while headwater areas that contain denser stands of other conifers will be less affected. Therefore, it is likely that over the long term (centuries) and on a large-basin scale, as the sources of POC decline, the subsequent proportion of POC in wood jams that contribute to salmonid habitat will decrease, except as mitigated by replacement with resistant stock (see Planting Assumption early in Chapter 3&4).

POC root disease infestations in streamside POC stands may lead to long-term increases of large wood recruitment to channels. Mortality and subsequent declines in root strength in

streamside POC may result in more dead trees that are susceptible to storm windthrow or localized undercutting by stream currents, especially on the outside of channel bends. POC trees that topple into the streams would create scour pools in the medium width channels and become parts of jam complexes or distributed downstream on the floodplains in wider channels. Over the long-term this may result in beneficial effects for aquatic habitat by providing increased pool depths, complex habitats, and cover. However, the potential for beneficial effects from increases in large wood depend several site-specific conditions, including POC density and channel geomorphological characteristics. For example, in wide floodplains where significant portions of dead POC are present, a large reduction in root networks may cause the channel to become less stable, move laterally across the floodplain, and become wider, shallower, and/or braided.

In most of the area, infected POC with dead crowns may contribute to more expansive holes in the canopy in riparian areas along streams. Infections of POC with PL would result in lesser amounts of shade than a healthy stand. On soils derived from ultramafic materials, shading may be reduced for long time periods. Other tree species have difficulty occupying the site due to waterlogged soils with unfavorable soil chemistry. Therefore, a lag time can be expected where alder, tanoak, or other pioneer hardwood species invade openings on many POC riparian sites. Alder and other hardwoods will sometimes provide shade over streams within 3 to 5 years of colonization. Hardwoods, as they mature, are less desirable as downed material for stream function because they are often of smaller diameter than conifers and do not last as long. Whether conifers eventually become established in these streamside areas depends on site conditions and disturbance history.

Effects of the Alternatives

Alternative 1. There is some risk to fish from the use of Clorox. PL-contaminated waters used for washing and firefighting would be disinfected with a 50 parts per million concentration of sodium hypochlorite, the active ingredient in Clorox bleach. Two fish-killing spills were reported during suppression of the Biscuit Fire from tanker fills located next to streams. A mitigation was subsequently implemented of adding Clorox to water only after tanks have been filled and moved away from the fill site. Continuation of this practice would substantially decrease the risk of this type of spill. Wash stations would be located to avoid direct flow of treated water into streams and other bodies of water, so there should be little or no effect to fish from that source. Direct input of chlorinated waters could result from fire suppression activities and would be small in scale and of short duration.

Alternative 2. The Clorox risk discussed in Alternative 1 applies to Alternative 2 as well.

Alternatives 3 and 6. These alternatives incorporate the features of Alternative 2, and add additional measures to control the spread of PL within 31 and 162 currently uninfested subwatersheds (generally 10,000 to 40,000 acres) and catchments (generally 1,000 to 10,000 acres) respectively. The Alternative 6 uninfested drainages are more widely distributed throughout the POC range than those of Alternative 3, excluding the Coos Bay and Roseburg BLM Districts, and include most of the core areas of Alternative 3. Alternative 3 features a larger acreage of watershed buffers (460,500 acres) throughout the POC range, when compared to Alternative 6 watershed buffers (216,000 acres). These POC buffers in Alternative 3 surround substantially greater miles of anadromous fish streams, when compared to Alternative 6.

Discontinuance of travel and maintenance on certain winter use roads to lesson PL spread, may also coincidently reduce sediment delivery to stream channels. This effect is variable depending on road location, surface type, adequacy of drainage structures, and closure level. Transportation analysis and management objectives for buffers in Alternatives 3 and 6 would give these alternatives the greatest indirect beneficial impact on water quality and salmonids.

In Alternative 3 and 6 management measures for water sources require mapping and using only untreated water from the uninfested watersheds for wildfire suppression. The risk of the Clorox water treatment additive from being washed into streams from mixing areas or dumping of treated water during fire suppression would be eliminated in these watersheds. These water management practices would have a beneficial effect on fishes and biota, by preventing spills and short-term water-chemistry changes. The Clorox risk discussion in Alternative 1 also applies to other parts of Alternative 3 and 6.

Alternatives 4 and 5. Alternatives 4 and 5 are similar in that no specific management measures would be applied, other than a root disease resistant POC breeding program in Alternative 4 and general discontinuance of the breeding program in Alternative 5. In the Northern/Coastal Region effects on fish would also be similar to Alternatives 1 and 2 in the short and long term. This is because POC is a minor riparian species in this region and 75 percent of the riparian areas are already infested in many of the lower drainages. Additionally, edaphic conditions suggest that other tree species can easily occupy most sites in this area. Alternative replacement species including hardwoods like red alder or conifers including western red cedar and western hemlock would most likely occupy the site. Planted POC would be small and would not provide effective shade or large woody debris recruitment for many decades.

In the Siskiyou and Inland Siskiyou Risk Regions, Alternatives 4 and 5 would be less favorable than Alternatives 1, 2, 3, and 6 in the short and long term. Currently about 27 percent and 15 percent respectively of POC of high-risk riparian areas are infested. An additional 62 percent and 68 percent of the high-risk areas in these risk regions are predicted to become infested in the next 100 years under Alternative 4 and 5, while an additional 16 to 25 percent would become infested under Alternative 3 and 2 in the same period. Seed would be available for planting resistant stock under Alternative 4 after 2010, and is not planned for some areas under Alternative 5.

Cumulative Effects of the Alternatives Specific to Downstream Temperature

The comparison of downstream cumulative temperature effects under all alternatives is that Alternative 3 (due to expanded buffer areas) has the least effect; Alternative 6 has slightly more effect; Alternatives 1 and 2 have an increased effect and are almost the same; and Alternatives 4 and 5 have the greatest effect and are equal at least in the short and mid term.

Approximately 25 percent of the salmonid habitat would be potentially affected by the cumulative downstream impact of temperature increases in ultramafic streams (based on analysis of the entire POC range in Oregon for the miles of steelhead streams that are ODEQ 303(d) listed for temperature and are in ultramafic terrain). The portion of high-risk areas that would be affected are approximately 9 percent for Alternatives 3 and 6, 13 and 12 percent for Alternatives 1 and 2, respectively, and 21 percent for Alternatives 4 and 5. The potential cumulative effects to fish would not be significant under Alternatives 1, 2, 3, and 6.

The cumulative effects potentially would be significant for steelhead under Alternatives 4 and 5.

These effects on steelhead and cutthroat trout are also attributed to their abundance and broad range in life history characteristics. Steelhead and cutthroat trout abundance in the region is relatively stable; they are both widely distributed, are both able to use a variety of stream habitats, and are therefore expected to be resilient to disturbance. However, Chinook and chum salmon would not be likely to be impacted by indirect temperature effects on rearing habitat due to the timing of their use of the habitat. Juvenile salmon emigrate from spawning areas during their first spring and so are not typically using tributaries in the upper watersheds affected by elevated temperatures in the summer months.

The effects discussion that follows provides more detailed descriptions of potential effects by risk region (North Coast, Siskiyou, and Inland Siskiyou Risk Regions).

North Coast Risk Region (Coos Bay BLM District, Siskiyou NF Powers Ranger District). The loss of POC under any of the proposed alternatives would not have a detectable effect on fish in this region. In this region, POC is generally a scattered component of riparian stands. Gaps in the canopy created by dying crowns are small and spatially distributed so average crown density is not reduced at a reach-scale of analysis. Spaces in the canopy would be filled rapidly by adjacent trees broadening their canopies, release of understory trees, or seeded trees. Summer temperatures and large woody debris recruitment would be maintained within the natural range of variability in headwater, mid-drainage, and valley streams.

The Siskiyou Risk Region (Siskiyou NF in Oregon and Six Rivers, Klamath, and Shasta-Trinity NF in California). The loss of POC on headwater streams in this region under any of the proposed alternatives will not have a detectable effect on fish because summer temperatures would not be elevated and the function of large woody debris transport would be maintained. Loss of POC on mid-drainage and valley streams within the nonultramafic portions of this region would not have a detectable effect on fish for the same reasons stated above in the Northern/Coastal Region (that is, other conifer species gradually replace POC, and summer temperatures and large woody debris function are maintained). In the lower rainfall ecoregions to the east of the Coastal Siskiyous boundary, species present with POC along creeks in nonultramafic soils would be expected to colonize the canopy gaps left by POC loss.

Mid-drainage and valley streams within ultramafic areas of this region would be affected by the loss of POC. Because POC mortality on these streams is not predicted to disrupt the recruitment of large woody debris, no effects to fish are anticipated related to its function (such as, pool formation, instream complexity, gravel recruitment). However, the loss of POC stream shade and the associated elevation of summer temperatures on these streams could have an indirect short- and long-term effect on fish. For salmonids, this effect would not be significant under any alternative because of the very limited habitat area it involves (6 percent of the total habitat).

The indirect effect that elevation of summer temperatures could have on salmonids in the ultramafic drainages affected by POC mortality would be a decrease in habitat quality in stream reaches that are directly associated with POC overstory canopy. However, the signifi-

cance of this potential decrease in the ultramafic areas must be placed in context of the importance of those areas for salmonid production in the region. The analysis of the impacts of POC loss on streams using plant association groups indicates that a small percentage of the stream miles in ultramafic soils would be directly affected by the loss of POC. Of the total 897 miles of streams in the Serpentine Plant Association Groups east of the Coastal Siskiyous, 192 miles (21 percent) would be affected, and within these miles, POC contributes 38 to 50 percent of the overstory. Therefore, the loss of POC on stream segments in the ultramafic areas would not be anticipated to have a significant short or long term effect on salmonids under any alternative because of the very limited habitat area it involves (6 percent of the total habitat), the limited shade loss that could actually result on a given segment of stream.

Inland Siskiyou Risk Region (Medford and Roseburg BLM Districts). In this region, the loss of POC under any of the proposed alternatives would not have a detectable effect on fish. POC lost to PL in riparian zones would gradually be replaced by other conifer species. In the Medford District, the loss of POC on headwater streams under any of the proposed alternatives would not have a detectable effect on fish because summer temperatures would not be elevated and the function of large woody debris transport would be maintained. In the Roseburg District, summer temperatures and large woody debris recruitment would be maintained within their natural range of variability in headwater streams and mid-drainage and valley streams.

The loss of POC stream shade and the associated potential elevation of summer temperatures in mid-drainage and valley streams within ultramafic areas of this region would have an indirect short- and long-term effect on fish. The effects are the same as described above for the mid-drainage and valley streams within the ultramafic areas of the Siskiyou Region.

In addition to the information provided in this SEIS, the following references were used in the Fisheries section of Appendix 7.

Busby, P.J.; Wainwright, T.C.; Bryant, G.J.; [and others]. 1996. Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. U.S. Deptartment of Commerce, NOAA-Fisheries Technical Memorandum NMFS-NWFSC-27. 261 p.

Johnson, O.W.; Ruckleshaus, M.H.; Grant, W.S.; [and others]. 1999. Status Review of Coastal Cutthroat Trout from Washington, Oregon, and California. U.S. Deptartment of Commerce, NOAA-Fisheries Technical Memorandum NMFS-NWFSC-37. 292 p.

Myers, J.M.; Kope, R.G.; Bryant, G.J.; [and others]. 1998. Stat us Review of Chinook Salmon from Washington, Idaho, Oregon, and California. U.S. Department of Commerce, NOAA-Fisheries Technical Memorandum NMFS-NWFSC-35. 443 p.

Rogue Valley Council Of Governments. 1997. Southwest Oregon Salmon Restoration Initiative, Phase 1: A Plan to Stabilize the Native Steelhead Population in Southwest Oregon from Further Decline. Central Point, OR.

Appendix 8: Areas of Critical Environmental Concern and Research Natural Areas and Requirements for Designation

Areas of Critical Environmental Concern

This appendix explains ACEC criteria as described in 3 CFR 16 and describes the existing and proposed ACECs and their relevant and important values (Tables A8-1 and A8-2). BLM regulations (43 CFR 1610) define an ACEC as an area

> . . . within the public lands where special management attention is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes, or to protect life and safety from natural hazards.

ACECs differ from other special management designations such as wilderness study areas in that the designation, by itself, does not automatically prohibit or restrict other uses in the area. The one exception is that a mining plan of operation is required for any proposed mining activity within an ACEC. The ACEC designation is an administrative designation and is accomplished through the land use planning process. It is unique to the BLM in that no other agency uses this form of designation. The intent of Congress in mandating the designation of ACECs through the "Federal Land and Policy Management Act" was to give priority to the designation and protection of areas containing truly unique and significant resource values.

Table A8-1.—*Areas of critical environmental concern and research natural areas within the range of Port-Orford-cedar in Oregon that contain healthy Port-Orford-cedar or are infested with* Phytophthora lateralis

	POC/ PL [1]	Acres	Primary objectives	Off-highway vehicle designa-tion	Leasable mineral entry	Locatable/ salable mineral entry	Timber harvest
Coos Bay BLM							
New River ACEC	PL	880	Dune blocked lake with aquatic beds, marshy shore, surrounded by unconsolidated sands	Closed/ limited	Open/NSO	Closed	Not available
Upper Rock Creek ACEC	POC	460		Limited	Open/NSO	Closed	Not available
North Fork Hunter Creek ACEC	POC	1,730	Coastal oak-conifer woodland and meadow mosaic	Limited	Open/NSO	Closed	Not available
Hunter Creek Bog ACEC	PL	570	Knobcone pine forest; *Darlingtonia* fen on serpentine peridotite w/POC	Limited	Open/NSO	Closed	Not available

[1] Uninfested ACECs or RNAs are indicated by the letters POC; infested ACECs or RNAs are indicated by the letters PL. The number of acres of POC or PL infestation are not available for any of the ACECs or RNAs.

Table A8-2.—*Areas of critical environmental concern and research natural areas within the range of Port-Orford-cedar in Oregon that contain healthy Port-Orford-cedar or are infested with* Phytophthora lateralis

Area Name	POC/ PL [1]	Acres	Primary objectives	Management
Medford BLM				
Brewer Spruce ACEC/RNA	POC	390	Brewer spruce forest and aquatic cell for mid- to high-elevation permanent pond.	Not available for timber harvest. OHV use restricted to designated roads. Mineral leasing subject to NSO. Close to mineral entry.
Woodcock Bog ACEC/RNA	PL	280	*Darlingtonia* wetland on serpentine and special status plant species.	Not available for timber harvest. Closed to OHV use. Mineral leasing subject to NSO. Closed to mineral entry.
Bobby Creek ACEC/RNA	POC	428	Natural systems, botanical, special status species, and wildlife fisheries.	Not available for timber harvest. OHV use restricted to existing roads. Mineral leasing subject to NSO. 428 acres designated as ACEC and 1,702 acres designated as RNA.
Rough and Ready ACEC/RNA	POC	1,164	Natural systems, special status plants, botanical.	Not available for timber harvest. OHV use limited to designated roads. Mineral leasing subject to NSO.
Bobby Creek ACEC/RNA	POC	1,702	Natural systems, botanical, special status species, and wildlife fisheries; moist tanoak forests [tanoak/Port-Orford-cedar/salal].	Not available for timber harvest. OHV use restricted to existing roads. Mineral leasing subject to NSO. 428 acres designated as ACEC and 1,702 acres designated as RNA.
Brewer Spruce Enlargement ACEC/RNA	POC	1,384	Natural area of Brewer spruce forest for scientific research and baseline study area.	Not available for timber harvest. Closed to OHV use. Mineral leasing subject to NSO. Closed to mineral entry.
Grayback Glade ACEC/RNA	POC	1,069	Terrestrial white-fir-Port-orford-cedar and aquatic first order stream for scientific research and baseline study area.	Not available for timber harvest. Closed to OHV use. Mineral leasing subject to NSO. Closed to mineral entry.
North Fork Silver Creek ACEC/RNA	POC	499	Douglas-fir/white fir forest with diverse shrub understory and third order stream; for scientific research and baseline study area.	Not available for timber harvest. Closed to OHV use. Mineral leasing subject to NSO. Closed to mineral entry. No surface disturbance within 100 feet of boundary.
Pipe Fork ACEC/RNA	POC	529	Port-orford-cedar/Oregon grape and Port-orford-cedar/salal communities; for scientific research and baseline study area.	Not available for timber harvest. Closed to OHV use. Mineral leasing subject to NSO. Closed to mineral entry.

Area Name	POC/ PL [1]	Acres	Primary objectives	Management
Roseburg BLM				
Beatty Creek	POC	180	Jeffrey Pine on Serpentine.	ACEC/RNA
Siskiyou National Forest				
Cedar Log Flat	POC	421	Port-Orford-cedar/hairy honeysuckle/fescue on ultramafic soils. Jeffrey pine grassland savannah.	RNA
Coquille River Falls	PL	470	Douglas-fir, Western hemlock, Port-Orford-cedar forest with wet shrubs and forbs.	RNA
Lemmingsworth Gulch	POC	1,224	Port-Orford-cedar/hairy honeysuckle/fescue on ultramafic soils.	RNA
Port-Orford-Cedar	PL	1,122	Douglas-fir, Western hemlock, Port-Orford-cedar forest with wet shrubs and forbs. Low elevation pond with aquatic beds and marshy shore. Oregon ash, red alder swamp.	RNA
Siuslaw National Forest				
Tenmile	POC	1,190	Sitka spruce-Port-Orford-cedar on sand.	RNA

[1] Uninfested ACECs or RNAs are indicated by the letters POC; infested ACECs or RNAs are indicated by the letters PL. The number of acres of POC or PL infestation are not available for any of the ACECs or RNAs.

Research Natural Areas

According to Oregon Natural Heritage Program (ONHP) (ONHP 1993, 1998) the purpose for research natural areas (RNAs) are:

> . . . to preserve examples of all significant natural ecosystems for comparison with those influenced by man; to provide educational and research areas for ecological and environmental studies; and to preserve gene pools of typical and endangered plants and animals.

The FS recognizes the role of RNAs in sound land use management and has provided for RNA establishment and management in FS Manual 4063. The basic policy is that RNAs may be used only for research, study, observation, monitoring, and those educational activities that maintain unmodified conditions (FS Manual 4063.03). The guiding principle of RNA management is to allow the natural ecological processes occurring in the area to predominate. Human encroachments, activities and management implications, which directly or indirectly modify natural ecological processes, generally are to be mitigated with active management.

RNAs of the FS are lands that are permanently protected for the purposes of maintaining biological diversity, conducting nonmanipulative research and monitoring, and fostering education. In RNAs, natural conditions are allowed to prevail, usually by eliminating or limiting human intervention. In many cases, however, human activities have interrupted natural processes for several decades or more. In these cases, prescribed management actions are used to restore the processes upon which the natural communities and species depend.

Pursuant to FS Manual 4063, in consultation with Forest Supervisors and District Rangers, Station Directors have authority to approve all management plans and to oversee and coordi-

nate approved research on all RNAs, except those RNAs in congressionally designated areas. District Rangers are responsible for direct administration, protection, and, in accordance with approved forest plans and/or project prescriptions, management of established RNAs. Forest Supervisors have the responsibility to execute approved management plans for RNAs and to administer, manage, and protect RNAs. Forest Supervisors must coordinate with the Station Director or Director's representative any needed changes in management or protection.

All BLM RNAs are designated and managed as ACECs (Oregon Manual Supplement 1623.35 for RNAs only). Therefore, all RNAs must meet both the ACEC criteria, as applied in writing by an interdisciplinary team and approved by the field manager, as well as the need for a RNA cell as defined in the ONHP data base. The ACEC can be larger than the RNA, to encompass other values, which may not be needed for the RNA. RNA management plans are usually more restrictive than ACEC plans. RNA cells determined by the ONHP are the basic units that are represented in a natural area system. These cells can be an ecosystem, community, habitat, or organism. Cells are artificial constructs used by the ONHP to inventory, classify, and evaluate natural areas in Oregon. Cells contain one or more ecosystem elements. Typically, a RNA aggregates several cells that need representation. The ONHP was created by the Oregon Natural Heritage Advisory Council to the State Land Board in 1993. They are the State counterpart of the Federal program. Of the 16 existing and proposed ACECs, 13 have ONHP cells within their areas. Within the existing and proposed ACECs, 11 have existing or proposed RNAs.

Requirements for Area of Critical Environmental Concern Designation

To be designated as an ACEC, an area must meet the relevance and importance criteria listed in BLM 1613 Manual (BLM 1988) and require special management. Specific evaluation questions for each of these three elements are listed below.

Relevance Criteria

Does the area contain one or more of the following:

- A significant historic, cultural, or scenic value;
- a fish and wildlife resource;
- a natural process or system; or
- a natural hazard?

Importance Criteria

Does the value, resource, system, process, or hazard described above have substantial significance or value? Does it meet one or more of the following criteria?

- Is it more than locally significant, especially compared to similar resources, systems, processes, or hazards within the region or Nation;

- does it have qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change;

- has it been recognized as warranting protection in order to satisfy national priority concerns or to carry out the mandates of the "Federal Land and Policy Management Act";

- does it have qualities that warrant highlighting to satisfy public or management concerns about safety and public welfare; or

- does it pose a significant threat to human life and safety or property?

Need for Special Management

Does the value, resource, system, process, or hazard require special management to protect (or appropriately manage) the relevant/important value(s)? Special management is defined as or is needed when:

1) Current management activities are not sufficient to protect a given relevant/important resource value and a change in management is needed that is not consistent with the existing land use plan(s).

2) The needed management action is considered unusual or outside of the normal range of management practices typically used.

3) The change in management is difficult to implement without ACEC designation.

Evaluation Process

Regardless of who nominates an area as a potential ACEC, it is the BLM who is responsible for evaluating the area to determine if it meets the relevance/importance criteria and requires special management.

Appendix 9: Summary of Modeled Potential Stream Temperature Increases Resulting from Port-Orford-Cedar Mortality

To help identify sideboards to the affect of POC mortality on stream temperatures, the following scenarios were run on the stream SHADOW model, Version X-15 (Parks 1993). Mortality of POC is expected to have the largest affect on stream temperature on ultramafic soils, where (1) overall vegetation is less than on other soil types, (2) POC is more prominent along stream sides compared to other species, and (3) POC is less likely to be replaced by other species if it is lost. The model was run for 10 (cases 1, 2, and 3) and 40 (cases 4, 5, and 6) square mile drainages. Latitude is 43 degrees, solar declination is 17 degrees (August 1), and ground temperature is 53 degrees. Modeling parameters are shown in Table A9-1.

These parameters assume 100 percent POC within the first 15 feet from the stream channel for a mile (POC averages 50 percent of the overstory canopy in the 10,600 acres of riparian ultramafic plant associations in Oregon in which it is prominent [Table 3&4-12]), and 100 percent kill for the 15 feet on either side of the channel, and zero kill beyond that distance. Results of conduction, convection, inflow, etc., were not modeled. The results of the temperature modeling are shown in Table A9-2.

Table A9-1.—*Mortality parameters for SHADOW stream temperature effects*

	Uninfested		Infested	
	Drainage size [square miles]		Drainage size [square miles]	
Modeling Element	10	40	10	40
% tree overhang	15	15	0	0
Flow width [feet]	8	17	8	8
Active channel width [feet]	30	60	30	30
Modeled length [9 miles]	1	1	1	1
Low flow [August 1] [cu.ft./sec.]	2.2	8.8	2.2	2.2
Tree height [relatively low on ultramafic] [feet]	130	130	130	130
Slope of adjacent terrain [%]	20	10	20	20
Distance from channel edge to trees [feet]	2	2	15	15
Shade density of unaffected [adjacent] stand [%]	70	55	70	70

Table A9-2.—*Summary of predicted shade decrease and temperature increase for August 1, comparison of uninfested and infested riparian areas with 100 percent Port-Orford-cedar*

	Uninfested Port-Orford-cedar		Infested Port-Orford-cedar		Comparison	
Case [1]	% shade	Temperature [C] increase/mile	% shade	Temperature [C] increase/mile	% shade decrease/mile	Temperature [C] increase/mile
1	86	1.6	77	2.7	9	1.1
2	88	1.4	77	2.7	11	1.3
3	88	1.4	74	3.0	12	1.6
4	70	1.8	61	2.3	9	0.5
5	69	1.9	58	2.6	11	0.7
6	49	3.0	30	4.2	19	1.2

[1] Case 1 and 4 are north-south orientation [0 degrees N]; case 3 ands 6 are east-west orientation [90 degrees N]; and case 2 and 5 are intermediate [45 degrees N].

Appendix 10: Response to Public Comments

Introduction

The public comment period for the Draft Supplemental Environmental Impact Statement for Management of Port-Orford-cedar in Southwest Oregon (Draft SEIS) began on June 13, 2003 and ran through September 12, 2003. Agencies, officials, and the public were invited to comment on the Draft SEIS.

During the 90-day public comment period, 45 communications were received in the form of letters, postcards, facsimiles, and e-mails (collectively referred to as letters). Letters were received from a variety of interests.

All of the letters received during the public comment period were read in their entirety by members of the SEIS Interdisciplinary Team, and substantive comments were compiled into "comment statements." Comment statements are summary statements that identify and describe specific issues or concerns identified in the letters. Unique concerns generated unique comment statements; similar concerns voiced in multiple letters were grouped into one comment statement. Letters or comments were not considered "votes". All letters are treated equally and are not given weight by number, organizational affiliation, or other status of the respondents. The comment statements were reviewed and the Agencies used information provided in the letters in the preparation of the Final SEIS.

Four letters were received in the 45 days following the close of the comment period. These letters were reviewed and any substantive information they contained was also considered in the preparation of the Final SEIS.

Several areas of controversy were raised in comment letters. These areas of controversy with a brief explanation of how they were addressed in the Final SEIS are listed below. This is not a complete summary of all public comments received.

Organization

This appendix contains the comment statements and responses. After analyzing the comment statements as described above, the Interagency SEIS Team grouped the related topics to avoid duplication and, then, responded to the comments. The Team received numerous form letters, or slightly revised versions thereof: Comment letter numbers of form letters are not included as part of the Comments responded to in the section that follows. Table A10-1 shows these letters and refers the reader to the "master" letter number where their comments can be found. The comments and responses are intended to be explanatory in nature; if there are any inadvertent contradictions between Appendix 10 and the text of the Final SEIS, the Final SEIS prevails.

Letters received during the comment period from Federal agencies, state and local governments, American Indian tribes, and elected officials are reproduced and included in Appendix 11.

Table A10-1.—*Draft POC-SEIS public comment period respondents*

Letter #	Name	Location	Letter type/ #pages [1]	Comments were the same as letter number [2]
1	Hill, Dan E.	Port Orford, OR	L/1	
2	Nielsen, James E.	Coquille, OR	E/5	
3	Lufkin, Paul	San Francisco, CA	E/1	4
4	Kohler, John F.	Daly City, CA	E/1	
5	Kellogg, Larry	lkellogg@mcn.org	E/1	4
6	Durham, Dane J.	Missoula, MT	E/1	4
7	LaVerne, Tim	Magalia, CA	E/1	4
8	Vogel, Kristin; Volckmar, Kurt	Garberville, CA	E/1	4
9	Lewis, Tryphena	Arcata, CA	E/1	4
10	MacDougall, Caroline	Santa Barbara, CA	E-1	4
11	Fischer, Doug	fischer@geog.ucsb.e	E/1	4
12	Cardella, Sylvia	Hydesville, CA	E/1	4
13	Steitz, Martin	Forest Lake, MN	L/1	4
14	Anderson, Candy	Sacramento, CA	L/1	4
15	Ingalls, Libby	San Francisco, CA	L/1	4
16	Mattson, Kim	Mount Shasta, CA	E/1	4
17	Christopher, Stephanie	Kentfield, CA	E/1	4
18	Jim Maurer	Milwaukee, WS	L/1	4
19	Mildrexler, David	Missoula, MT	L/1	
20	Shelton, Lisa	Arcata, CA	L/1	4
21	Jimerson, Thomas	Eureka, CA	E/6	
22	Matteson, Peter	San Francisco, CA	E/1	4
23	Zoah-Henderson, Zakkary	Eureka, CA	L/1	4
24	Ragon, Robert E.	Douglas Timber Operators, Inc., Roseburg, OR	L/1	
25	Zobel, Donald B.	zobeld@science.oregonstate.edu	E/6	
26	Wickham, Steve H.	Plum Creek Timber Co., Coos Bay, OR	E/1	
27	Campbell, Bruce	Los Angeles, CA	E/3	
28	Partin, Thomas L.	American Forest Resource Council, Portland, OR	L/2	
29	Kern, Hugh	Chico, CA	E/3	
30	Lipscomb-Kern, Leigh Ann	Chico, CA	E/3	29
31	Hansen, Everett	Oregon State University, hansene@bcc.orst.edu	E/5	
32	Cooper, Lori	Siskiyou Project, Applegate, OR	E/26	
33	Jules, Erik; Kauffman, Matt	Humboldt State University, Arcata, CA	E/6	
34	Heiken, Doug	Oregon Natural Resources Council, Eugene, OR	E/9	
35	Pappalardo, Sue	Arcata, CA	E/1	4
36	Wroncy, Jan	Eugene, OR	E/2	
37	McKay, Tim	Northcoast Environmental Center, Arcata, CA	E/2	
38	Eatherington, Francis	Umpqua Watersheds, Roseburg, OR	E/4	
39	Vileisis, Ann	Kalmiopsis Audubon Society, Port Orford, OR	E/2	
40	Amaroli, Thomas	tomamaroli@yahoo.com	E/1	
41	Kennel, Ted	Millbrai, CA	E/1	
42	Baker, Kimberly	Klamath Forest Alliance, Orleans, CA	L/1	
43	EPIC	Environmental Protection Information Center, El Cerrito, CA	L/27	32
44	Sjogren, Karen J.	Salem, OR	L/21	
45	Tuss, Craig	USFWS, Roseburg, OR	E/3	
46	Tyler, Joan	Talent, OR	E/1	
47	Board of Commissioners	Douglas County, Roseburg, OR	L/2	
48	Connor, Tom	USEPA, Region 10, Seattle, WA	E/2	

[1] L = conventional letter; E = e-mail.
[2] Letters 3, 5-18, 20, 22, 23, 30, 35, and 43 were the same as the letter number appearing in this column. The reader should therefore see the comments of the letter shown in this column for the Team's response.

Public Comments and Agency Responses

Codes in brackets at the end of the Comment paragraph are letter number and (after the -) comment number in that particular letter. An attempt was made to link specific comments with individual letters; however, the process of combining and editing comments may have resulted in (1) comments being phrased differently than originally presented, and (2) portions of comments being answered elsewhere in this section without a linkage assigned.

Summary

Summary

Comment: *The summary of effects table states that there are no adverse effects on ESA-listed species. This is inconsistent with the "may affect" determination in the Biological Evaluation, Appendix 7. [44-2]*

Response: The wildlife effects section in Chapter 3&4 and the effects summary table have been corrected to reflect the "may effect" determination.

Chapter 1

Background

Comment: *The Background says the disease is unlikely to kill all trees. Since the disease is almost always fatal, this statement could be misleading. It would be more accurate to say the disease will not affect the range or ecological amplitude. [2-5]*

Response: It is unlikely the disease will eliminate POC from large areas. The text has been edited to clarify this point.

Comment: *POC is an important ecological component in many watersheds where its ability to survive on poor soils often results in this species being the only large structural component on the landscape. [4-5, 37-4]*

Response: This is an important point and contributes significantly to the ecological value of POC. This value is mentioned early in the Background section of the SEIS, and discussed in some detail in the Ecology and in the Water and Fisheries sections in Chapter 3&4.

Comment: *The SEIS does not disclose that failure to prevent the spread of PL will violate the Northwest Forest Plan Aquatic Conservation Strategy and its 9 ACS objectives. The difference between Alternatives 2 and 3 (and an even more conservative alternative) is the difference between maintaining aquatic habitat (Alt. 3 or better) or degrading, retarding or preventing attainment in violation of the ACS (Alt. 2). Loss of POC will cause loss of shade and bank stability, and, over the long term, loss of large wood recruitment, which will cause aquatic degradation. [34-19, 32-68, 43-80, 32-3]*

Response: Discussion of the importance of POC to stream function begins in the Background section with ". . . it often grows within the active stream channel, where, as large, old

trees, it provides shade and long-lasting stream structure . . . " and ". . . important for contributing shade and coarse wood in certain stream systems." This function is incorporated into the Issues identified in Chapter 1 as ". . . how are the aquatic and terrestrial ecosystems affected by the loss of POC." Specific details about these roles and how the loss of POC might affect streams are included in the Water and Fisheries section in Chapter 3&4. A discussion of the consistency with Aquatic Conservation Strategy has been added to the Water and Fisheries section in Chapter 3&4.

Comment: *The NWFP requires management of POC ecosystems. LSR direction requires protection and enhancement of late-successional and old-growth forest ecosystems and protect them from loss from disease epidemics and major human impacts (NWFP pg. B-1). [32-3]*

Response: The Need for the maintenance of POC as an ecologically significant species includes maintaining the role POC plays in the functionality of late-successional ecosystems. Several of the alternatives, including the proposed action, would provide even greater protection of these environments when compared to current management practices.

Comment: *The draft SEIS states that in the Kern case, the 9th Circuit said that the Agencies were "vigorously" exercising management direction to limit the spread of the disease. A thorough reading of Kern does not support such a statement. Nowhere in Kern does the Court express any opinion about the adequacy of the BLM's implementation of management direction to limit the spread of PL. [32-17]*

Response: The SEIS wording mistakenly gave this impression and has been rewritten.

Comment: *The SEIS explains how timber hauling and other public uses on commingled private and public lands make many techniques to reduce disease spread ineffective or not cost effective. This should be dealt with by having the Oregon Department of Forestry as a cooperating agency. One outcome of having the ODF participate would be formal recommendations to amend the Oregon Forest Practices Act. Amendments to the Oregon Forest Practices Act could greatly reduce the risk of spread on private lands, especially those located upslope or upstream of Federal lands. Such cooperation is directed by the NWFP, and is part of the court's mandate to consider ". . . cumulative effects to the health of POC over its entire range in light of the reasonably foreseeable actions of the Agencies and others." The inclusion of state agencies as cooperators would broaden the Purpose to include maintaining POC on all lands; a strategy that includes only public lands is not scientifically credible or adequate because the disease is readily transported across property lines via vehicles or stream flows. [32-63]*

Response: Under Council on Environmental Quality regulations, a state agency may by agreement with the lead agency become a cooperating agency (40 CFR 1508.5). Thus, it is not simply the choice of the lead agency, as it is under 40 CFR 1501.6 where there is a Federal agency ". . . which has jurisdiction by law." The Agencies do not have the jurisdiction to require the state governments to cooperate in any effort that may be undertaken by Federal agencies to reduce the rate of the spread of this disease.

State forestry personnel were included in scoping and early SEIS design. It was clear that the state and private approach to PL is likely to remain substantially different from that on

Federal lands. The state Agencies typically do not try to impose their management approach on private lands.

Preparing a scientifically valid cumulative impact analysis, however, does not depend on having the states as cooperating agencies. The analysis has considered the reasonably foreseeable actions on state and private lands. While efforts to slow the spread of the root disease would no doubt be more effective if all timber landowners participated, previous efforts and responses to the SEIS indicate that is not likely to happen at any significant scale. The effects predicted in the SEIS are based on the assumption that other landowners will continue their current management practices to control the disease. To the extent they do, the impacts would likely be less than what are predicted. The analysis shows that the Federal agencies can influence the rate of infestation regardless of what other owners choose to do.

Comment: *This document presents a very limited historical perspective on the effort to combat root disease. There is no mention of the important contributions that various individuals and environmental groups made to the Forest Service and later to the BLM programs. There is no mention that Lew Roth started the whole process of disease management including the resistance program, working first with Coos County Forest and then with the Powers District, Forest Service. There is no mention of a researcher named Trione who did some early work. There is no acknowledgement of the importance of environmental organizations in pushing the Forest Service to organized action in 1987 and 1988 and again in 1995. And there is nothing included in the History section about the 1985 letter to the Agencies from the Eugene Law Clinic and the formation of the Consensus Group in 1986. These were important events in the development of a POC management strategy. The Consensus Group developed a prototype PL control strategy for a timber sale. These omissions are more than just historical carelessness. They reinforce a "go it alone" image that is counter to the need for public involvement and cooperation if the POC program is to succeed. [31-3, 2-7, 2-8]*

Response: The objective of the Background section in Chapter 1 is to sufficiently set the stage to define the Purpose and Need sections and not to provide extensive historical detail. In the SEIS, the Background section in Chapter 2 was also intentionally limited, in this case to provide enough background about the origin of the current direction to provide context and possible sideboards for the alternatives. However, in response to these comments and in the interest of better presenting the historical setting, additional discussion has been added to Chapter 2 about the history of Federal POC management.

The Need/The Purpose

Comment: *The described "need" is to maintain POC as an "ecologically and economically significant" species on BLM and FS lands. These terms are undefined, and there is no explanation of how they will be met by the alternatives. [21-17]*

Response: The various discussions of affected environment in the SEIS, in total, are intended to describe the ecological and economic role POC plays in the southwest Oregon (and to some degree, the northwest California) landscape, and how POC's contribution to that role would be expected to change under each alternative. It will be up to the decision-makers to evaluate the significance of that role, and select an alternative that appropriately maintains POC.

Comment: *The Purpose and Need should be for POC to fulfill all of its functional roles in ecosystems throughout its historic range, both now and in the future. [32-2, 43-73]*

Response: That is essentially what the Need statement describes.

Comment: *Under the Need, the Agencies also have an opportunity to mitigate PL losses by planting POC on sites not currently occupied by POC. [2-6]*

Response: This opportunity has been added to the Need statement.

Comment: *The goal of management and/or the purpose and need for the SEIS must be to prevent, not just reduce, the spread of PL and its introduction into uninfested areas. Prevention of spread and introduction is the appropriate goal in congressional designations including but not limited to Wilderness, National Recreation Areas and Wild & Scenic Rivers and land allocations such as Late-Successional Reserves, Riparian Reserves, Botanical Areas and Research Natural Areas. [32-76(S), 25-14, 40-2, 39-1, 38-15(S), 34-15, 32-78(S), 43-80(S)]*

Response: The Agencies would very much like to "prevent" PL from entering many of the areas described, but there are semantic, access, and cost-effectiveness issues with using the word "prevent." To many readers "prevent" means the Agencies will do whatever it takes to block new infestations. Unfortunately, every entry into the forest creates some risk of spreading PL. Without closing the forest, managing PL becomes an issue of risk management. Instead of agreeing to "prevent" infections up front, the SEIS looks at alternatives to variously reduce long-term spread, and weighs the costs of those alternatives against the ecological and other benefits of each.

Comment: *The statement that the root disease seems destined to spread over the entire range sets up a minimalist proposed action reflected in the proposed action and other alternatives. [32-1]*

Response: The statement is made in the recognition that PL is transported by animals, hikers, and other vectors unlikely to be controlled by the Agencies. However, discussions of the ecological value of the large POC remaining, mostly on public lands, have been strengthened. The proposed action has been expanded to place more emphasis on uninfested watersheds, and an additional alternative has been added that provides more protection for uninfested 7th field watersheds. The Agencies have no preconceived position of a "minimalist" approach, but are using the SEIS process to take a hard look at the risks, the ecological values at stake, and the relative costs for each of the alternatives.

Comment: *The Need should not be just to "maintain" Port Orford cedar as a species in the ecosystem but to maintain Port Orford cedar's genetic diversity and ecosystem function throughout its native range. A Port Orford cedar seedling, albeit important, cannot perform the same function or ecosystem services as a 200-year old cedar growing on a floodplain or streambank. [32-76(S)]*

Response: Maintenance of genetic diversity and ecosystem function are part of the Need to maintain POC as an ecologically significant species. The effects sections describe the values that would be lost if larger trees are killed by PL.

Comment: *The draft SEIS states that the Need for this proposed action was not created by any previous management action. While it is true that the Agencies did not create PL itself and were not responsible for its initial introduction, the draft SEIS should have disclosed the Agencies' complicity in the spread of the disease. Agencies' management activities plus a resistance to closing roads and strictly enforcing off-highway vehicle activity and special forest product gathering (particularly POC boughs), despite countless letters and conversations from conservation organizations and concerned scientists, has lead to what the draft SEIS refers to as the "inevitable" spread of PL and a downplaying of the seriousness of the current situation. [32-15]*

Response: This discussion has been edited to acknowledge the contribution of management activities and past Agency policies to the current status of the disease.

Comment: *Under the Purpose section, the draft SEIS argues that the current management protocols have not been found illegal by the courts, and therefore ". . . meeting the Need does not necessarily require a change in the current management direction. Arguably, all that is missing from the current direction is a determination of the range-wide environmental effects of that direction." The draft SEIS could have just as easily said that perhaps the current management protocols are inadequate and this draft SEIS will evaluate the need to strengthen protections for POC. But instead, the draft SEIS chose to bias the selection process to the current protocol. [38-11]*

Response: The cited paragraph notes that the SEIS analyzes a range of alternatives that would meet the Need, that the No-Action Alternative is expected to meet the Need, and that other alternatives provide either higher, lower, or different kinds of protection and mitigation measures than the No-Action Alternative. The point is that a range of alternatives including the No-Action Alternative are examined in the SEIS, and the deciding officials will weigh each alternative against the Purpose and Issues to make their selection. No bias toward any particular alternative is stated or assumed. On the contrary, to have assumed the current management was inadequate would have biased the selection process away from an alternative that may, pending evaluation of the analysis by the decision-makers, meet the Need.

Comment: *The Purpose section should include maintenance of POC as an important element of biodiversity, as called for in the National Forest Management Act. [21-2, 43-80(S)]*

Response: The Need for maintenance of POC as an ecologically significant species includes having it contribute to its role in biodiversity. The Purpose section has been edited to note that the selected alternative must meet legal requirements.

Comment: *The Purpose section of the SEIS should be expanded to answer the following questions:*

1) What is the extent of POC on Federal lands and how much is infected?
2) Which plant communities are represented and what is their extent?
3) What is the allocation of POC by land management classification (congressional withdrawal, administrative withdrawal, late seral reserve)?
4) What is the risk of POC root disease being introduced into these plant communities?

5) Are administrative units of the BLM and FS operating under the same management direction?
6) Are the management directions being followed on each unit?
7) How effective is the management direction?
8) Is the lack of accurate maps of POC in Oregon affecting the ability to manage POC and the root disease? [21-8]

Response: The purpose of the SEIS is not to provide various POC data, but to identify and evaluate alternatives that will maintain POC as an ecologically and economically significant species on BLM and NF lands. To the degree answers to the above questions are needed for the analysis, they are included in the analysis, or the implications of not having the information are discussed. To some degree, answers to each of the above questions are included in the analysis. For example (but not limited to):

1) GIS and CVS inventories of POC and PL are discussed in the Port-Orford-cedar Acreage Data section in Chapter 3&4 and carried into the disease projections table in the Pathology section. Map 3 shows Agency GIS mapping of all POC and PL infestations. The mapping techniques and potential accuracy issues are discussed in the Acreage Data section and noted in the Incomplete and Unavailable Information section.

2) Plant community information is summarized in the Ecology section and used in the Water and Fisheries and other sections to help quantify potential effects. Specific PL risk is not evaluated by plant association because the average PL spread predictions apply equally within the accuracy of this programmatic analysis.

3) POC by NWFP land allocation is shown in the NWFP discussion early in Chapter 3&4.

4) The predicted 100-year spread rate for the various alternatives translates to a general risk prediction. In Alternatives 2, 3, and 6, for example, the Agencies have an opportunity to create risk above or below that average depending upon the significance of the POC in the particular case. A plant community-specific evaluation of risk is not necessary within the SEIS to design an effective PL-reducing strategy.

5) The descriptions in Chapter 1 and Appendix 3 makes it clear that the units, other than the three BLM districts, are not operating under the same strategy. Appendix 2 makes it equally clear the Agencies have been operating similarly, and coordinating and sharing resources and knowledge. More consistent direction across units is one reason the Siskiyou NF joined the BLM in this SEIS effort.

6) Annual implementation monitoring on each unit indicates a high compliance with land and resource management plan Standards and Guidelines.

7) The effectiveness of the various elements of management direction are described in the Pathology section, are the subject of continued monitoring as described in Appendix 5, and are discussed in the Incomplete and Unavailable Information section of Chapter 3&4.

8) This is a subjective question. The Agencies are continually remapping POC and PL to

improve management. For example, BLM and FS are ground-truthing POC mapping of the Biscuit Fire within 100 yards of roads, and have an active contract to remap the 75 percent of the Biscuit Fire with post-fire aerial photos. The current information is adequate for the design and evaluation of the programmatic alternatives in the SEIS. This point is discussed in Alternatives Eliminated from Detailed Study, and under Incomplete and Unavailable Information.

Comment: *Retention of large, old POC, as well as those on serpentine soil where they are critical to providing canopy, should be part of the Need section. [44-4]*

Response: The importance of the ecological role POC plays on serpentine (ultramafic) soils is part of the ecological significance intended by the Need section, and is well described in several Affected Environment sections of the SEIS.

Comment: *Despite the draft SEIS' expansion of the Need to include ". . . providing access to POC products . . . avoiding unnecessary restrictions to public access and use . . . " and ". . . providing for continued extraction of a wide range of products . . . " it is appropriate for this Agency action to fulfill these secondary "purposes" only as side-effects to fulfilling the "primary underlying need" to which the POC draft SEIS responds, which is maintenance of POC as an ecologically and economically significant species on Federal lands. The Forest Service and BLM cannot avoid this "underlying need," because the NWFP, the National Forest Management Act, the Federal Land Policy and Management Act, and the Forest Service Organic Act also mandate that the Agencies protect Port Orford cedar. The multiple-use mandates should not be presented as absolutes, as taking precedence over the need to maintain POC as an ecological and economically significant species on BLM and FS lands. These mandates need to be treated with the flexibility intended them, if the need to maintain POC is to be met. The open-ended inquiry required by NEPA should not be constrained by the need to continue POC harvest or for that matter widespread timber harvest. Alternatives should be modified to meet this need, and alternatives eliminated from detailed analysis for these reasons should be analyzed. [21-9, 32-10, 34-2, 34-1, 32-38, 32-39, 32-1]*

Response: The Purpose section has been edited to show more flexibility in balancing other multiple-use goals with the Need for maintenance of POC. Alternatives considered but eliminated from detailed study have been reconsidered, and elements of those alternatives brought into existing alternatives as appropriate. The record of decision will examine compliance with appropriate laws as it weighs the balance between meeting species conservation needs and other applicable laws and objectives.

Comment: *With respect to the Purpose, restricting public access is not necessarily a "cost" since this helps prevent forest fires caused by arson or carelessness, and reduces vandalism, trash and the cost of administering public lands. [44-5]*

Response: Restricting access has these and other benefits, but also reduces opportunities for certain kinds of forest uses, including recreational and extractive. It can also make wildland fire operations more difficult. The relative values of roads and other means of access are considered during road management planning, and are outside the scope of this analysis.

Comment: *The "issue" list should include mineral entry as an activity considered for restriction, especially since the text discusses it. [44-6]*

Response: The list of management practices that may spread the disease has been expanded to include livestock grazing and mining. However, even management activities not on the list my be affected by the Standards and Guidelines of the selected alternative.

Comment: *"Maintenance" and "Restoration" are not defined. If mature POC are to be maintained and the ecosystem is to be restored to include mature POC, then it is not clear that any alternatives will meet this need without termination of logging and other management operations wherever POC are present. [29-6]*

Response: *Maintenance* and *restoration* have been added to the Glossary. However, the determination of whether POC has been sufficiently "maintained" or whether POC functionality can be "restored" are determinations to be made in the record of decision based on the analysis in the final SEIS. POC will have been maintained if its ecological role is sufficiently maintained. Although the SEIS Team attempted only to include alternatives it thought would meet this need, it will be the decision-makers' evaluation of the SEIS analysis that will determine if the selected alternative meets that test.

A planting assumption has been added to the Assumptions section in Chapter 3&4 to explain expectations for planting levels, priorities, and expected growth rates, to provide a basis for restoration expectations within resource sections in Chapter 3&4.

Comment: *Regulations promulgated pursuant to NFMA also mandate that the Forest Service provide for protection of POC:*

- *36 CFR 219.26 requires the Forest Service to ". . . provide for diversity of . . . tree species consistent with the overall multiple use objectives of the planning area."*
- *36 CFR 219.27(c)(7) prohibits silvicultural treatments " . . . where such treatments would make stands susceptible to pest-caused damage levels inconsistent with management objectives."*
- *36 CFR 219.27(g) states that management prescriptions ". . . shall preserve and enhance the diversity of plant and animal communities . . . so that it is at least as great as that which would be expected in a natural forest and the diversity of tree species similar to that existing in the planning area."*

The draft SEIS should have disclosed the Forest Service's obligations to protect diversity pursuant to NFMA and its implementing regulations. The proposed action does not satisfy these obligations. [32-6]

Response: The stated Need for maintenance of POC as an ecologically and economically significant species on BLM and NF lands encompasses these requirements. A need for the decision to meet all applicable laws is understood. A complete listing of such laws would be too voluminous to include in the Need statement. The record of decision will make a finding of consistency with applicable laws.

Comment: *Alternative 3 will clearly cause PL to spread less than other alternatives, and will still allow the Agencies to fulfill their other management objectives. Therefore by not selecting Alternative 3, the Agencies will be taking an action that violates FLPMA and NFMA:*

> *In managing the public lands the Secretary shall, by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands . . . [FLPMA]*
>
> *. . . destructive insects and disease organisms do not increase to potentially damaging levels following management activities. [NFMA]*

[29-3]

Response: The selected alternative must meet all legal requirements. The analysis helps establish "necessary" and "damaging levels." The decision-makers will address how the selected alternative meets these requirements.

Issues

Comment: *Continued harvest of POC to feed Japan's demand for culturally significant products should have been included as an Issue. This is certainly a greater demand than tribal uses and affects the economic viability of POC, biasing the SEIS toward continued commodity production. Meeting this "need" could influence the continuation of the otherwise useless "roadside sanitation" mitigation that provides a source of POC to overseas markets. [38-12]*

Response: The economic and product benefits derived from POC harvesting are factors to be considered in a management strategy. In recent years, however, Japanese demand for POC has dramatically decreased. Production of products is not a decision factor in whether or not to do sanitation treatments, but the ability to sell resultant products can affect Agency costs for the treatment, which is a consideration in evaluating various mitigation treatment options.

Comment: *The main problem with the spread of PL is roads. Jules found that vehicles along roads caused 72 percent of POC infections. He found POC populations in creeks crossed by roads were more likely to be infected. [38-17]*

Response: The connection between PL spread and roads as documented by Jules and others is acknowledged in the Pathology section and elsewhere.

Comment: *The Agencies current management of POC does not reflect the current knowledge about POC and PL. Of particular concern is the loss of older POC which are irreplaceable, the impacts of their loss on the important and often unique ecosystems they inhabit, and the effect on associated species. Other concerns include the loss of biodiversity within the native range of POC, the impacts to associated species such as native, naturally reproducing salmon and steelhead or rare plants, the loss of the ecosystem functions/benefits preformed by POC as they are lost or their ecological role diminished in sensitive habitats, and the diminished aesthetics from the loss of beautiful old cedar. [32-73]*

Response: All of these concerns are addressed in relevant sections of the SEIS.

Comment: *The scoping notice identified an issue as ". . . should forest uses be restricted to prevent the spread of the disease." The issue as written is too broad-brushed and a red herring that will only serve to stir up public opposition to POC disease control measures. [32-79]*

Response: Numerous commenters expressed substantial doubt over the effectiveness of sanitation, gates, and other mitigation measures, and insisted closing roads was the most important treatment. The Pathology section gives high marks to road closing as a way to control PL spread. Some of the alternatives include requirements to close non-system discretionary roads in POC stands. Similarly, some specific forest uses were identified in the SEIS and by the public as significant PL spread vectors. PL bough collection and certain off-highway vehicle use are a couple of examples. Restricting some current forest uses is being considered, and is clearly an issue. The balance between those restrictions and the predicted benefits of such restrictions (among other things), in terms of reduction in PL spread rates and resultant maintenance of ecological and other values, is at the heart of the decision of which alternative to select.

Scoping

There were no substantive comments.

Chapter 2

Background, The Supplemental Environmental Impact Statement, Endangered Species Consultation, The Planning Area, and Relationship of Alternatives to Existing Management Plans

Comment: *The draft SEIS states ". . . none of the EIS alternatives would result in a significant change to the Siskiyou forest plan." For POC to be managed as an ecologically and economically significant species as identified in the Need, all Federal management units will require significant changes to the management of their lands. Timber harvest, special forest products, off-highway vehicle use, access, and recreation activities to name a few, will need significant modifications to meet the POC Need and carry out the legal mandates of the FS and BLM. [21-21]*

Response: As noted in the SEIS, *significance* in the NFMA planning regulations sense is different from NEPA significance. The NFMA question of significance is designed to determine if the proposed change is so great as to require a complete restart of the Forest land and resource management plan. The SEIS concludes this is not the case. The SEIS does not deny the issues considered and the changes proposed could be significant in a NEPA sense; that is one reason an EIS has been prepared.

Comment: *Root disease is not the only pressure on POC populations. Historically, it seems clear that timber harvest and regeneration practices have caused an overall reduction in POC, especially mature POC. The SEIS seems to rely heavily on the large proportion of Federal POC that grows in areas with more or less protection from harvest resulting from the NWFP. [31-6]*

Response: The historical loss of old-growth POC across the landscape has been added to the discussion in the Port-Orford-Cedar Background section in Chapter 3&4. Many sections of the SEIS reflect a higher level of protection of POC on Federal lands where timber harvesting is not the primary land use objective.

The Alternatives

Comment: *None of the alternatives meet the Purpose and Need sections because the planning area does not include California. If this is allowed to remain, forest management in Oregon could have detrimental effects throughout POC groves within Six Rivers, Shasta-Trinity, and Klamath National Forest watersheds in California. [32-12, 4-1, 37-1, 20-8, 34-24, 21-15, 43-74(S), 11-8]*

Response: The action area is limited to the Federal lands in Oregon because those were the units whose land and resource management plan direction was the oldest, most incomplete, and/or whose direction the court found inadequate. The land and resource management plans for the California NFs are more recent, about 1995, and contain substantially more POC management direction.

The court did not suggest that California needed to be part of the proposed action, only that cumulative effects of the alternatives be analyzed at the appropriate scale. In this case, the action alternatives would only affect the Oregon administrative units, and to the degree that the effects of those alternatives may affect California, those effects have been displayed. For the purpose of the analysis, the existing land and resource management plan direction for the California administrative units was assumed to apply regardless of which alternative is selected for Oregon.

Comment: *One or more alternatives should include land exchanges as a tool for protecting existing POC. Land exchanges could consolidate Federal ownership, making road closures and other access control measures more effective. [25-12]*

Response: The new Alternative 6, similar to Alternative 3, but based on 7th rather than 6th field watersheds, includes a requirement to consider land exchanges to block-up these uninfested watersheds and obtain control of access routes, especially on serpentine-affected soils.

Comment: *The SEIS should consider a rule-making process to establish reserved areas to preserve POC, its habitat, and the genetic diversity of the species. [32-82(S)]*

Response: Whatever management direction is selected can be applied without rule-making.

Comment: *The Agencies should put more emphasis on preventing the spread of the disease to healthy trees. Even if the resistance breeding works, it won't adequately replace the ecological function for many years if ever. [38-2]*

Response: The tone or balance of the SEIS has been changed to better recognize the importance of existing POC, and more descriptively define the timing, limitations, and risks associated with the resistance breeding program.

Comment: *The accelerated breeding program described in Alternative 4 should be added to Alternative 2 or 3 to produce seed for all breeding zones within 10 years, and because of its potential importance in providing seed to private timberland owners. [44-19, 2-26]*

Response: The SEIS has been edited to further illustrate the effects and implications of the accelerated breeding program. A planting assumption has been added that describes the assumed planting and growth rates; those assumptions have been better referenced in the resource effects section, and the cost section has been edited to show the benefits of accelerating in terms of reducing costs in future decades. While these discussions are part of Alternative 4, they are identifiable enough that the decision-makers can assess the benefits of adding this feature to any other alternative at the time of the record of decision.

Comment: *The draft SEIS does not adequately protect POC across the planning area. There should be new alternatives that provide much more conservative protocols for assessing projects that may put POC at risk, and more effective and comprehensive mitigation efforts for when projects do go forward beyond the planning stage. The assessment protocols must be clearly defined and must set an upper level of risk that beyond which a project would not go forward. Mitigation strategies should focus on those that are proven to work, rather than on unproven techniques. The strategies that are clearly best include permanent and seasonal road closures, as well as stronger protection of currently roadless areas. [33-21]*

Response: A new alternative has been added to the SEIS that adds the features of Alternative 3 to 162 uninfested 7th field watersheds. In Alternative 2, these same watersheds have been linked to the risk key to provide equal protection as other areas essential to meeting land and resource management plan objectives. The options of not going forward with the project, and not building roads, have been added to and below the risk key, respectively. The value of road closures over other mitigation measures is recognized and described in the Pathology section. The complete set of all known possible PL control and mitigation measures is included in Alternatives 2, 3, and 6 either above or below the risk key. The relative value of each of these measures is described, referenced, or alluded to in the Pathology section; project designers can access that information when deciding what measures to select to satisfy the risk key. The need to apply ". . . one to several . . . " of the Management Practices, and ". . . the one or combination of specific practices best fitting the nature of the risk and the site-specific conditions . . . " is clarified below the risk key. One or more of the alternatives in the SEIS appear to fully meet the Need statement and applicable laws; the SEIS provides a rigorous examination of all reasonable alternatives appropriate to the programmatic scale.

Comment: *No alternative meets the NWFP's Aquatic Conservation Strategy (ACS) Objectives 1, 4, 5, 6, 8, and 9 because they do not protect Riparian Reserves from the degrading effects of PL. Specifically the Restoration requirement in Alternative 2 is inadequate because it does not provide a timetable or prioritization scheme for restoration of areas already affected; no alternative adequately implements NWFP RF-3c (page C-32 of NWFP ROD S & Gs), which calls for the closing or obliteration of roads based on the ongoing and potential effect to Aquatic Conservation Strategy objectives and considering short-term and long-term transportation needs; and, no alternative addresses the need to restrict or regulate mining access in riparian reserves which contain POC. Specifically, Standard and Guideline MM-1 is not being implemented by the Siskiyou National Forest. Miners are accessing riparian reserves with motorized vehicles and equipment without restrictions designed to reduce introduction of PL. [32-68]*

Response: Not unlike watershed analysis, the SEIS analysis examined the potential effects of the loss of POC under the various alternatives in the context of current watershed and fisheries conditions, and described those effects so decision-makers can determine if either

the Aquatic Conservation Strategy would be met or the analysis and selected alternative provides the opportunity and information to make that determination at the project scale. Each alternative except Alternative 4 provides PL control or mitigation measures that will, among other objectives, help meet the Aquatic Conservation Strategy.

Generally, restoration needs would be determined at the site-specific scale. The newly added planting assumption describes assumed reforestation and stand-tending levels, and assumed growth rates of planted stock. It is anticipated that highest priority for placement of this stock are those areas impacted most by POC mortality, particularly those areas harboring listed species. The value of road closing is well described and would be implemented as needed to meet site-specific needs. Mining activities are generally permitted or trends are known, and application of the risk key can help identify appropriate Management Practices to apply. In any event, the suggestion to focus education and outreach efforts for ". . . user groups most likely to engage in activities at more risk for spreading PL . . . " is a requirement of Alternatives 2, 3, and 6 above the risk key.

Comment: *The draft SEIS does not disclose or address the impacts of mining and mining access roads in POC areas. The issue is not whether mining is allowed but how best to minimize surface damage from PL introduction. Suction dredge mining is widespread in the range of POC. Miners have constructed and/or use many 4 wheel drive or ORV roads. Some of these roads do not appear on transportation maps. In addition miners have been known to construct or reconstruct roads and trails through uninfested POC stands along creeks. The number and distribution of high-risk sites is underestimated because mapping does not include mining access roads. [32-67]*

Response: A mining effects section has been added to Chapters 3&4. The Pathology section also addresses the contribution of ongoing mining activities to the spread of PL, projected over 100 years. The SEIS notes that a mining road has been implicated in a long-distance spread to the interior of the Kalmiopsis Wilderness. The nature of mining and potential permitting and other conditions applicable to mining is discussed in the Alternatives Considered but Eliminated From Detailed Study section of Chapter 2. Agency actions related to mining are subject to assessment through the risk key described for Alternatives 2, 3, and 6. The concern with roads and the value of closing them, particularly in the high-risk areas where much mining takes place, is well discussed in the SEIS. The Community Outreach provision of Alternatives 2, 3, and 6 includes the suggestion to focus education and outreach efforts for ". . . user groups most likely to engage in activities at more risk for spreading PL."

Comment: *The draft SEIS does not provide for the implementation of NWFP Standard and Guideline GM-1 on a regional basis. Current livestock grazing is likely to increase the spread of PL. The draft SEIS provides no regional guidance to prevent the spread of PL from livestock grazing (e.g., review of existing Allotment Management Plans). [32-68]*

Response: As noted in the Pathology section, livestock (as well as elk) are implicated in PL spread. Reissuance of livestock grazing permits has been added as an example of an activity requiring application of the risk key under Alternatives 2, 3, and 6. A grazing effects section has been added to Chapter 3&4.

Comment: *It would be useful to have some more protective options in place so if the underlying assumptions about level of forest use or spread of the disease are discovered to be*

incorrect, managers can have the option of picking more protective measures or alternatives. [39-6]

Response: The monitoring plan for the Action Alternatives includes a requirement to regularly evaluate ongoing mapping and inventories to determine if disease spread departs significantly from the predictions made in this SEIS. If such a departure indicates the need for a different management strategy, alternative strategies would probably be examined under a new NEPA process as part of a regular land and resource management plan planning cycle. It would not be practical to identify the "fix," without seeing what is "incorrect." Displaying the environmental effects of such a fix would necessarily be based on wholly speculative projections, and therefore useless to a rational decision-maker.

Comment: *The range of alternatives is too narrow and fails to include a highly conservative alternative that would aggressively protect a larger fraction of the uninfected POC along streams and other wet areas, in ultramafic areas, in old-growth, where rare and sensitive species live, and so forth. [34-1]*

Response: Alternative 6 has been added, in part, to address this issue. Also, the risk key of Alternative 2 has been revised to highlight the importance of the 48,000 acres of POC in uninfested 7th field watersheds, changing the proposed action to be more conservative as well.

Alternative 1

Comment: *Since the court is requiring NEPA analysis for the original BLM resource management plan direction, it is incorrect to call continuation of that RMP direction the "no action" alternative. The draft SEIS does not have a "no action" alternative as required by CEQ regulations. [29-1]*

Response: The court did not vacate the 1995 Coos Bay resource management plan decision regarding POC direction, and it did not address the Roseburg, Medford, or Siskiyou plans at all. The existing direction is correctly identified as the No-Action Alternative. Even so, this identification has little material effect on the analysis in this SEIS. If this were the construction of a dam or similar project, the No-Action Alternative would serve as a baseline from which to measure and describe environmental effects. In the POC SEIS, only direct effects like jobs, special forest products, and timber harvest are described from the No-Action Alternative baseline. Indirect effects, those resulting from the various levels of POC mortality, are described from a baseline of current infestation level, with adverse effects variously described for all alternatives without regard for whether those effects are less than or more than what would be expected under the No-Action Alternative. For these effects, Alternative 5 might arguably be presented as the "no action" alternative, with all other alternatives variously reducing PL spread and related indirect environmental effects when compared to an Alternative 5 baseline.

Comment: *For baseline purposes, the draft SEIS proposed the No Action Alternative, Alternative 1, which is the current management approach. [48-1]*

Response: Although Alternative 1 is the No-Action Alternative, Chapter 1 notes that this appears to be a selectable alternative, and nothing in the court decision leading to the FSEIS

implies the current strategy is not adequate. It is not just included ". . . for baseline purposes."

Comment: *The current direction for the Forest Service is defined only by example, and reference to the Siskiyou Management Plan, which refers to the POC Action Plan, which has been formally declared to be ceasing to be operative. This seems to be extraordinarily weak documentation of existing POC policy. [31-12]*

Response: Other than the emphasis inferred from the citations in the land and resource managment plan, many of the current PL management practices being implemented on the Siskiyou NF are "routine business" or otherwise incorporated into various management practices, without a specific direction document specific to POC. However, additional emphasis on POC and control of PL was added to the management strategies for the Siskiyou NF with the release of "Interim Direction for Best Management Practices (BMPs) for Noxious Weed Prevention and Management, Port-Orford-cedar Root Diseases Prevention and Management, and Sudden Oak Death Prevention and Management" on February 15, 2002. The best management practices highlighted the need for environmental analysis of the potential effects of management actions on POC and PL. Direction focused on roads but also included review of all projects within the natural range of POC, and the use of Clorox bleach. This explanation has been added to the description of the current Siskiyou NF direction in Alternative 1, within Chapter 2.

Alternative 2

Comment: *The stated objective for Alternative 2 of "maintain[ing] POC on sites where the risk for infection is low" is too limited. The Agencies should aim to protect native POC on sites with low and moderate risk of infection. [25-7]*

Response: The objective statements for all of the alternatives have been revised to better describe the intent of the alternatives. For Alternative 2, additional wording includes reducing the spread "and severity" of root disease ". . . in high-risk areas to retain its ecological function to the extent practicable."

Comment: *Alternative 2 does not meet the Need for the maintenance of POC as an ecologically and economically significant species because it would actually lead to further loss of POC due to infection with PL. [32-10]*

Response: All alternatives, and any others that could be designed, would lead to further loss of POC due to infection with PL. It is up to the analysis to show whether, and which, alternatives meet the Need. Prevention of any further loss of POC to PL infection is not the Need, and it would serve no useful purpose to set such an impossible objective as the Purpose of the action.

Comment: *Alternative 2 would provide nominal prevention from infestation compared to the current management direction. The estimated area of infestation in 100 years is 35 percent of the acres where POC is prominent under Alternative 1, dropping only to 33 percent in Alternative 2. [48-2]*

Response: There were errors in the SEIS for some of the numbers in the Ecology section, and those tables have been reworked. The percentage differences between alternatives where POC is prominent are now proportionate, and similar, to the percentage differences for the 100-year PL spread predictions from which they are derived. With revisions because of changes to the preferred alternative, the predicted infestation percentage at 100 years is 21 percent for Alternative 1, 19 percent for Alternative 2, and 17 percent for Alternative 3.

Comment: *Alternative 2 does not provide additional protection for uninfested areas from PL. These areas can act as a refugia of diversity and abundance of an unimpaired POC ecosystem. [48-3]*

Response: Alternative 2, the preferred alternative, has been revised to include identification of, and emphasis on, the 162 currently uninfested 7th field watersheds.

Comment: *The strategy should develop options to curtail or modify mining activities, logging practices, livestock grazing, off-highway vehicles, other recreation, and wildland fire operations policies to prevent or limit spread of infestation. These policies should also be implemented with Standards and Guidelines that cannot be exempted at the discretion of the Forest Supervisor. For example, on the Biscuit Fire in 2002, Six Rivers National Forest, Port Orford cedar policies for preventing the spread of the root disease were suspended during fire suppression activities by the Forest Supervisor. [43-86(S)]*

Response: Alternatives 1, 2, 3, and 6 all contain provisions that would curtail or modify mining activities, logging practices, livestock grazing, off-highway vehicles, other recreation, and wildland fire operations as needed to prevent or limit spread of PL infection. For Alternatives 2, 3, and 6, these practices are implemented according to values and risks identified through the risk key.

For Alternatives 2, 3, and 6, the Standards and Guidelines place a high emphasis on PL control, particularly in all fire preparedness planning and also during suppression activities to the extent practicable. Extensive use of vehicle washing, Clorox bleach use, and using water from identified disease-free sources are examples described in the Fire and Fuels section of Chapter 3&4. However, these practices may be curtailed when safety and property protection issues arise. This potential is described in the alternatives and considered in the calculations of 100-year PL spread.

Comment: *The strategy should permanently close infested campgrounds such as the Fish Lake Campground located on the Orleans Ranger District, Six Rivers NF, to prevent infections from getting into adjacent high-risk uninfested areas with high biological value such as the Blue Creek Watershed. [43-85(S)]*

Response: The current direction, Alternative 1, has resulted in closing Fish Lake Campground in Region 5 for conducting eradication treatments; the campgroud will be closed until baiting indicates PL is gone from the soil. The risk key and related direction in Alternatives 2, 3, and 6 would lead to similar actions in Oregon when warranted by similar conditions.

Comment: *The proposed action should include requiring a control strategy be developed for each activity such as a timber sale, as has been done on the Siskiyou NF in the past. You should add a requirement for 5 to 15,000 acre (watershed scale) PL control plans that*

consider all resource activities. [2-12, 2-22, 2-25]

Response: Working within the direction provided in the selected alternative from this SEIS, the determination of appropriate management of POC root disease at the "activity" scale would be documented in NEPA documents or similar planning record for the activity. The result should achieve most or all of the potential benefits that would be achieved from a mid-level control strategy.

Comment: *The selected alternative should encourage voluntary agreements with private landowners to take measures which would reduce the spread of PL. Better cooperation and understanding would improve protection of private stands (which fill some of the same ecological needs) and Federal stands at the same time. [44-18, 2-26]*

Response: The Community Outreach provision applicable to Alternatives 2, 3, and 6 has been edited to include ". . . coordinate with state, local, industrial, and small woodland owners to help meet overall POC management objectives."

Comment: *Off-road vehicle users should be targeted in public education efforts, especially where road closures are called for. [44-9]*

Response: The Community Outreach provision applicable to Alternatives 2, 3, and 6 has been edited to suggest education and outreach efforts focus on ". . . user groups most likely to engage in activities at more risk for spreading PL."

Comment: *Probably under the "Integrated Management Approach", the SEIS should specify that the North Coast Risk Region where POC grows across the landscape would, in some ways, be managed differently from the other parts of the range where POC is more limited to moist sites or along streams. These are site specific decisions that depend on POC presence, PL presence and other concerns such as road stability and soil/terrain stability. [2-9]*

Response: The effectiveness of specific mitigations varies across the landscape and from location to location. To allow flexibility, the Management Practices below the risk key are intentionally not ranked, required, or overly specific. Local managers are best aware of these differences and are best able, armed with the discussions in this SEIS and other relevant publications and information, to decide how much each practice reduces risk in their areas. The Comparison of Alternatives section in Chapter 2 briefly discusses how the differences between the North Coast Risk Region and other parts of the range may affect implementation of the selected alternative.

Comment: *There is no stated reason for treating firefighting water with Clorox. [44-14]*

Response: The Wildfire Fire Operations provision applicable to Alternatives 2, 3, and 4 has been edited to show treatments are to kill water-borne PL spores. This process is explained in more detail in Appendix 4.

Comment: *It is unlikely that the heat from surface fire would penetrate soil enough to eradicate PL, especially in wetter soils where POC tend to grow. [25-11]*

Response: The reference to prescribed fire potentially killing PL in the soil has been removed in favor of a more generic ". . . additional tools for eradicating PL in the soil would be sought, developed, and implemented as evidence warrants." Study of whether prescribed fire heats the soil enough to be effective as an eradication treatment is included as an example of effectiveness and validation monitoring requirement in Appendix 5.

Comment: *PL eradication, and selling POC as part of the treatment, is inappropriate. [29-13]*

Response: Depending upon the ecological value of surrounding trees and the extent of infection, it is sometimes appropriate to remove POC in a buffer surrounding an infection. This is a common, albeit typically expensive, way to isolate forest and other diseases when the situation warrants. The decision to eradicate POC in such cases is not made to provide POC for sale, but to accomplish the treatment within available funding is a factor in whether the treatment would be carried out. Sale of the resultant POC products partially helps fund the treatment, and has the benefit of reducing theft by persons who would not respect the seasonal restrictions, equipment cleaning, and other management practices that would be employed to keep the PL isolated.

Comment: *Sanitation has not had the desired effect; the alternatives should concentrate on preventing vehicles from spreading the pathogen from infested areas to uninfested areas. [41-1]*

Response: As described in the Pathology section, sanitation appears to be effective at reducing disease starts along roads and other areas. The SEIS describes this treatment as not as effective as closing roads, but for reasons described in the SEIS, closing roads is not always an option or the best option. The effectiveness of any given PL control or mitigation practice is a consideration by the manager when determining what practice, or combination of practices, to apply in any given situation.

Comment: *The Regional Ecosystem Office (REO) has without public notice or review, NEPA process or scientific basis adopted guidelines for determining when POC sanitation logging can be done in Late-Successional and Riparian Reserves. If the Agencies are going to use the REO guidelines for sanitation logging they must be subject to NEPA review in this EIS process before they can be applied again. [32-83(S)]*

Response: The Regional Ecosystem Office examined a POC sanitation project proposal submitted by an administrative unit and found it to be consistent with the NWFP Standards and Guidelines for Late-Successional Reserves. Nothing in that review precluded the application of the NEPA process to that or future projects.

Comment: *The Water and Fisheries section identifies inadequate large woody debris levels as a problem for salmonids in southwest Oregon, yet the Agencies preference to sacrifice POC along high-risk riparian areas that support declining salmonids and amphibians would lead to loss of bank stability, loss of shade, and long-term loss of down woody debris. [34-16]*

Response: The snag retention Standard and Guideline applicable to Alternatives 2, 3, and 6 adds emphasis to requirements already in the NWFP. This Standard and Guideline provides

needed emphasis for leaving POC that are especially resistant to decay and because few replacement POC are likely to become available in the near future. This direction is identified as being particularly applicable on ultramafic soils where POC can be some of the largest and most abundant trees. Thus, there is a stated reluctance, not preference, to "sacrifice" POC along riparian areas.

Comment: *Although POC snag retention would be emphasized in riparian areas, it should be prohibited. Nawa (1997) reported that "...the management assumption that a removal surplus of dead and downed Port-Orford-cedar exists in riparian reserves is false. Dead and downed trees appear to have as much influence in maintaining ecosystem functions as standing live trees. No evidence was found for the desirability of an upper limit for managing downed woody debris in streams and adjacent valley surfaces. Thus, there appears to be no scientific conservation rationale for the removal of dead or downed Port-Orford-cedar trees from floodplain forests or Riparian Reserves." [32-69]*

Response: Removal of POC from riparian areas is only made after watershed analysis and recognition of the continuing value of dead and down trees, particularly durable species like POC. But while there may be little or no evidence for an upper limit except for fuels considerations, the NWFP specifically anticipated and included provisions for salvage once levels are so high that removal of "surplus" would essentially be neutral to the attainment of Aquatic Conservation Strategy objectives.

Comment: *The streamside snag standard and guide defers to the Aquatic Conservation Strategy (ACS) objectives in the NWFP Standards and Guidelines, and these objectives defer to Watershed Analysis to determine if existing large wood levels meet stream management objectives. This is inadequate because watershed analysis often fails to set standards about quantities. Further, compliance with the ACS is likely to become discretionary under revisions being considered the current Aquatic Conservation Strategy SEIS. [32-69]*

Response: The streamside snag Standard and Guideline does not mention the Aquatic Conservation Strategy objectives or the NWFP at all, but requires emphasis in the retention of POC snags in Riparian Reserves. However, the Aquatic Conservation Strategy in the NWFP, like any other underlying resource management plan/land and resource management plan Standard and Guideline, does apply to salvage of POC in Riparian Reserves. Whether the NWFP-required watershed analysis recommends specific large wood levels or addresses riparian health and objectives in other terms, the NWFP Standards and Guidelines permit salvage in Riparian Reserves ". . . when watershed analysis determines that present and future coarse woody debris needs are met and other Aquatic Conservation Strategy objectives are not adversely affected." Revisions being considered in the Aquatic Conservation Strategy SEIS would not change this provision.

Not all POC removal in Riparian Reserves is salvage, however. Eradication or other silvicultural treatments are appropriate in Riparian Reserves ". . . when needed to attain Aquatic Conservation Strategy objectives." Treatments to prevent the further spread of the disease usually would meet this requirement.

Comment: *The Agencies should make special rules for using equipment on Federal lands after it has been used in infested areas, especially in highly infested private lands in Coos County. [34-8]*

Response: Alternatives 2, 3, and 6 include a Disease Export provision above the key, specifically for this purpose.

Comment: *Alternative 2 contains so much vague language it is hard to tell what would be done. For example, the "integrate management approach" is encouraging, but nothing specific is promised. In general there are few "shalls" and more "shoulds". [31-13]*

Response: The Standards and Guidelines in Chapter 2 have been edited with the following words to make requirements clearer. *Must*, *shall*, *will*, and *would* denote requirements. *Should* and *ought* denote actions that are required unless a justifiable reason exists for not taking action. These words recognize extenuating circumstances are likely to occur at times. *May* and *can* specify when actions are optional. However, there are several paragraphs above the key (for example, Planning and Integrated Management) that do not necessarily apply binding language to specific management situations. These paragraphs can best be described as what the Agencies are doing now, and the likely level of compliance with them might best be determined by studying Appendix 2, Summary of Agency Actions for Fiscal Years 2001 and 2002. The effects described for these alternatives recognize the applicability of these provisions and give them appropriate credit.

Comment: *Forest-wide direction such as road maintenance seem to be subject to project-based analysis and the risk key. It is not clear this would lead to forest-wide actions to reduce risk from roads, such as doing roadside sanitation or recognizing when roads need to be closed. [31-13]*

Response: A paragraph above the risk key requires application of the key to not be limited to any one type of management activity. Agencies will recognize programs in a broader context, such activities will be reviewed to treat chronic problems that are not otherwise within a given project area. This level of review is not intended to require that every ongoing forest activity be immediately subject to a detailed POC risk analysis. It is intended to reduce the spread of PL by implementing effective management practices as activities are initiated.

Comment: *More resistant seed than that needed to produce 50,000 to 100,000 seedlings per breeding zone needs to be available for catastrophic events. [26-1]*

Response: The genetics provision applicable to Alternatives 2, 3, 4, and 6 has been edited to clarify the difference between operational seed development and need for conservation seedbanks.

Risk Key

Comment: *Alternative 2 (and 3) say that use of the risk key "precludes the need for additional project-specific analysis of risk…." Are the Agencies proposing to implement or not implement disease control measures with no further NEPA analysis based on the risk key? The final SEIS must be explicit on whether the application of the risk key and disease control measures would be disclosed and analyzed in project level decisions. [34-27, 32-8]*

Response: The following text has been added to the referenced paragraph:

Project-specific NEPA analysis will appropriately document the application of the key and the consideration of the available Management Practices. Application of the risk key and application of resultant Management Practices (if any), will make the project consistent with the mid- and large-geographic and temporal-scale effects described by the SEIS analysis, and will permit the project analysis to tier to the discussion of those effects."

Comment: *On the risk key, the phrase "meeting land and resource management plan objectives" is undefined, and leaves it unclear whether this would increase or decrease future PL control activities. It needs to be quantified. One could claim that allowing new infestations would not meet the management objective of preventing the spread of PL, or one could argue that the loss of downstream POC is negligible. The emphasis should be on protection of the current status of POC; maintaining the ecological and economic importance on sites where it grew naturally. For question 2, you should define "significant risk". [25-13, 33-19, 32-65, 2-10, 39-3, 45-3, 38-9, 29-11, 31-15, 34-10]*

Response: Land and resource management plan objectives are familiar concepts to the managers who would be making these decisions, and include: maintaining or working towards desired future condition, including vegetation for habitat, visual values, and providing forest products; maintaining ecosystem health; and meeting law, regulations, and Agency policy requirements for diversity, viability, water quality, and other purposes. Since most of these objectives apply at multiple scales, there is not generally expected to be an issue over whether an objective needs to be met in the project area versus somewhere else. *Significant* has been changed to *appreciable*, and a defintion has been added to the footnote section of the risk key. Five paragraphs of exploration have also been added to define the term's use on the risk key.

Comment: *On the risk key, the words "considerably farther in streams" would mean different things to different people. [32-65]*

Response: This has been changed to ". . . 100 to 200 feet in streams."

Comment: *In the risk key, the determination of risk could be better standardized and made more repeatable by adding distances from roads and the percent of POC, like that shown in Appendix 4 of BLM's POC Management Guidelines (shown in Appendix 1 of the SEIS). [2-10]*

Response: The risk key is designed to be flexible enough to work across the range and apply to a variety of situations. Standardizing by adding specific distances would hinder this feature.

Comment: *How would use of the risk key be standardized among the different administrative units, especially since FS and BLM regulations differ. [44-15]*

Response: While the process and language in the key is clear enough for managers to understand with consistency, the risk key is flexible enough to respond to different situations and different objectives: It would not turn out the same every time, for every manager. It does, however, add considerable consistency and predictability to the application of PL control measures when compared with Alternative 1. It is this improvement in, and not the absolute application of, consistency upon which the predicted reduction in PL spread is based.

Comment: *The risk key could be made more specific if a separate one was tailored for each risk region. [2-10]*

Response: Perhaps so, but the flexibility of the risk key makes it applicable to a wide variety of situations. As described in the Comparison of Alternatives section in Chapter 2, use of the risk key can be tailored to different situations while producing a reasonably consistent and predictable result.

Comment: *The risk key is too subjective. The alternative should make spatially explicit identifications of high-risk areas and identify protection measures. The best way to do this is by expanding the protected watersheds and core areas identified in Alternative 3. The SEIS should have decided what areas were essential and protected them. [32-66, 38-9]*

Response: The risk key has been modified so that activities in the 162 uninfested 7th field watersheds always get a "yes" to question #1 in the risk key.

Comment: *The risk key could prevent new infestations, but there appears to be no means of avoiding intensification of the disease. Is an area no longer subject to project-specific direction once it is infested? [31-14]*

Response: The presence of uninfested areas within infested watersheds or project areas would still be considered by the key.

Comment: *The risk key considers "downstream" from the analysis area, but fails to consider the haul routes to the project area. [38-9]*

Response: Haul routes are considered part of the analysis area and are therefore considered during application of the risk key.

Comment: *The risk key is flawed because listed mitigation is only applied "until the analysis indicates no other treatment is effective or practicable". There is no scenario in which the key can lead to the answer: The project is too risky and no mitigation would reduce risk enough to make it worthwhile. It needs an option NOT to conduct the project. [33-19, 31-16]*

Response: The option to drop or redesign the project has been added to the risk key.

Below the Risk Key

Comment: *Managers should be required to select the most effective management practices rather than the cheapest and easiest ones. Roads should be closed rather than sanitized, for example. [39-3]*

Response: It would be good stewardship of Federal resources to apply the cheapest ones that would accomplish the objectives. However, the application of Management Practices is not limited to one. The message in the bottom section of the key has been repeated in the introductory paragraphs for the list of Management Practices to help clarify the Management Practice selection process. Added words include ". . . the one or combination of specific practices best fitting the nature of the risk . . . " and "As noted in the Pathology section of the

SEIS, combinations of practices can be more effective than single practices, depending on site-specific circumstances."

Comment: *The choice of Management Practices is far too discretionary (e.g., "one or more practices…would be applied.") The preferred alternative fails to mandate any particular Management Practices or combination thereof to prevent or reduce the spread of PL; it just says apply "one or more." For example, dry season harvesting should be required and apparently never would be if other seasonal restrictions (owl and murrelet nesting seasons) are in place. [34-10, 38-10]*

Response: There are no particular Management Practices or combination specified, but the standard to be achieved is specified. The Management Practice introductory paragraph now includes " . . . the one or combination of specific practices best fitting the nature of the risk and the site-specific conditions would be applied until the answer to risk key question 1 or 2 is no, (or, as noted in the risk key, until the project analysis indicates no other treatment is effective, no other treatment is practicable, the project is cancelled or redesigned, or disease control objectives can be met by other means.)"

Comment: *While the menu of Management Practices gives managers flexibility in dealing with specific situations, it would be helpful to offer some indication as to which of these practices are most effective. For example, does putting up posters really rank equally with road management measures in preventing disease spread? [39-3]*

Response: Each of these practices is discussed, rated, or otherwise referenced in the Pathology section in ways to provide managers with information about the relative value of each. However, they are not ranked because their relative value and applicability varies by situation. It is possible, for example, there are circumstances where posters might do as much for off-highway vehicle hazard as closing roads.

Comment: *Road closures are superior to sanitation logging of infected cedars that are at least still performing certain ecological functions. [27-4, 39-2, 40-3]*

Response: Dead trees generally do not need to be removed because harvesting dead trees does not change the amount or condition of roots. In any event, decisions to sanitize along a road are made after considering the effects of tree removal, and considering road closures and other options.

Comment: *The strong association between roads and the spread of PL makes it clear that any alternative should include road closures and restrictions as a principle strategy, particularly in uninfested areas of greatest ecological significance. [44-24]*

Response: Alternatives 3 and 6 identify the currently uninfested 6th and 7th field watersheds, respectively, and include requirements of no harvesting and closing all discretionary non-mainline roads. The risk key in Alternative 2 places emphasis on the 7th field watersheds. The comparable value of closing roads is well understood. The Road Management measures below the risk key now include, ". . . not building roads, not using existing roads, seasonal or permanent road closures, road maintenance . . . "

Comment: *The Agencies should bar motor vehicles from inventoried roadless areas and study an alternative giving wilderness status to roadless areas to reduce the spread of the root disease. A significant portion of the non-wilderness watersheds with uninfested POC are in roadless areas which do not have wilderness designation. The alternatives should provide more protection for inventoried and non-inventoried roadless areas. [41-2, 27-6, 39-2, 40-3, 34-55]*

Response: It is clear in the analysis that any management decision that reduces access to the forests is likely to slow the spread of the disease. The SEIS provides analysis for what amounts to various levels of access and management restrictions by examining a range of alternatives defined in part by exclusions in, or emphasis on, uninfested watersheds. A complete examination of a proposal to provide wilderness status or otherwise eliminate vehicles from all roadless areas goes beyond the purpose and need and is beyond the scope of this analysis.

Comment: *Roads that are presumed closed have been opened by vehicle users and many roads used by miners are not mapped. [32-72]*

Response: A Mining section has been added to Chapter 3&4. That road closures do not always work is acknowledged in the Pathology section and the Incomplete and Unavailable Information section of Chapter 3&4. Similarly, predictions in the Pathology section are based on the full suite of current use levels.

Comment: *If the Inland Siskiyou is 60 percent high risk in part because of roads, then roads should be reduced in this area, especially near creeks and wet areas. [44-26]*

Response: That would reduce the amount of high-risk area, and road closures would continue to be considered as part of project-specific planning and during overall road management planning under Alternatives 1, 2, 3, and 6. The Inland Siskiyou is heavily roaded in part because it is predominantly checkerboard lands. Issues surrounding efforts to close roads in checkerboard ownership are discussed in the Alternatives Considered but Eliminated from Detailed Study section of Chapter 2.

Comment: *The strategy should close roads, including mining roads, and there should be no new roads or road reconstruction in uninfested POC areas. [41-2, 27-3]*

Response: Alternatives 3 and 6 prohibit construction of new roads in POC in uninfested 6th and 7th field watersheds respectively. Alternative 2 places emphasis on the 162 7th field watersheds and suggests activities that pose significant risk of introducing PL be changed or mitigated to eliminate that risk. Alternative 6 requires closure of all discretionary non-mainline (tie) roads and sanitation along those that are left.

Comment: *Level 1 and 2 roads and trails should be closed in or approaching uninfested watersheds. [(27-5, 39-2, 40-3]*

Response: General transportation analysis, including considering potential impacts on POC, are already routinely done. Under Alternatives 3 and 6, additional analysis to specifically determine road needs for POC buffers would also be required. The objective for both of these alternatives is to reduce risk to the POC cores by minimizing or closing most roads in

these areas. Alternative 2 also places emphasis on uninfested watersheds as well, and would result in additional protection for those watersheds.

Comment: *The strategy should prohibit road construction in the range of POC. [43-82(S), 39-2, 40-3]*

Response: Although roads are implicated in the majority of PL spread and therefore road closures, not building roads, and other road-related practices are variously prescribed in some of the alternatives, there is nothing in the analysis indicating a general range-wide prohibition on road construction is needed or appropriate.

Comment: *The strategy should permanently close as many roads as possible in infested areas to contain the infestation, as well as permanently close as many roads as possible in and around existing uninfested areas to prevent infections and conserve intact forest communities. [43-83(S)]*

Response: The provisions of Alternative 6 and to some degree, Alternative 3, generally do this for the uninfested 7th (or 6th) field watersheds. Roads through infested areas are considered for road closure or other mitigation measures such as sanitation or road surfacing when either project planning or other trigger described above the risk key, coupled with proximity of the infestations and other site factors, indicates a need.

Comment: *The strategy should strictly limit off-highway vehicle use in the range of POC. Considering the limited range of this species, off-highway vehicle use should take place in other areas. [43-84(S)]*

Response: Off-highway vehicle use would be prohibited within POC in uninfested watersheds under Alternatives 3 and 6, and prohibited in other areas under Alternatives 2, 3, and 6 when an unacceptable risk is indicated by the risk key.

Comment: *The Management Practices should include not building roads in the first place, but rather logging by other means or by not logging where this "benefit" is outweighed by the potential effects of root disease. [44-3]*

Response: These options have been added to the Management Practices below the risk key.

Comment: *Under Management Practices listed below the risk key, partial-suspension skyline systems should be lumped with full-suspension and helicopter in the non-ground-based systems. This would be consistent with standard logging and contract terminology, and the likelihood of moving infested soil with such a system is far more comparable to full suspension and helicopter than to tractors and other ground-based systems. [2-11]*

Response: Partial suspension is now included as a "non-ground-based" logging system under the Management Practices.

Comment: *The list of Management Practices includes many that would not be effective: (1) Project scheduling during the dry season ignores that fact that significant precipitation can occur during any season; (2) sanitation removal of POC may leave viable inoculum in the soil for many years; (3) equipment washing; and (4) road closures are ineffective, not build-*

ing roads in the first place is far better but not among the menu items. [34-12, 32-21]

Response: All of these practices would be effective to some degree, and when used in the right situations or in combination with other practices, will often meet risk reduction objectives. It would be inappropriate to say any of these practices would not be effective in any situation. Even so:

1) An additional Management Practice has been added suggesting application of a permit clause that would require cessation of operations for certain rain events.

2) It is recognized sanitation may leave inoculum in the soil, but it does eliminate the production of additional inoculum, thereby reducing risk. Further, sanitation may also be applied to uninfested areas to reduce the likelihood of PL being brought into an area.

3) Equipment washing has been shown to be effective through studies, as described in the Pathology section in Chapter 3&4.

4) "Not building roads" in the first place has been added as an option under the Management Practices below the risk key.

Comment: *The most effective means of preventing/limiting the spread of PL are not among the list of Management Practices (e.g., exclusion, minimize entry, transportation analysis and control, no action (i.e., no roads, no mining, no grazing, no timber harvest). [34-12]*

Response: The option to cancel or redesign the project has been added to the risk key.

Comment: *The vehicle washing requirement applies to vehicles having traveled on roads "deemed at risk for spreading the disease" but fails to disclose how that finding would be made. [34-14]*

Response: The Management Practice for Washing Project Equipment has been edited to say such roads are ". . . generally project area secondary roads around diseased POC."

Comment: *The thinning spacing objectives are not conservative enough. Why must POC populations be discontinuous? [44-16]*

Response: It is desirable for thinned and planted POC to be discontinuous where consistent with resource objectives, so that any future infestation does not travel through the entire stand.

Comment: *Non-POC special forest product gathering should be permitted in low-risk sites only, in areas without POC and/or in dry seasons only, with permit conditions strictly enforced. Gatherers should not be allowed to travel between infested and uninfested areas either by car or foot. [44-41]*

Response: Non-POC special forest products collection areas such as for personal use firewood collection would, under Alternatives 2, 3, and 6, be subject to application of the risk key and appropriate measures applied to reduce any identified unacceptable risk. Potential measures to be applied include those mentioned in the comment.

Alternative 3

Comment: *The road restrictions proposed for POC cores and buffers [Alternative 3 and 6] will increase the management costs to private landowners within the checkerboard lands. [28-2]*

Response: BLM roads are considered private government roads and the Agency retains the right to control activities on these roads including use by the general public. This does not mean that all access is controlled by the BLM. Many of the roads that run through BLM lands are subject to reciprocal rights-of-way agreements. These agreements are legal contracts that have specific terms and apply to the BLM and other party equally. Terms of the reciprocal rights-of-way agreement cannot be modified without the agreement of the BLM and other party in the agreement. As described in the Roads section of Chapter 3&4, access to private land within the checkerboard lands impacted by the Alternative 3 and 6 transportation management Standard and Guideline, particularly industrial private lands, are covered by reciprocal rights-of-way agreements that do not allow for extensive road decommissioning or the discretion to halt new road construction. However, there are a few private landowners that could have their road management and access costs increased if some non-mainline roads are decommissioned or new construction is not allowed on Federal lands due to the transportation management Standard and Guideline in Alternatives 3 and 6.

Comment: *Alternative 3 does not meet the purposes of the SEIS or the NWFP because of limitations on timber harvest in the Matrix, limitations on habitat improvement in Late-Successional Reserves, and limitations on the ability to treat fuels in the Core areas. [28-1]*

Response: Alternative 3 would create the negative effects cited, but these practices are generally discretionary, not required, under the NWFP. The decision-maker will weigh these effects against other direct and indirect effects to determine what alternative meets the Need and best meets the Purpose.

Comment: *While the uninfested watershed maps are coarse in scale, it appears that some areas have frequently used roads, such as the road to Black Butte trailhead in the East Fork Illinois River. Does the "no vehicles" section suggest that this road would be closed to public traffic? This sort of action is probably going to be very unpopular with the public. In fact, perhaps the restrictions inside the core areas are so strict that public sentiment would never allow them to be created in the first place. This option would need to be applied with care, considering other uses of the forest. [33-20]*

Response: Alternatives 3 and 6 close or limit use of all discretionary roads in POC cores except mainline (tie) roads. Roads through these areas leading to nearby trailheads could be affected. This has been clarified in the Recreation section in Chapter 3&4.

Comment: *In Alternative 3, there is no explanation of the choice of 6th field as the level of analysis. Using such large areas severely limits the areas subject to special protection. [31-18]*

Response: Sixth-field watersheds were selected because they are the smallest watershed having a national or even POC range-wide standard for mapping. The Regional Ecosystem Office has compiled multi-agency (agreed-to) 6th field watershed mapping for all of Oregon.

Each of the four administrative units with POC in Oregon has a 7th field map layer, but there are inconsistencies between units that create edge mapping issues. Also the average size of such watersheds varies widely between the FS and BLM. Finally, in some cases, 7th field watersheds do not aggregate up to the standard 6th fields because the mapping was done before the 6th fields were standardized. Nevertheless, the need for a smaller scale approach to uninfested watersheds became apparent as the result of numerous public comments. As a result, a SEIS map of the combined 7th field watersheds has been created and serves as the basis for Alternative 6. Alternative 6 includes a clause that if the watersheds are remapped to some regionally agreed-to standard in the future, the POC core areas being managed under the SEIS map would be held constant regardless.

Comment: *Alternative 3 identifies 32 uninfested 6th field watersheds with more than 100 acres of POC. What if more than 100 acres is found in another watershed? Why not use 10 acres of POC instead of 100? How many uninfested watersheds have greater than 10 acres of POC? Smaller stands are important and should be protected. [34-29, 38-3, 38-4]*

Response: The provisions of Alternatives 3 and 6 state ". . . actual POC core boundaries would depend on where POC occurs on the ground and the absence of PL, and may include additional watersheds." Regarding the number of uninfested watersheds having less than 100 acres of POC, an analysis was not done for the 6th field watershed of Alternative 3, but was done for the 7th field watersheds of Alternative 6. To the 162 uninfested watersheds exceeding 100 acres, dropping the cutoff to 50 acres would add approximately 90 more watersheds (with an average POC acreage of about 75 acres). Dropping to 25 acres added another 57. As the cutoff was made smaller, GIS slivers and other accuracy issues made the finding more and more suspect. It was noted that the 75 acre average per watershed (using the 50-acre cutoff) was not necessarily all in same location, but could be spread into numerous smaller stands. The practicality of managing these smaller areas as "cores" is a significant management, tracking, and cost-benefit issue and 100 acres was selected as the minimum for these alternatives. This does not mean watersheds containing less than 100 acres of POC are ignored under these alternatives. Smaller areas of uninfected POC, particularly those in uninfested watersheds, would be identified by the risk key and managed accordingly.

Comment: *In Alternative 3, the Federal Agencies should have identified the best POC old-growth groves left, and protected those groves. If uninfected old growth is in blocks of 10 or 20 acres, their watersheds should at least be identified so that protections could be implemented on a project basis. [38-3]*

Response: The implementing administrative units possess and use the POC maps that show where 10 or 20 acres uninfested stands exist, and whether in uninfested watersheds or not. Through the risk key, these stands would be appropriately considered for avoidance or other protection measures.

Comment: *It appears (from previous project analyses) that the POC in Roseburg's watershed number 1710030221002 is planted. The POC EIS ID team should find better core areas than planted POC in watersheds where it does not naturally grow. [38-4]*

Response: Two watersheds were counted towards the uninfested watersheds in Alternative 3 in the SEIS because POC was included in more than 100 acres of young plantations on sites not previously containing POC. The criteria for watersheds included in Alternatives 3 and 6

have been rewritten to exclude such watersheds.

Comment: *Alternative 3 is apparently rendered meaningless by the Biscuit fire. There is no substantial discussion of the impacts of this or any other fire on POC. There are no described plans to bring the Biscuit back disease free. Substitutions should have been made for the areas lost to fire. [31-11, 31-17, 31-18, 25-6]*

Response: The discussion in the Port-Orford-Cedar Acreage Data section of Chapter 3&4 of the Biscuit Fire and its implications to the overall acres of POC has been expanded. Further, discussion has been added to the Fire and Fuels section about the likelihood of future, POC-killing fires. However, as explained in the SEIS, stands receiving 75 percent top kill were removed from the POC GIS database before the Alternative 3 and 6 watersheds were identified, and the POC maps included in the SEIS were created. The POC acreage within the Biscuit Fire perimeter was decreased by approximately 50 percent because of this analysis. Seventy-five percent was used to insure POC acres shown on SEIS maps still retained POC. Subsequent analysis of the Biscuit Fire using other mortality indicators still shows the total POC mortality to be about half the previously mapped POC acres. In any event, live POC, whether on the SEIS maps or not, will be managed according to the provisions of the selected alternative. If surviving POC exceeding 100 acres is discovered in previously unmapped uninfested watersheds, it would result in additional POC cores and buffers under Alternatives 3 and 6. Any plans to bring the Biscuit Fire area back disease free would be outside the scope of this programmatic analysis and would be more appropriately discussed in the EIS for the Biscuit Fire. Substitutions cannot be made for burned areas because the alternatives already include all uninfested watersheds containing more than 100 acres of POC and, in the case of Alternative 6, are more than 50 percent Federal ownership.

Comment: *The POC Buffers are meant to protect the core areas, but the mandated actions are few and weak. Roadside sanitation should be added in buffers, and along roads leading into buffers and core areas that are outside the protected watersheds. [31-19]*

Response: The Standards and Guidelines for POC buffers are limited because road use and wildland fire operations water movement are the only big issues within the buffers that relate to keeping the buffers disease free. Sanitation is not prescribed because, by definition, there are no POC present in the buffers. If there were, they would been designated as part of the POC core areas. Roads leading into buffers could be important, but can be considered as part of the required transportation analysis.

Alternative 4/Alternative 5

Comment: *The suggestion that the EIS can contain alternatives that do less than the no action alternatives is wrong. Alternatives 4 and 5 do not appear to meet the need of maintaining POC and an ecologically and economically significant species on BLM and FS lands. [21-10, 21-13]*

Response*:* It is up to the analysis to show that, and it would be wrong for the SEIS to assume, before analysis, that anything less than the current direction was inadequate. Since the court did not necessarily find fault with the current direction, but only that the Agencies had not analyzed it adequately, it seems appropriate to analyze that direction and alternatives that both increase and decrease current protection measures. Alternative 5 also serves as a

"no management protection" basis from which to measure the effects of the other alternatives.

Comment: *Alternatives 4 and 5 assume that usable resistance exists and that it would be maintained over time, and the technology of re-establishing POC can be developed. None of those have been proven and no plan for use of resistant seedlings even proposed. [25-15]*

Response: Alternatives 4 and 5 do more than rely on existing resistant stock and natural resistance (Alternative 5) or an accelerated resistance breeding program (Alternative 4). These alternatives also assume a portion of the POC will not become infested even without the Agencies' control efforts, and that other trees will fill at least some of the ecological roles of POC. These alternatives are included so that these assumptions, and their implications, are analyzed. Alternative 5 is included because it fulfills many of the objectives normally associated with a No-Action Alternative.

Comment: *An alternative to provide maximum protection to POC was not presented. Alternative 3 is the best offer in this regard, but it is seriously and arbitrarily limited. [31-11]*

Response: Alternative 6 provides more protection, incorporating the concepts of Alternative 3, but focusing on 7th field watersheds. These watersheds are more widely distributed than those in Alternative 3, and contain about 50 percent more uninfested POC cores.

Comment: *Including selected 7th field watersheds into Alternative 3 would better comply with the NWFP Aquatic Conservation Strategy objectives. [32-62]*

Response: Alternative 6 has been added to the SEIS, incorporating the approach of Alternative 3, but applying it to the 162 7th field watersheds. These watersheds are more widely scattered than those of Alternative 3, and contain nearly 50,000 acres of POC cores.

Comment: *The watersheds selected for protection in Alternative 3 are a start, but coho salmon streams and 303(d) listed stream segments would have benefited by identifying uninfested 7th and 8th field watershed such as the Left Fork of Sucker Creek and Khoerry Creek. Including selected 7th field watersheds in Alternative 3 would obtain better distribution of protected watersheds in the planning area; coastal streams are conspicuously absent. [32-50, 32-62]*

Response: Alternative 6 has been added to the SEIS, incorporating the approach of Alternative 3, but applying it to the 162 7th field watersheds. These watersheds are more widely scattered than those of Alternative 3, and contain nearly 50,000 acres of POC cores.

Comment: *The alternatives do not provide a balanced consideration of competing resources. There should be at least one more alternative that is more protective of POC than Alternative 3, an alternative that would close or seasonally close or decommission more roads which pose a risk to POC and otherwise restrict wet season motorized access to POC areas. [32-41]*

Response: There is now an alternative, Alternative 6, that is more protective than Alternative 3. It includes a requirement to close all discretionary non-mainline (tie) roads in POC cores.

There is a Management Practice addressing seasonal restrictions, and another has been added to address storm events. These Management Practices are applicable to Alternatives 2, 3, and 6.

Comment: *The draft SEIS failed to display the current system of road closures that would reduce the spread of PL and more importantly, failed to display recommendations from each district about the need for additional road closures or improved gates. These recommendations could have been illustrated and prioritized in the draft SEIS. There is currently no means of systematically identifying roads that are a high priority for closure, and the SEIS provides no specific guidance about how to identify priority roads for seasonal or permanent closure. [32-50, 32-62, 32-72]*

Response: Regular transportation system planning done at the administrative unit level is referenced in the SEIS, and linked to the risk key in Alternatives 2, 3, and 6. Standards and Guidelines of the different alternatives would be applied to roads at that time and during projects. For POC cores in Alternative 6, the Standards and Guidelines call for closing all discretionary non-mainline (tie) roads ". . . pending required transportation analysis." However, POC is only one consideration when determining road closures, and the subject is too complex for further road closures to be addressed within the scope of this programmatic SEIS.

Comment: *The Agencies should consider an alternative that adds Alternative 3-like protection to uninfested [7th] field watershed with less than 100 acres of POC, to provide protection (1) along streams, especially those in ultramafic areas and streams important to amphibians and salmonids; (2) to protect more watersheds and provide for more genetic diversity; (3) in the 30 plant associations with sensitive plants; and (4) in ultramafic areas where POC is particularly important to riparian, terrestrial, and below ground ecosystems. [34-28]*

Response: Alternative 6 has been added to the SEIS, incorporating the approach of Alternative 3, but applying it to the 162 7th field watersheds. These watersheds are more widely scattered than those of Alternative 3, and contain nearly 50,000 acres of POC cores.

Alternatives Considered But Eliminated from Detailed Study

Comment: *Risk ratings need to be developed for each POC stand, and new alternatives should then be drafted based on these ratings. An example of this approach can be found in the draft "A Risk Assessment of Port-Orford-cedar Plant Associations on Federal and State Lands in California" (Jimerson and others in prep). Risk maps are necessary to evaluate the current status of POC populations and to manage the risk to POC biological and genetic diversity. [21-4, 21-5, 21-7, 21-11, 21-12, 21-14]*

Response: A "in process" copy of this publication was obtained by the SEIS Team during formulation of the alternatives, and it was examined for concepts and processes that could be applied to one or more of the SEIS alternatives. Although the existing alternatives were developed after reading this and other published POC management ideas and strategies, the basic approach in Jimerson et al. relied on detailed mapping sufficient to assign relative value and risk to each stand. Maps in California, generally done by Dr. Jimerson himself, may have sufficient detail for such an analysis. POC maps in Oregon generally do not have this same detail. The Oregon maps do have sufficient detail for designing appropriate strategies and for

conducting an adequate analysis of effects. Possible deficiencies in the Oregon POC maps are acknowledged in the Incomplete and Unavailable Information section and deemed not to be a significant problem. The risk rating approach referenced in this comment is discussed under Manage According to Stand-Specific Risk Assessment Methods in the Alternatives Considered but Eliminated from Detailed Study section in Chapter 2. As noted in that discussion, a similar result is achieved at the project-specific scale by using the risk key.

Comment: *All areas with uninfested POC should be withdrawn from mineral entry. [27-3, 39-2, 40-3]*

Response: As noted under the alternative Close Roads and Eliminate Mining in Wilderness to Exclude *Phytophthora lateralis* in the Alternatives Considered but Eliminated from Detailed Study section of Chapter 2, mining is an important and legitimate use of public lands, providing raw materials for a variety of industrial uses. Congress considered these uses so important that the 1964 "Wilderness Act" had a grace period for filing and beginning operations on mining claims in wilderness.

There are other measures that can be taken under the Standards and Guidelines of Alternatives 1, 2, 3, and 6. On NFs, operations of any size, and even most prospecting, requires a plan of operation to be filed with the local administrative unit if the proposed activity would likely cause significant disturbance of surface resources. Applications typically trigger an EA or other NEPA analysis. Depending upon the risk, the Agency is required to provide reasonable terms and conditions for the operation. In this case, requirements to follow the same POC management practices used on other Agency activities would be binding on the claimant. The BLM rules are similar.

Comment: *The alternative to "Retain All Port-Orford-Cedar Old-Growth Stands and Large Trees" was inappropriately eliminated from detailed analysis. The reason presented in the SEIS is flawed: "This alternative is very similar to Alternatives 1, 2, and 3, in that (1) about 80 percent of the landscape is in reserves that preclude old-growth harvests;…" This is flawed because up to half of the reserves could have already been clearcut before they were designated as reserves. Eighty percent of the landscape is NOT reserved as a late-successional forest. The 20% of the forest that is open to harvesting likely has 50% of the remaining old-growth forests that could be cut - including valuable, disease resistant, genetically diverse, legacy material, Port Orford Cedar. The SEIS should include an alternative to prevent this. [38-8, 34-3]*

Response: While it is true up to half of some reserves have been previously harvested or otherwise have younger stands in them, it is also true that over 80 percent of the existing late-successional and old-growth forest is in NWFP reserves. Further, since POC is concentrated more in riparian areas in parts of its range, it, as a species, has more of a tendency to be concentrated within Riparian Reserves than other old growth. Although POC cores have a tendency to be in wilderness and other protected areas, it is still illustrative to look at the percentage of POC core acres that fall in Matrix and thus would be available for regularly scheduled timber harvest (PSQ) if an alternative with POC cores is not selected. The amount of POC in POC cores that are also Matrix is displayed in the Timber Harvest section in Chapter 3&4. There are approximately 2,260 "PSQ" acres in 34,000 acres of POC cores in Alternative 3, and 3,010 "PSQ" acres in nearly 50,000 acres of POC cores in Alternative 6, or just over 6 percent. The percentage of POC in the Matrix is likely much higher in the North

Coast Risk Region where POC is more evenly distributed across the landscape, but the apparent ecological significance of larger POC is also lower here when compared with other risk regions.

The ecological and other values of the larger POC that do remain "available" for harvest will be considered at the site-specific scale. The SEIS has been edited to better describe that the POC remaining on Federal lands is only a portion of what was on all lands historically. Nevertheless, there is no apparent reason to have an alternative that prohibits harvest of any large POC for any reason.

Comment: *The alternative to "Focus on Prevention Rather Than Mitigation or Control" were inappropriately eliminated from detailed analysis. The draft SEIS dismisses these alternatives in part because they would not meet the need of supplying POC products. The Special Forest Products section explains that less than 4 percent of the POC bough market is from Federal lands, so why not just forego the risk? There is no legal mandate for the Federal lands to supply something just because there is a demand. If someone wants to sell fur coats made of wolves, does the Forest Service let them? [34-3, 32-37]*

Response: The discussion of this considered alternative has been rewritten to recognize the contribution of Alternative 6, revisions to the preferred alternative, and other information.

Comment: *The alternatives to "Close Roads and Prohibit Management Activities in Uninfested Watersheds and Small Subwatersheds" and "Impose Stronger Protections" were inappropriately eliminated from detailed analysis. The SEIS dismisses these alternatives based on the unsupported conclusion that they would not meet the need of avoiding "unnecessary" restrictions on public access. The SEIS notes under Potential Mitigation Measures that more road closures would be more effective than any of the developed alternatives but does not consider such as alternative even as a point of reference. Such an alternative would allow the public to scrutinize how many roads, and how much access the public has and how much they need. The Multiple-Use Sustained-Yield Act is broad and can encompass many widely different mixes of use and conservation within its legal framework. [34-4, 32-37, 29-2]*

Response: The alternative that was considered but eliminated to Close Roads and Prohibit Management Activities in Uninfested Watersheds and Small Subwatersheds has been removed because the new Alternative 6 responds to these issues. The discussion of the Impose Stronger Protections alternative has been rewritten to recognize the contribution of Alternative 6, revisions to the preferred alternative, and other information.

Comment: *The alternative considered to "Impose Stronger Protections" was inappropriately eliminated from detailed analysis. There are numerous locations where stronger protections are warranted and where imposition of stronger protections would not significantly affect the Agencies abilities to meet the Needs section. No analysis was made for such opportunities. [29-2]*

Response: The discussion of this alternative has been rewritten to recognize the contribution of Alternative 6, revisions to the preferred alternative, and other information.

Comment: *The alternative to "Restore Old-Growth to its Historic Range" was inappropriately eliminated from detailed analysis. The SEIS incorrectly claims that there is a conflict between old-growth conservation/restoration and multiple-use. This unsupported conclusion demands more analysis and scrutiny in an SEIS alternative. [34-5]*

Response: This discussion has been rewritten.

Comment: *The alternative to "Eliminate Timber Harvest in Port-Orford-cedar Areas" was inappropriately eliminated from detailed analysis. The SEIS dismisses this alternative based on conclusions about multiple use and unacceptable impacts on "other timber harvest objectives" but the SEIS mischaracterizes its multiple use duties and fails to state what those impacts would be. There are only 272,000 acres with POC and the vast majority of this area is already designated as some sort of reserve. Only 92,600 POC acres are in Riparian Reserve/Matrix/AMA, and only a fraction of this is expected to provide significant wood products. If all that land were withdrawn from commodity-driven timber harvest, the regional effect would be insignificant, but the EIS did not disclose this fact, or factor in that timber harvest on Federal lands represents only 13% of the timber harvest within the range of POC and less than 10% regionally. [34-6, 32-37]*

Response: The discussion of this alternative has been rewritten to include these points.

Comment: *The alternative to "Close More Roads Within Federal Lands" was inappropriately eliminated from detailed analysis. The draft SEIS says that closing more roads is possible even those within the O&C checkerboard, but dismisses it because private right-of-way interests would have to be purchased. High costs are not a reason to refuse to consider an otherwise reasonable EIS alternative. The Agencies are required to consider all reasonable alternatives (even if they are outside their discretion) and this is not outside their discretion. [34-7, 32-37]*

Response: This alternative was eliminated because there are provisions within other alternatives to consider closing roads where needed and appropriate. The discussion goes on to note that a substantial increase in road closures is not possible in many cases, at least not without purchasing existing private interests to those roads. The Council on Environmental Quality requires inclusions of alternatives that are "reasonable." Although the Council's "40 Most Asked Questions Concerning CEQ's NEPA Regulations" says alternatives outside of what Congress has funded should be included because the EIS may serve as the basis for Congressional funding (question 2b.), the Questions also describe "reasonable" as ". . . those that are practical or feasible from the technical and economic standpoint and using common sense." In this case, the roads in question access private sections of the checkerboard lands. Purchasing interests in the roads would reduce private land access. The government would thus need to compensate for the loss in value to those lands as well. Expecting a substantial increase in Federal funding for such a purpose is not reasonable. Furthermore, the end result could, in some areas, lead to an increase in roads as the private landowners build alternate access over private lands with more circuitous routes. This is an issue which would be better considered on a case-by-case basis rather than as a programmatic alternative. Closing roads is not precluded by any of the alternatives considered in detail.

Comment: *The alternative to Close More Roads Within Federal Lands was inappropriately eliminated from detailed analysis. The O&C Logging road rights-of-way regulations did not*

envision the Federal government getting permanently prevented from properly managing Federal lands. The rights-of-ways envisioned in the law must have expirations and there are numerous methods by which they may be terminated. The Agency has improperly entered into rights-of-ways with numerous landowners. The rights-of-ways are likely mostly illegal and non-binding, and the Federal government should take a hard look at its patchwork of roads and associated rights-of-ways and close and terminate (respectively) those which prevent proper management of Federal resources, specifically prevention of further spread of PL. [29-2]

Response: The requirements and administration of reciprocal rights-of-way agreements is discussed at length under this alternative. These agreements permit access to both Federal and private lands in checkerboard ownership instead of requiring each party to build their own independent road systems. The amount and kind of use restrictions that may be imposed by the Federal government has been tested in court. Further discussion of the legality and appropriateness of continuing these rights-of-ways is outside the scope of this analysis.

Comment: *In the discussion of why the draft SEIS did not analyze an alternative which would close more roads on Federal lands, the draft SEIS went on at length about how the Agencies have reciprocal right-of-way agreements and other obligations to keep roads open. Some of the things this discussion did not disclose were what percent of roads in POC areas are subject to such obligations, whether there are any roads which can be closed or decommissioned, and whether the private landowners with whom the Agencies share rights-of-way would be willing to allow at least seasonal closures on these rights-of-way. [32-40]*

Response: The SEIS does not say all roads in POC areas are covered by such agreements, but does say a substantial increase in road closures is not possible in many cases, and goes on to explain the situation with reciprocal rights-of-ways. In checkerboard areas, such agreements apply to almost all mainline roads. Knowing the exact percentage or location of each, however, is not needed at this programmatic scale. Road closures, not building roads, and other road-related practices, are described in some of the alternatives. Further, unit road management plans will consider POC-related road closures as they are renewed. There is nothing in the analysis indicating a general range-wide prohibition on road construction is needed or appropriate.

Comment: *Closing roads which are no longer needed and/or which pose a risk of becoming a vector for PL, as well as instituting additional protections for POC (i.e., prohibiting off road vehicle use in POC areas) is both permitted and anticipated under the statutes that govern the Forest Service and BLM. Additionally, closing roads and instituting other protections for POC is necessary to preserve and protect the highest and best uses of areas where POC grows. As a result, one or more alternatives which propose to close and decommission some roads (a more aggressive strategy than Alternative 3) and institute stronger protections for POC are reasonable and viable alternatives that should have been considered in the draft SEIS. [32-40]*

Response: Alternative 6, and additional provisions in other alternatives, provides the additional protections suggested by this comment.

Comment: *Federal POC management must allow private timber owners reasonable access to their private timberlands for management purposes throughout the year. [26-2]*

Response: Many of the roads that access private timberlands are covered by reciprocal right-of-way agreements that already allow for the reasonable access of private owners. Additionally, regular transportation system planning is done at the local administrative unit level and would take into consideration the access needs of adjacent private landowners. POC management is but one consideration when determining road management needs.

Comment: *Please list POC as endangered under the Endangered Species Act. It meets all five of the factors listed in Section 4 of the ESA. [27-8]*

Response: The listing of a species such as POC under the "Endangered Species Act" is beyond the authority of the BLM or FS, and resides under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS). Nonetheless, this SEIS analysis concludes that (1) POC is not in danger of extinction throughout all or a major portion of its native range, no matter which alternative is selected, (2) populations exist away from roads and streams which are the carriers of the root disease, and (3) utilization for commercial purposes has been sharply curtailed.

Comparison of the Effects of the Alternatives

Comment: *The document repeatedly mentions "early, prolific seed production" by POC. This is true in greenhouses where trees are given hormone treatment, and it speeds the breeding program. POC also produces seed rather early when open-grown. But in forests, POC in subordinate crown positions produces little if any seed. Because POC growth is slow, in most forests POC trees spend much of their lives beneath the canopy with probably no seed production. Most planted resistant seedlings are unlikely to add resistant genes to the seed rain until they reach the canopy, probably long after the 100-year scope of the document's projections. [25-20]*

Response: As described in the newly added planting assumption, most resistant seedlings planted to replace trees lost to PL will not be in subordinate crown positions. Nevertheless, the prediction of onset of seed production for outplanted resistant seedlings in these circumstances has been changed in the SEIS from 5 to 25 years.

Potential Mitigation Measures

Comment: *The following mitigation measure should be added for pathology: Work with private landowners thru small woodlands associations, ODF Service Foresters, and Industrial Forestry Associations to encourage them to apply acceptable (to them) disease control measures on their land. [2-14]*

Response: Such a clause has been added to the Community Outreach requirement applicable to Alternatives 2, 3, and 6.

Comment: *In checkerboard ownerships such as on the Coos Bay District, voluntary road treatment and control programs could be encouraged. [44-13]*

Response: Within the Community Outreach requirement in Alternatives 2, 3, and 6, a requirement to ". . . coordinate with state, local, industrial, and small woodland owners to help meet overall POC management objectives . . ." has been added.

Comment: *It is unclear how or whether the SEIS considered the mitigation measures at the end of Chapter 2. Examples include: allowing restoration thinning in some dense young plantations, and allowing fuel reduction treatments in the wildland-urban interface. Consideration of these mitigation measures would substantially improve the outcomes under Alternative 3 and other Alternatives that were eliminated from detailed study. [34-9]*

Response: Council on Environmental Quality Regulations at CFR 40 1502.14(f) and 1502.16(h) require a discussion of mitigation measures for all adverse effects identified in the SEIS that are not otherwise included in the alternatives. (The alternatives themselves are mitigation measures, and measures already included in the alternatives are generally not included in this section.) A clarifying sentence has been added to the mitigation section at the end of Chapter 2 stating ". . . in general, mitigation measures listed . . . are ones not explicitly part of the referenced alternative, or at least not part of the alternative at levels that would completely mitigate the adverse effect described."

Comment: *The Agencies should consider an effective and timely annual trail maintenance program so that hikers are more likely to stay on trails. [34-11]*

Response: Timely maintenance of trails so hikers can stay on them has numerous benefits, with the protection of POC being one of them. POC considerations are one factor the Agencies use to set priorities for trail maintenance.

Chapter 3&4

Introduction

Comment: *The SEIS should describe the value of roadless and wilderness areas in conserving POC, and consider expanding roadless areas as a de facto mitigation measure. [43-78(S)]*

Response: The value of roadless areas is apparent in the delineation of uninfested watersheds and in the discussion of how the disease spreads in the Pathology section in Chapter 3&4. The primary difference in the percentage of high-risk sites between the Siskiyou and Inland Siskiyou Risk Regions, as explained in the Pathology section, is that the Inland Siskiyou is more heavily roaded. "Expanding" roadless areas, already inventoried based on an absence of roads, could only be done by closing roads. Closing discretionary non-mainline roads is required within uninfested POC cores in Alternative 6, and an effective option for reducing risk identified by the risk key in Alternatives 2, 3, and 6. A decision to maintaining existing roadless areas in a roadless status is outside the scope of this analysis because the potential benefits to POC can essentially be achieved in less impacting ways within the elements of other alternatives.

Comment: *A prototype POC Management Plan was presented as an example at the 1999 POC seminar. I understand it is being implemented as much as possible by a forestry consulting firm in Coos Bay, within the current constraints of resistant POC seedling availability. [2-16]*

Response: Scoping, examination of published strategies that could be found, examination of the 1999 POC Seminar notes, the involvement of Agency POC program managers, discussion

with Oregon Department of Forestry officials, and public comment on the SEIS were all explored by the team developing the alternatives examined in this SEIS, and relevant elements were included.

Incomplete or Unavailable Information

Comment: *The draft SEIS Incomplete and Unavailable Information section statement that "no missing information was identified that is essential to a reasoned choice among the alternatives" is not justifiable. Among topics with incomplete information in the document are: uncertainties about which geographic areas will produce resistance, whether there will be sufficient genotypes with resistance to support a wide program of planting, whether that resistance will hold up over a rotation, how to manipulate vegetation to assure success of planted resistant seedlings, how many resistant trees need to be planted to improve stand resistance sufficiently, where POC genotypes can be successful if planted outside their native habitat, how well measures to reduce spread of PL really work, how the long-distance spread of POC has occurred, how long PL can survive in soil without POC… I agree that decisions will have to be made now, without all the desirable information, but that does not require such untrue statements to justify it. In contrast, this document needs to identify clearly the information needed for the best POC management, suggest mechanisms for getting it, and provide a mechanism for the revision of management as the information needs are met. [25-21, 25-24]*

Response: There is adequate information described in the SEIS to address most of the mentioned items. The Genetics section notes that few resistant trees have been confirmed in some breeding zones, but few trees have been tested. Based on the distribution of resistant genes so far, there is little reason to believe resistance will not be found in sufficient levels in all zones. Manipulation of vegetation to ensure success of planting seedlings is an area in which the Agencies have hundreds of thousands of acres of experience. Similarly, silviculturists and geneticists have considerable experience with moving planting stock outside of established seed zones or plant associations, and a potential reduction in adaptability is referenced in the new planting assumption. Genetic variability within stands is high; as noted in the Genetics section, maintaining major alleles with limited resistant stock is not a problem, in part because mortality does not typically affect all trees in anything larger than a small geographic area. The Pathology section has been edited to more thoroughly discuss the effectiveness evidence for the various PL control measures. The Pathology section specifically discusses each of the longest PL spread events and what is believed to have caused them where known. Studies indicate inoculum, in the absence of POC, decreases in the soil over time. Studies so far have run 8 years, and wording in the draft indicating inoculum might last "up to 10 years" has been changed to read "at least" 10 years. Nevertheless, the commenter makes a good point that none of this information is perfect or, even though limited knowledge is acknowledged elsewhere in the SEIS, it should be summarized here and potential risks acknowledged. The SEIS has been edited accordingly. As described in the Monitoring sections of the alternatives, Appendix 5, the agencies will continue to examine the effectiveness of various treatments and modify practices accordingly.

Comment: *There are several places where the draft SEIS describes incomplete information, including imprecise POC acreage information because of mapping techniques or GIS limitations. The SEIS should identify the information needed for the best POC management, suggest mechanisms for getting it, and provide a mechanism for a revision of management as*

the information needs are met. [25-24]

Response: The existing maps are more than adequate for the design of the programmatic alternatives in the SEIS and to evaluate the likely effects. As noted under in the Incomplete and Unavailable Information section, precision and certainty could be added by having more detailed maps, but to the degree such details would affect site-specific management, they will be discovered during project planning and addressed in subsequent site-specific NEPA. There is no expectation that improving maps or other data will negate or significantly change the predicted effectiveness of any alternative analyzed in the SEIS. Therefore, there is no need to consider the direction "interim" while additional specific information is gathered.

The monitoring plans for each of the Action Alternatives, Appendix 5, note the ongoing process of updating Agency maps. Contracts for such updates are in effect as the SEIS is being prepared. These maps improve site-specific application of the POC management direction today, and they will continue to do so under the selected alternative.

Comment: *The draft SEIS Incomplete and Unavailable Information section statement that the "assumptions…are based on consideration of 50 years of forest management activities" is not true. Following the advent of PL in the native range and the collapse of POC prices, the species was abandoned as a commercial entity. Management in the face of the disease began in the 1970's at the earliest, only after the Japanese market was re-established, and management throughout the range was not mandated until late in the 1980's. [25-25]*

Response: This and a similar statement elsewhere have been revised to more accurately reflect basis of experience.

Comment: *The SEIS Incomplete and Unavailable Information section states that "…it is possible to make predictions about the future spread of PL. This statement is true for spread by water and along roads. But allowing off-road vehicle travel and POC bough harvest, and considering spread by grazing and wild animals, removes much of that predictability. [25-26]*

Response: It is true that spread by water and along roads is predictable, so much so that time-sequence maps have been prepared of infestation for at least one watershed based on short-term data. The predictions made in the SEIS, however, are simply an acreage spread rate prediction that includes spread from watershed-to-watershed and across the range that, while not applicable to any specific watershed or direction, are nevertheless soundly based on observations of spread processes, knowledge of the road systems and forest-use levels, personal observation of medium- and long-distance spread over the past two decades on the part of Agency pathologists, and overall consideration of spread patterns and rates since the pathogen was first discovered in the Coos Bay area in 1952. However, the limits of the predictions and the need to check progress with monitoring are better acknowledged in the final SEIS.

Comment: *The effectiveness of the resistance breeding program constitutes incomplete and unavailable information which, while perhaps not "essential" to a reasoned choice from among the alternatives, precludes Alternative 4 from being the preferred choice as it relies entirely on an untested program to meet the Purpose and Need. [44-20]*

Response: A discussion of the uncertainties about the resistance breeding program has been added to the Incomplete and Unavailable Information section in Chapter 3&4.

Comment: *If the currently proposed Forest Health Initiative is passed, it could significantly increase the amount of traffic and pressure for road building in POC habitat. [39-5]*

Response: The possibility of the Forest Health Initiative increasing traffic has been added to the Incomplete and Unavailable Information section in Chapter 3&4. However, it is unlikely the Initiative would increase traffic beyond that which was envisioned with full implementation of the NWFP, which is already an assumption in the SEIS.

Comment: *The draft SEIS states that riparian POC plant association data is not fully available for Oregon. (3&4-44) This is a significant data gap. This information should be obtained and disclosed before any decision on this SEIS is made. At the very least, the draft SEIS should have identified the relevance of this unavailable information to the evaluation of the environmental effects of the proposed action and alternatives. [32-23]*

Response: The preliminary analysis did not indicate any resource issues relevant to plant associations. The Ecology section, among others, discussed the effects of the alternatives on plant associations, riparian ecosystems, and unique plants. The Genetics section discussed whether individual plant associations are likely to have unique alleles (they are not). No adverse effects particular to any specific plant association were identified. However, further information about plant associations in riparian areas was obtained between draft and final SEIS and used particularly to help determine the amount and level of POC stream shading along streams important to listed coho salmon. Information about plant associations are now included in the Water and Fisheries and the Ecology sections.

Cumulative Effects

Comment: *It is not clear why the Agencies consider the risk of PL spreading from Oregon to California worth mentioning, but not the risk of PL spreading from California to Oregon. PL is spread not just through timber sale activities, but through recreation (particularly motorized recreation), special forest product gathering, and other activities. The risk of these types of activities spreading PL between the two states should have been more thoroughly analyzed in the draft SEIS. [32-18]*

Response: As noted in Chapter 2, the current management direction for the California NFs is included in the SEIS and is held constant across the range of alternatives. The relative effectiveness of that direction is considered in the PL spread rate predictions. Potential methods of spread from California are noted: for example, there is a discussion of logging truck traffic to Oregon from NFs in California in the Timber Harvest section. There is also a discussion in the Recreation section noting off-highway vehicles can be driven or transported both ways between California and Oregon. These potential carriers are considered in the PL spread predictions for the various alternatives.

There are two reasons why the discussion of spread appears one sided, however. First, the level of infestation is generally lower in California and therefore the likelihood of spread from California to Oregon is lower. Second, and more importantly, the SEIS must include a cumulative effects analysis of the foreseeable effects of the alternatives. The alternatives

only apply to Oregon. Therefore, the primary issue, with respect to spread, is whether the alternatives and related actions of the action Agencies contribute to the spread of PL to other ownerships including California.

Comment: *Despite the strong direction from the 9th Circuit regarding cumulative impacts analysis, the SEIS contains inadequate and inconsistent (between resources) cumulative effects analysis. There are only two sections (long distance spread and water and fisheries) in the draft SEIS that discuss cumulative effects. [32-33]*

Response: A fuller range of effects has been added to the various resource element discussions as appropriate. As described under the Cumulative Effects heading early in Chapter 3&4, six different types of effects are included in the SEIS. The individual resource element effects discussions now include effects of the Standards and Guidelines directly on the resource area (reduction in timber harvest, for example), the effect of various forest management activities on the spread of PL across the range (expressed as a 100-year PL spread prediction in acres), effects on resource areas via the effect of the alternatives on PL-spread (such as stream temperatures), the indirect effect of various PL-controlling measures on non-POC resources (road closures also protect soil stability and thus water quality, for instance), effects of management activities on non-Federal lands or outside the planning area to PL spread (such as spread from infested checkerboard lands, risks of PL import from California), and effects of the alternatives on non-Federal lands and those outside the planning area (risk of spread to National Park Service lands and into California) As noted early in Chapter 3&4, the combination of these effects, all of which are expressed in terms of 100 years, represent the cumulative effects of the various alternatives. Attempting, in the various resource element sections, to identify which of these various direct or indirect effects are the "cumulative" ones would be moot at best, and more likely misleading.

Comment: *The 9th Circuit Court case law holds that a SEIS must adequately catalogue the relevant past projects in the area. It must also include a useful analysis of the cumulative impacts of past, present and future projects. This requires discussion of how future projects together with the proposed project will affect the environment. The SEIS must analyze the combined effects of the actions in sufficient detail to be useful to the decision-maker in deciding whether, or how, to alter the program to lessen cumulative impacts. Detail is therefore required in describing the cumulative effects of a proposed action with other proposed actions. [32-34]*

Response: The Affected Environment sections in Chapter 3&4 for those resource areas potentially directly affected by application of the provisions of the alternatives (for example, Timber Harvest, Special Forest Products, and Recreation), are written with somewhat more detail than would be needed to establish a base from which to determine direct effects of the alternatives. This additional detail is intended to provide the Pathologist and the decision-makers with a description of the scope and nature of activities on the forest affecting PL spread. Chapter 1 has also been edited to acknowledge that past level of past management activities and the lack of specific control measures have contributed to where the disease is today. Finally, the assumptions in the Pathology section and Assumptions section early in Chapter 3&4 discuss, among other things, anticipated future activity rates. Together these sections provide a picture of past, present, and future activities sufficient to predict PL spread rates and related effects for the different alternatives.

Comment: *The draft SEIS fails to disclose the multiple benefits of closing and obliterating roads. Such closings would reduce PL and sediment that harms fish; they would reduce off-highway vehicle use that spread PL and harm to rare or sensitive plants; they would improve elk and wolverine habitat. [32-49, 32-62]*

Response: Measures in the SEIS would require some roads to be closed under Alternatives 3 and 6, and additional (cumulative) benefits of those closures are variously included within the respective effects sections. The benefits of such closures have been added to appropriate resource effects sections in Chapter 3&4. Most future road closures under Alternatives 1, 2, 3, and 6 would result from site-specific analysis or consideration under unit-wide transportation plan updates, with PL control and mitigation measures considered as indicated by risk. In those analyses, the cumulative beneficial effects of road closures will also be considered.

Comment: *The draft SEIS fails to describe how the various Management Practices interact to magically prevent POC infections. The Water and Fisheries effects section for Alternative 2 hints at how practices might interact, but the SEIS needs a comprehensive crosswalk table to explain how this is going to work. [34-10]*

Response: Provisions of Alternatives 2, 3, and 6 call for an integrated management approach using all categories of PL control and mitigation techniques. Language below the risk key has been edited to clarify that combinations of treatments are expected to the degree necessary to achieve risk reduction objectives. The discussion of various mitigations measures in the Pathology sections includes a discussion of the benefits of combining treatments. The Water and Fisheries discussion for Alternative 2 is an excellent example of how the process will work, and indicates the effects authors understood the application and benefits of this process. However, because the number of combinations and their applicability to any given situation is so variable, it is no more possible to present a crosswalk table than it would be to rank the 15 Management Practices by priority.

Relationship to the Northwest Forest Plan

Comment: *The draft SEIS assumption that the NWFP will be implemented as written and intended does not disclose that the Aquatic Conservation Strategy and Survey and Manage provisions of the NWFP are being severely weakened and eliminated, respectively, through administrative actions. [32-19, 39-5, 31-7]*

Response: The Aquatic Conservation Strategy SEIS stated Need is to fix Aquatic Conservation Strategy language preventing the NWFP from reaching its stated goals. There is no objective to change those goals or to have the Aquatic Conservation Strategy do anything other than what it was intended to do when the NWFP was written. Any changes in the Aquatic Conservation Strategy resulting from that SEIS are still expected to conform to the assumption in the POC SEIS that the NWFP will be fully implemented.

The Survey and Manage NWFP mitigation measure is indeed proposed for removal, with some of the species being moved to Agency special status species lists for future management. However, the current declared PSQ of 805 million board feet annually for the NWFP area does not include a reduction for Survey and Manage. Estimates of harvest levels in the POC SEIS are based on this declared PSQ level, and none of the alternatives in the Survey and Manage SEIS, including the proposed action, would increase PSQ above this level.

Comment: *The draft SEIS assumes that "reserves" will continue in the future (NWFP section, Pathology section), however the BLM just signed a settlement that commits them to consider new RMPs that are consistent with 9th circuit case law and do away with all reserves on O&C lands except to the extent they are required to avoid ESA jeopardy. This settlement could lead to an outcome completely inconsistent with the SEIS assumption. The SEIS should disclose the consequences of loss of reserves on O&C lands. [34-34, 31-7]*

Response: The referenced settlement calls for BLM to revise the resource management plans for the Districts within the NWFP area, evaluating at least one alternative that rolls back the reserves to the minimum needed for federally listed species, and to complete that revision by 2008. The BLM is not ". . . committed to do away with [existing] reserves." Given the timeframes involved and the nonbinding nature of the agreement relative to the alternative likely to be selected, there is little reason for the POC SEIS to speculate upon, and accommodate, the settlement agreement alternative. It would be more appropriate for a resource management plan amendment to each respective and appropriate EIS to consider the effects of various alternatives on the adopted POC management strategy.

Comment: *The draft SEIS statement that the NWFP reserve system created de facto protection areas for POC fails to recognize that LSRs are already highly roaded and allow off-highway vehicles, and will be managed extensively in the future for plantation restoration, fuel reduction, special forest products, and fire management. All these activities can easily spread PL, so the analysis in the SEIS is skewed. [34-37]*

Response: While it is true these activities are variously permitted or expected, in different locations, depending upon where they are needed or happened historically, the reality is that even if the NWFP is fully implemented (which is the SEIS assumption), overall management activity within Late-Successional Reserves is a small fraction of what it was before adoption of the NWFP. The full citation from this section states, "In many ways the reserve system of the NWFP created de facto protection areas for POC. Certainly the risk of exposure has been reduced for many POC stands as a result of these allocations." In context, the statement is true.

Comment: *The draft SEIS incorrectly states the NWFP did not address POC because it was outside its scope and purview. Appendix A of the FSEIS for the NWFP (the FEMAT report) states ". . . it is critical for the conservation of [POC] to close roads and restrict further road construction in watersheds that contain uninfected stands (e.g., inland California populations)" (FEMAT pg. IV-123). [32-4]*

Response: The SEIS has been revised to correct this omission.

Assumptions and Clarifications

Comment: *Wasn't the original intent of the Range Wide Assessment to develop a conservation strategy for POC? It is not clear to me from the SEIS what became of that effort and what the relationship is between the SEIS and the Range Wide Assessment. [21-1]*

Response: The POC Range-wide Assessment, begun by the Agencies in 1998 and referenced in this SEIS, was designed primarily for internal (Agency) use to provide a comprehensive summary of recent information about POC. It will be released before the final SEIS for POC.

At one point it was to include a chapter suggesting a conservation strategy, but that concept was dropped in favor of developing alternatives for this SEIS.

Comment: *The SEIS needs to account for new technology and new behaviors such as new and more powerful off-highway vehicles, and GPS geocoaching which encourages off-trail travel. [34-13]*

Response: The Recreation section in Chapter 3&4 has been rewritten to discuss these use changes.

Comment: *The draft SEIS assumes that the Agencies will attain declared PSQ timber targets, but of course they will not. If monitoring is to pick up departures then it needs to be based on an accurate expectation of timber harvest. [34-34]*

Response: Some commenters maintain use levels consistent with full implementation of the NWFP as intended will not occur, while others maintain the Forest Health Initiative and the recent settlement agreement directing the BLM to consider a resource management plan alternative of rolling back the reserves to the minimum needed for federally-listed species will increase use levels above those predicted for the NWFP. The NWFP use level assumption is consistent with other recent Agency EISs and there appears to be scant reason to change it at this time. Regardless of actual use levels, if the PL spread predictions turn out to be correct, no adjustments would be indicated.

Comment: *The assumptions in the Pathology section unrealistically deny the very real possibilities of increased forest use associated with increasing human population, harvest pressures, and associated changes in land use allocation. [31-9]*

Response: The assumptions apply only as long as they are valid, and increases in use will signal a need to be even more vigilant in comparing actual PL spread with predictions in the SEIS. However, increases in recreation, special forest products, and similar uses are predicted, and may offset the reduction in timber management activities from levels of the 1980s. Future activity levels are arguably lower, higher, or about the same as past levels, and the SEIS has made a reasonable assumption. Regarding land use allocations, the SEIS assumes no change. If demands or other factors cause land use allocations to be reconsidered, then implications to POC management need to be reconsidered as well.

Comment: *Matrix and Riparian Reserve acres are lumped together in the table of gross and POC acres by NWFP land allocation. Surely the Riparian Reserves are mapped, and the acres in these two very different land allocations could be displayed. [44-21, 44-22]*

Response: Because Riparian Reserves surround seeps, springs, intermittent steams, and unstable soils, project Riparian Reserve mapping generally relies on site-specific information and field verification. Therefore, the SEIS estimates of Riparian Reserves (and non-forest areas) is a percentage of the Matrix/Riparian Reserve land allocation, based on individual administrative unit experience. The units have created a Riparian Reserve map for use in GIS that can be used for some estimates. For example, such maps would be a fairly accurate tool for matching plant associations with Riparian Reserves along fish-bearing streams. But because many soil and water features do not show up on the underlying U.S. Geological Survey base maps, the Riparian Reserve GIS maps likely underestimate total Riparian Reserve acres.

Comment: *The draft SEIS assumption that there will be adequate funding to implement the selected alternative is flawed. The appropriations for the Agencies are not in an upward trend, and it is very unlikely that there will be enough money to fully implement a POC management strategy. At the very least, the draft SEIS should have outlined a prioritization plan for different components of a POC management plan, so that the public and the decision-makers could make an informed decision about what alternative would protect POC in the most efficient and effective manner. For example, given that the Agencies have a road maintenance backlog and will probably not receive funding in the foreseeable future to adequately maintain all roads that need it, the most efficient and effective way to manage for protection of POC may be to close and/or decommission roads that are not used often or that pose a significant threat to POC, wildlife, and/or water quality. [32-19]*

Response: Most of the elements of the strategy are mitigation measures related to specific activities, and thus will be implemented as part of the costs of those activities. Other elements of the action alternatives are being implemented now. The biggest difference between Alternative 1 and Alternative 2 is not an increase in the types of treatments, but the risk key that will lead to more consistent implementation and the added protection of uninfested 7th field watersheds. As shown in the Cost section of Chapter 3&4, the estimated implementation cost for the Proposed Action is actually less than the current direction. The largest cost item, the resistance breeding program, is acknowledged to be dependent upon available funding.

Comment: *The SEIS assumption that gates will work "most of the time" is highly suspect. The only evidence that the draft SEIS offers in support of this assumption is unpublished data from a sampling of gate closures which purported that 90% of gates were intact and apparently effective in preventing entry. The truth is, the Agencies don't have a clue how often gates are breached (or how many keys to gate locks are given to members of the public by Agency personnel). The Siskiyou Project, KS Wild, and other organizations and members of the public frequently find that gates have been breached, and notify the Agencies of this fact. Many times, the Agencies ignore the fact that gates have been vandalized or left open. [32-19]*

Response: This may be a case of remembering the exceptions, and further, not necessarily knowing why a particular gate is in place and when it is supposed to be open or closed. The sampling discussed in the Pathology section represents a systematic random sampling, and helps meet commitments to monitor the effectiveness of various PL control strategies. The Pathology section goes on to acknowledge that gates are not as effective as permanent road closures, and managers addressing individual risk situations will use that information accordingly.

Comment: *The statement that resistant seed can now be used to achieve large POC on high hazard sites is premature given the experimental stage of this program, and cannot at this point be relied on as a certain source for large POC. [44-37, 37-5, 25-1]*

Response: Uncertainties about the durability of resistant seed for mitigating POC loss are displayed in the SEIS, and has been variously edited to place more emphasis on reducing disease spread and less on the benefits of planting resistant stock.

Comment: *The draft SEIS does not adequately address the issue of time lag. Even if resistant varieties become available, there will not be developed, out-planted in all the remote areas of the forest, reach maturity, and become fully functional in the ecosystem for several hundred years. It's true that dead POC do provide some habitat complexity that helps bridge the gap, but the EIS does not recognize the temporal gap in POC recruitment into all its diverse ecological roles. [25-4, 34-30, 33-12, 4-6]*

Response: A planting assumption has been added to the Assumptions section of Chapter 3&4, and a discussion of expected growth is included in that section. References to "several decades" have been removed or changed to 100 years.

Comment: *The availability of resistant seedlings is key to the involvement of industrial and non-industrial forestland owners. [2-17, 26-1]*

Response: A requirement to coordinate with other owners to achieve overall POC management objectives has been added to the Standards and Guidelines of Alternatives 2, 3, and 6. This includes developing or facilitating development of enough resistant seed to supply private lands.

Comment: *The draft SEIS needs to establish some parameters for planting disease resistant stock and how these areas will be managed in the future. The draft SEIS needs to address whether or not resistant stock should be planted in infested areas, and the outcome of planting disease resistant stock. [25, 15, 32-64]*

Response: The newly added planting assumption in the Assumptions section of Chapter 3&4 addresses these points.

Comment: *Once disease resistant stock is planted, the Agencies will claim that protections such as seasonal or permanent road closures are unnecessary and precautions such as vehicle washing during fires will be removed. The SEIS needs to explicitly state that PL spread preventions must remain in effect even though disease resistant stock has been planted. [32-64]*

Response: Planting is one of the management practices available to mitigate adverse effects identified through the risk key (Alternatives 2, 3, and 6) or through other site-specific analysis. However, the Planting Assumption in Chapter 3&4 and Appendix 6 describes the minimum time for planted POC to become large enough to significantly contribute to ecological function as being 50 to 100 years, depending upon the level of stand tending taking place. Clearly, short-term mitigation of most ". . . measurable effects on land and resource management objectives . . . " can not be accomplished simply by planting trees. If Alternatives 1, 2, 3, or 6 are chosen, implementation of a combination of treatments would continue for the foreseeable future, depending upon the nature of the effect to be mitigated.

Comment: *The area of POC could be increased by planting POC onto sites that are suitable for the species but currently have none. It is clear to me from my photo surveys that red alder is an excellent indicator of sites suitable for POC. There are other indicators also such as aspect, soil depth, etc. I have successfully introduced POC onto my tree farm using this concept and feel it can be applied on Federal and private forest land. These sites, even if*

classed as high risk, are uninfected and have a lower likelihood of becoming infected in the future. [2-1]

Response: This opportunity is described in the newly added planting assumption.

Comment: *In addition to protecting existing stands and replanting killed stands, Agencies can try to increase the acreage of low-risk POC stands by planting seedlings on drier topography (e.g., farther away from streams than it occurs naturally). I believe that the limitation of POC to streamsides in many locations is a result of drought intolerance of very small seedlings, which can be bypassed by planting nursery stock. This applies to any alternative. [25-9]*

Response: This opportunity is described in the newly added planting assumption.

Comment: *Restoring POC with resistant stock will only happen if two activities are successful:*

> *1) Resistance is discovered in genotypes suited to that specific environmental region or can be transferred into such genotypes. Much work has gone into discovering resistant trees, but known resistance is still sparse for much of the range and its effectiveness over even part of a rotation remains to be proven.*
>
> *2) Some management methods are developed and successful at allowing resistant seedlings, planted into existing vegetation, to reach the canopy on those sites where POC has been killed. The methodology for using resistant POC seedlings is not presented here. So far as I know, no significant proposal has been made for how to use resistant seedlings to return POC to its previous importance in an ecosystem; Appendix 6 provides only a few guidelines for developing such a proposal. Using resistant POC is an important but unproven tool, and no management to maintain POC should be based on that method alone. [25-2, 25-10]*

Response: Although resistant trees have not been found in all breeding zones in sufficient numbers to supply genetically diverse seed for reforestation purposes, neither have many trees been tested in these same zones. Indications are that a sufficient genetic base will be found.

Comment: *The objective should be to increase the resistance of POC to disease by planting resistant stock wherever POC is cut and risk is high or moderate, as well as replacing stands killed by PL. [25-8]*

Response: The newly added planting assumption describes these two opportunities.

Comment: *Page A-46, Appendix 6] This appears to be the only description of how resistant POC might be introduced into the forest—but these are simply suggestions for developing a methodology. I have the following disagreements with this appendix:*

> *a) Item 3. There is little co-occurrence with western red cedar; it cannot be assumed to take the place of POC killed by PL except in a few local areas. Incense cedar has a*

partially overlapping range but different microhabitat requirements in most places I have seen it.

b) Item 5. I do not recommend underplanting without providing some overhead light for the planted POC. POC usually naturally invades disturbed areas along with Douglas-fir, but then becomes an undercanopy later, because the fir grows faster. I doubt that POC will grow well enough to make the canopy if planted in heavy shade. Underplanting in gaps in sparse stands may be more successful.
c) I do not understand the intention of "Integrate the use of resistant stock with other management techniques such as prescribed fire", or of "Resistant stock will be used in a manner which does not compromise the health of natural stands."

d) If resistant stock is really resistant, why not plant it where infection risk is high? I thought that was the point of developing resistant stock. Not planting where risk is high will exclude much of the interior part of the range, where POC is primarily along streams, from use of resistant stock.

In addition to the points listed, the following need to be considered: consider competition—will resistant POC be planted only after disturbance such as harvest or fire, or will resistant trees be planted into undisturbed vegetation?; if only after disturbance, will this not remove much of the range from the use of resistant stock for the foreseeable future?; if resistant POC is planted in undisturbed areas, will brush or the trees that replaced the dead POC be removed or treated? [25-30]

Response: The guidelines in Appendix 6 for developing a methodology have been replaced with an assumption of planting levels and locations, and subsequent growth. The section eliminates the reference to western red cedar. Plantations, which are assumed to be installed in PL-mortality, harvest, or fire areas are assumed to receive site preparation, release, and thinning treatments sufficient for them to reach growth objectives. Since resistant stock may foster PL without showing effects, planting of resistant stock will not be done where "bridges" for PL from infested areas to uninfested areas would result. Such areas include high public use areas where PL can be picked up on shoes and transported to other areas.

Port-Orford-Cedar Background

Comment: *The potential for commercial exploitation of POC is not adequately discussed. [43-76(S)]*

Response: Commodity production including POC logs and POC products can be consistent with management objectives identified in the land and resource management plans for the Siskiyou NF and the BLM Districts engaged in the SEIS. Applicability of commodity production is a function of the resource objectives and land use allocation for a specific site.

Comment: *A POC stand should be defined as any stratified stand or timber harvest unit with more that 1% of volume, basal area or number of trees. Riparian stands should be stratified separately from upland stands. [2-4]*

Response: Stand is defined in the Glossary of the SEIS. There are no quantifiers in the definition for amounts of POC in a stand. Riparian POC stands are recognized separately

from upland stands in the analysis done in the Ecology and Plant Associations and Water and Fisheries Sections of Chapter 3&4.

Comment: *The SEIS is incorrect when it says "POC seems largely restricted to moist sites where the regionally common species (Douglas-fir and western hemlock) grow poorly." [25-27]*

Response: This sentence has been deleted from the SEIS.

Distribution Across the Range

Comment: *Was the 2002 disease mapping on the South Fork of the Coquille River drainage, Powers Ranger District, part of the GIS data? [2-20]*

Response: The 2002 mapping is not included in the GIS database. This data was developed for district use on a localized project analysis and was not mapped at the same standards as the Siskiyou NF data. The South Fork Coquille mapping was never intended to be used for regional analysis of POC or the root disease data.

Comment: *It is not clear what items are included and the rationale for their inclusion in the private lands discussion for the North Coast Risk Region. For example, are private lands included in the data for the Coos Bay District? Are roadside surveys included in the data for private lands? [44-23]*

Response: There is no roadside survey data available for the private lands within the North Coast Risk Region, and therefore private lands acreage is not included in the Coos Bay BLM District discussion. A separate Private Lands in the Region section is included.

Comment: *The non-roadside infestations were mapped to a 200-foot wide infestation width on each side of an infested stream on the Powers Ranger District. If this mapping standard was used on all Forest Service lands, the draft SEIS overstates the number of PL-infested acres. [2-19]*

Response: For most of the Siskiyou Risk Region, there is a steep moisture gradient as distance from streams increases. This change in environmental conditions limits POC to a much narrower band along streams. Using a mapping standard for the North Coast Risk Region, which contains the Powers Ranger District, and applying it to other areas within the natural range of POC, would be inconsistent with local conditions and would over estimate acres of POC and PL.

Comment: *The Kalmiopsis Wilderness Area is uninfested except for Collier Creek. [32-5]*

Response: Besides Collier Creek, portions of the Chetco River drainage also are infested. Information on the SEIS maps shows most of the Kalmiopsis Wilderness to be uninfested. The uninfested POC in the Kalmiopsis Wilderness Area is shown on Map 3: *Phytopthora lateralis* and Port-Orford-Cedar by NWFP Allocation for the Oregon Portions of the Range under the Congressionally Withdrawn symbol.

Comment: *The Siskiyou Wilderness Area contains important stands of POC. [32-5]*

Response: The importance of uninfested POC stands in wilderness and elsewhere is recognized and highlighted in several sections of the SEIS, and the importance of such areas would be recognized in the implementation of Alternatives 1, 2, 3, and 6.

Comment: *Was the post Fiscal Year 2000 planting of POC on the Coos Bay BLM District done with resistant seedlings? [44-23]*

Response: The planting noted in the Coos Bay part of the Distribution Across the Range section of the SEIS was nonresistant seedlings. The SEIS has been edited to reflect this information.

Comment: *The pre-root disease baseline for POC should be included for the entire range of the species. This information shows that historically the highest concentrations of POC were on private and county lands along the coastal shelf from Coos Bay to Port Orford. Many of these stands had much greater than a 5% component of POC. Combinations of fire, harvest, regeneration practices, land use change, and root disease have drastically reduced the importance of mature POC on the private and county lands along the coastal shelf from Coos Bay to Port Orford. As a consequence, economic as well as disease pressure on the remaining Federal POC resource is dramatically increased, as is the importance of providing lasting protection. This extra urgency in protecting Federal POC is not evident in the SEIS. [31-4, 31-5, 31-6, 38-19(S)]*

Response: Historically, POC was a more prominent component across its natural range. Over the last 150 years the loss of old-growth POC due to fire, harvest, land use changes, and root disease has been especially pronounced on the private and county lands along the coastal shelf from Coos Bay to Port Orford. A 1953 description of the POC is provided in "A Natural History of Western Trees" and was supplied by a commenter:

> But from the first discovery of the big stands of timber in 1855, man and fire have assaulted it relentlessly. A disastrous fire in the Coos Bay region at an early date wiped out a vast but undetermined amount. Next, sawmills were at work, and schooner were anchoring off the rocky, harborless coast, to be loaded with Cedar logs carried by high line from the cliffs to the decks.
>
> The demand for Port Orford Cedar, as soon as it became known in eastern and foreign markets, grew swiftly and remained steady.
>
> Today [1953] 69 percent of this precious timber is in private ownership, which means that its destiny is the saw mill . . . while 15 per cent is held on the Oregon and California Railway revested grant lands managed by the Department of Interior [BLM]. Only 16 per cent is in the hands of Forest Service.
>
> The best way to see this tree of almost legendary fame is to follow U.S. Highway 101 between Reedsport and Gold Beach, Oregon.

Old-growth POC that might have survived logging interests on private lands have since been lost to urbanized land use changes and the POC root disease. For the most part, old-growth POC along the 101 corridor does not exist today. Currently, almost all old-growth POC is on Federal ownership.

Comment: *Did the Coos Bay area provide all of the POC timber in 1953 and why is the 1953 data for POC distribution by land ownership presented? [44-23]*

Response: The context for this question is not the geographic source of the POC timber. The important point is that pre-PL infestation within the natural range of POC, almost 70 percent of all merchantable POC timber, was on private ownerships and about 30 percent was on lands administered by the Federal Agencies. This is very different from POC distributions seen today, especially for larger more economically valuable trees.

Comment: *I have observed live POC and PL infections at the State of Oregon campground at Tahkenitch. Therefore, the natural POC occurrence may be further north than was described in the SEIS. [2-18]*

Response: It is believed that the POC located at the Tahkenitch Campground were planted outside of the natural range of POC and were therefore excluded from Map 4.

Port Orford Cedar Acreage Data

Comment: *The SEIS does not adequately discuss locations and character of POC that survived in the Biscuit fire area. The SEIS does not recognize that POC still exists in many of those stands when it identifies the uninfested 6th and 7th field watersheds. [32-81(S), 44-25, 32-20]*

Response: The discussion of the Biscuit Fire in the POC Acreage Data section of Chapter 3&4 has been edited to say that if POC actually survived, or is reseeded or replanted in burned areas, the Standards and Guidelines of the selected alternative (including those defining uninfested watersheds, if PL was not previously present) would apply to them.

Comment: *There a discrepancy between the total infestation for the North Coast Risk Region (Coos Bay BLM and Powers RD) of 7,560 acres shown on Table 3&4-5, and the infestation of 9,447 acres cited on page 3&4-16 for the Powers RD? [2-21]*

Response: Review of inventory data for the Powers Ranger District shows a total of 61,014 acres with POC. Of this, 8,138 acres are infested with PL and the other 52,876 acres have healthy POC. The narrative and the appropriate tables have been modified to reflect this change.

Comment: *A study by Jules et al. in 2002 in the Siskiyou region shows that some Forest Service GIS mapping of PL substantially underestimated PL infections. Since SEIS projections are based on the GIS data, the SEIS projections must also be low and thus underestimate the seriousness of future PL levels. [33-10, 29-8, 33-24(S)]*

Response: Jules' et al. (2002) Page Mountain study area was conducted in the Siskiyou Risk Region. The SEIS does not use the GIS data in the Siskiyou Risk Region as the baseline from which the 100-year spread is calculated in Table 3&4-10. The SEIS states that, "Given some of the inherent overestimates and underestimates of the GIS mapping data, the CVS percent mortality calculation is considered more useful for projecting the long-term POC mortality in each region for each alternative."

The CVS data was reexamined, however, and the final SEIS now uses an 11 percent infestation rate as a base for projecting long-term mortality (Table 3&4-10) in the Siskiyou Risk Region.

Comment: *With a relatively small range, natural catastrophes such as wildland fire can have a large impact on population viability. The Biscuit Fire dramatically demonstrated this, but I find no discussion in the document of the long-term effects of catastrophic disturbances such as this. The SEIS needs a discussion of the impacts of recent and future catastrophic fires upon the current population of POC. [31-11, 32-81(S), 31-8]*

Response: Within the Biscuit Fire perimeter, air photo interpretation and other remote sensing applications indicate approximately half of the acres with healthy POC experienced a stand-destroying fire event. These acres were removed from the GIS database. A discussion of the likelihood of future wildland fires and their potential effects on POC has been added to the Fire and Fuels section of Chapter 3&4 and referenced in the Comparison of Alternatives section in Chapter 2.

Comment: *The statistical accuracy of the mapped POC data in GIS and CVS leave significant uncertainty for describing the POC population. There are few accurate maps of the extent of POC and the root disease for Oregon. [34-39, 21-3]*

Response: The SEIS seeks to create the most accurate map ever of POC and PL areas across the natural range of POC. While there are differences in mapping standards based on administrative unit and source of the mapping data, this effort still represents the most comprehensive effort to date to describe POC and PL locations. Appendix 5 recognizes that effectiveness and validation monitoring will continue to improve the existing mapping and increase its accuracy over time.

Comment: *Reporting PL infestations as a percentage of the total acreage of POC does not accurately represent the negative impacts that the infestations have on stream ecology, riparian reserves, and fisheries. [32-51]*

Response: The SEIS displays the PL infestations as a percentage of the total acreage of POC within risk regions to provide an overview across the range of POC. Specific impacts of PL infestations upon stream ecology, Riparian Reserves, and fisheries can be found in in Chapter 3&4 under Ecology and Plant Associations and under the Water and Fisheries sections.

Pathology

Comment: *The specific bases for impacts over 100 years on high-risk sites are not clearly discussed. They are estimates and are not quantitative or science based. [2-2, 33-2, 33-7, 33-8, 33-9]*

Response: The percentages which are used in the SEIS to represent impacts over 100 years under the different alternatives are professional estimates made by FS pathologists with input from forest pathologists from the Oregon Department of Forestry and Oregon State University. As 100-year projections involving consideration of many highly variable factors, no claim is made that they are absolutely precise. They are believed, however, to give a reasonable estimate of the relative impacts associated with each of the alternatives in terms of

ranking and magnitude, and provide a realistic framework for comparing alternative effects. Additional clarification of the reasoning used in making the estimates has been added to the SEIS.

Comment: *The possibility of all innoculum dying naturally over time on an infested site allowing such a site to be recolonized by healthy POCs is not discussed. [2-13]*

Response: This possibility is not discussed in the document because, although it may happen, it is likely infrequent and only occurs under fairly unusual circumstances (for instance, when all the trees in a high-risk area are killed very rapidly by the pathogen and there is a several year period before POC seeds back). There is not enough evidence for the SEIS to speculate about this possibility, but it might need more evaluation in the future.

Comment: *Seasonal road closures, are difficult to administer, expensive, and are not always respected. Rain during the periods when the roads are open may render them ineffective. They are not nearly as effective as permanent road closures in protecting POC. [2-15, 25-29, 34-32]*

Response: Seasonal road closures are susceptible to all of the problems listed. Their effectiveness is influenced by how well they are designed and located, how stout the gates or structures used are, and how well they are administered. Maximum effectiveness of seasonal closures involves use of barriers that are resistant to vandalism, are sited in locations where they cannot be bypassed, and that are carefully monitored and closed whenever rain events of sufficient magnitude to foster PL spread occur. Permanent road closures are more effective than seasonal road closures and are preferred when they can be used. The difference in effectiveness between the two types of closures is discussed in the Pathology section. However, even with their shortcomings, seasonal road closures greatly decrease road use relative to the amount that would occur if roads are open and unobstructed at all seasons of the year. They certainly reduce probability of spread relative to no treatment.

Comment: *Many currently-used management activities lack hard evidence of effectiveness and are perceived to be ineffective. What are the treatments? How well do they really work? Which are the best? Where are the monitoring results? Have they been looked at over a variety of habitats? Roadside sanitation and vehicle washing in particular seem questionable. [4-2, 25-5, 25-23a, 29-7, 29-14, 32-16, 32-35a, 32-75, 33-13, 33-16, 33-17, 33-23(S), 34-31, 37-2, 38-5, 38-18, 43-77(S)]*

Response: Many results of effectiveness monitoring and other evidence that control measures will be successful were not well covered in the SEIS. Additional discussion has been added to the SEIS.

Comment: *Differences between high–risk and low-risk sites are not well documented. There are no risk maps for Oregon evaluating the probability of introduction of PL. [21-6, 33-3, 33-4]*

Response: High-risk sites are areas with conditions favorable for spread of waterborne PL spores. High-risk areas were defined for this SEIS as low-lying wet areas that are located downslope from already infested areas or down hill from sites where future introductions could occur, especially areas below roads. They include streams, drainages, ditches, gullies,

swamps, seeps, ponds, lakes, and concave low-lying areas where water collects during rainy weather. Low-risk sites are those that do not fit the criteria for high-risk sites. They include upland sites, sites on convex slopes, sites above the high water mark of streams, and areas away from roads. Detailed plant association-level risk maps for POC do not exist for Oregon. The estimated extent of high-risk areas for PL infestation in Oregon considered the area within 50 feet of roads, streams, and water features in all areas where mapping showed that POC occurred.

Comment: *How long can PL really survive in soil? The EIS misinterprets data on survival of PL. [25-23b, 33-18]*

Response: Hansen and Hamm (1996) examined long-term survival of POC and found that: (a) PL could not be isolated directly from any POC dead for more than 2 years, (b) the pathogen was recovered by baiting from litter bags after 5 years but not after 6 years, and (c) the pathogen was recovered by baiting of root systems in buried pots for the entire 7 years of the study, though recovery was sharply reduced in the last year. The wording in the SEIS has been changed to read that PL has been shown to survive for at least 7 years under ideal conditions. Hansen and Hamm indicated that PL survival was considerably influenced by temperature and moisture and was much shorter when warm, dry conditions prevailed than when conditions were cool and moist.

Comment: *Research by Jules et al. was improperly dismissed in the draft SEIS. The importance of roads as avenues of spread were not given sufficient weight, and distance of potential spread down a stream was dismissed with an unsupported speculation. [29-5, 29-10, 32-36, 33-14, 33-15, 34-44]*

Response: The research of Jules et al. (2002) was not dismissed. It is an useful study. The study used a dendrochronology approach to determine the probable way in which PL was introduced into and subsequently spread within four adjacent watersheds. Its results tally with other investigators' information indicating that PL is introduced into areas on vehicles traveling on roads and that streams often are infested at points where roads cross them. It also indicates that animal or human foot traffic are probably responsible for considerable within-basin transport of PL. The Jules et al. paper was cited in the SEIS as one of the papers indicating that transport of infested soil on vehicles is the major means of long distance spread of PL. The SEIS analysis also agrees that where it can be used, exclusion of vehicles provides more protection to uninfected POC than any other single approach. Jules et al. indicates that the maximum distance that they observed between a presumed dispersal source (a road crossing on a creek) and the first dead tree that they detected down stream in a creek was 165 meters. They also indicated that spore dispersal in flowing water most likely follows a diminishing function with distance from a source controlled by the rate at which spores settle in water. Analysis in the SEIS, however, suggests that a dendrochronological approach may make it difficult to be sure that you are in fact detecting the first tree that is infected in a creek, especially if the initial infection was many years before. Small trees and especially seedlings that may have been closer to the dispersal source and acted as intermediate spore producers are no longer detectable in such cases. Nevertheless, the SEIS indicates that spread to a first POC that is well down a stream is possible as Jules et al. suggest, though the probability is considerably smaller than spread to a first tree that is close to a dispersal source.

Comment: *The draft SEIS assumes a mortality rate of 0.1% per year on all low-risk sites. It concludes that there will be no differences among alternatives in impacts on low-risk sites. These are questionable statements. [31-1a, 31-10, 33-5, 33-6]*

Response: Many observers have reported that levels of POC mortality attributed to PL on low-risk sites is very low or appears to be absent altogether (Goheen et al. 1999; Harvey et al. 1985; Hansen et al. 2000; Kliejunas 1994; Roth et al. 1987; Zobel et al. 1985). Unfortunately, there are no published studies that have evaluated amount of POC mortality on low-risk sites, especially over time. The estimation of 0.1 percent per year is based on personal observations and professional judgements of of Agency pathologists, and it is meant to be an average.

Though levels are very low, especially compared to mortality levels in high-risk areas, there is certainly variation in amount of POC mortality on low-risk sites. Higher levels of infection surely occur near the boundaries between low-risk sites and infested high-risk sites, and lower levels of infection occur where POC in low-risk areas occurs at long distances from such boundaries. Alternatives 1, 2, 3, and 6 would reduce the amount of roadside inoculum near low-risk sites to varying levels and regulate or curtail human activity associated with bough collecting and harvest of other special forest products that could involve foot traffic from infested high-risk onto low-risk sites. The probability of PL-caused mortality in low-risk sites would be slightly less under these alternatives than under Alternatives 4 and 5, and this is now indicated in the SEIS. The assumption that mortality on low-risk sites will be completely replaced by natural regeneration and growth has been modified to say "partially," and a footnote has been added to the table showing 100 years infested acreage predictions to indicate the predicted 0.1 percent per year predicted mortality on low-risk sites is not included.

Comment: *The assumption that vehicle use in the next 100 years will remain at about the same level as it has been in the last 50 years is unrealistic. There is a very real possibility of increased forest use associated with increasing human population, harvest pressures, and associated changes in land use allocations. [31-1b, 31-9, 31-10]*

Response: There is, of course, uncertainty about what will happen in the next 100 years. The analysis in the SEIS assumes that overall level of vehicle use would be the same as in the past 50 years, but suggests that there will be changes in the kind of use with a much higher proportion of it involving recreationists and small forest products entrepreneurs rather than timber harvesters. The level of use in the last 50 years has been high, and the SEIS assumption is that it will remain high over the next 100 years. If use substantially changes, PL spread could be affected. Such a change would be reflected in monitoring, and the selected strategy can be reconsidered as needed.

Comment: *The ecological and economic significance of POC has been seriously impacted by root rot and human activity. Unless deliberate actions are taken to reverse the course, the pathogen will cause the functional extinction of the species. [31-2, 32-11, 32-13]*

Response: It is generally agreed that PL will not cause the extirpation of POC because many POC will survive on low-risk sites and because POC is an extremely prolific seed producer starting at a fairly young age. On infested high-risk sites, POC usually continues to seed and maintain some level of presence on the site, even though chronic PL infection insures that

trees never live to attain large size. However, PL has had considerable impact on POC, especially on high-risk sites where conditions are particularly favorable for the pathogen and disease management actions were not taken in the past. Without the analysis, however, it is premature to say to what degree the root disease has impacted POC's ecological and economic significance. The analysis in the SEIS attempts to quantify the impacts of the various alternatives so the decision-makers can select the alternative that most efficiently meets the Need for the maintenance of POC as an ecologically and economically significant species on BLM and NF lands.

Comment: *The draft SEIS discusses the risk of PL spreading from Oregon to California but not spread from California to Oregon. It is not clear why the latter is not a concern. [32-18]*

Response: There is no biological reason, under the proper conditions, why PL could not spread from infested sites in California to infect POC in Oregon. From the pathology perspective, this possibility is a concern and has been considered in the predictions of 100-year spread. The SEIS assumes the existing management direction for the administrative units in California (see Appendix 3) applies across the range of alternatives in the SEIS.

Comment: *The statement that a remote area on the Little Chetco River became infested in an unexplained manner is questionable. The pathogen must have been introduced on vehicles using the mining claim road that runs into the Wilderness in this area. [32-22]*

Response: A team including forest pathologists from the FS and Oregon State University visited the Little Chetco River in August 1995 to attempt to determine how and where PL was introduced. The point of origin of the infestation, as determined by locating the highest point with infection of POC in the drainage, was on a tributary of Hawks Creek (at T. 39S, R.10W, Sec.14, NW ¼), a rugged area with no trails or roads. The team hiked to the Chetco River from Baby Foot Lake, walking most of the way on the mining access road to the Emily Cabin. Although they noted numerous POC in wet crossings and seeps, they found no evidence of PL infection or POC mortality along the road. Mortality and confirmed infection by PL were only observed on hosts in the channels of Hawk Creek and the Little Chetco River below the apparent origin point. There was some evidence of old logs having been cut in the stream area near the origin point and there was speculation based on District reports that a portable gold mining dredge had been used in the stream. There was also record of a fire suppression effort uphill from the point of origin, but fire fighting was not considered to be a likely cause of disease introduction since the fire occurred during hot summer weather, no water was brought in to fight the fire, fire crews accessed the site on foot, equipment was packed in by horses, and evidence of POC mortality involving large trees quite some distance down stream was observed only days after the fire had burned. The team felt that the means of introduction of PL in the Little Chetco area could not be determined and remained unexplained. Direct spread down the mining road by contaminated vehicles had been suspected but, on examination, appeared unlikely.

Comment: *The draft SEIS does not adequately discuss cumulative effects of off-highway vehicle use in spread of PL nor does it provide information on cumulative effects of logging and other activities on private land. [32-35b]*

Response: The discussion of off-highway vehicle use in the Recreation section has been expanded and then referenced in the Pathology section and considered in the 100-year PL

spread predictions. Such use is part of the assumption about future activity levels. Logging on private lands is discussed in the Timber Harvest on Private Lands within the Range of Port-Orford-Cedar section early in Chapter 3&4, and is also considered in the 100-year PL spread predictions.

Comment: *Given the primary purpose and need to maintain POC as an ecologically and economically significant species on Federal land, the draft SEIS does not explain how other uses such as off-highway vehicle use, timber sales, and special forest product gathering can continue at their current levels and POC be protected at the same time. [32-44]*

Response: The alternatives include a range of PL control measures from no control (Alternative 5), to the application of various mitigation measures applied to the current level of activities (Alternative 1), to applying mitigation measures including redesign or cancellation of projects (Alternative 2), and finally to alternatives that identify uninfested areas in which many management activities are prohibited (Alternatives 3 and 6). The analysis indicates how well each of these alternatives lessens the spread of PL and what benefits that lessening has to ecological and other functions of PL.

Comment: *The SEIS should make spatially specific identifications of high-risk areas and identify protection measures. The best way is to expand the protected watersheds and core areas identified in Alternative 3. [32-66]*

Response: High-risk areas are low-lying wet areas that are occupied by POC and are located downslope from already infested areas or downhill from sites, especially roads, where future introductions could occur. They include streams, drainages, ditches, gullies, swamps, seeps, ponds, lakes, and concave low-lying areas where water collects during rainy weather. There are no detailed maps showing exactly where all individual high-risk areas are in Oregon, though their locations can be approximated by overlaying a map of streams, roads, and water features on the map of POC occurrence. In terms of managing POC root disease, some alternatives focus on protecting yet uninfested high-risk areas. The 162 uninfested 7th field watersheds identified as POC core and buffer areas in Alternative 6 and as special emphasis areas in the risk key in Alternative 2, contain a high proportion of the yet uninfested high-risk areas in Oregon. Alternative 3 contains a smaller, but still substantial portion of uninfested high-risk areas in the POC cores and buffers of its 31 uninfested 6th field watersheds. Under any of these alternatives many of the uninfested high-risk areas with POC would receive management emphasis.

Comment: *The draft SEIS ignores the risk of infection during storm events on upland low-risk sites. There are very high soil water content and water movement in upland areas during storms. [34-35]*

Response: Infection of POC requires very wet conditions and the presence of PL inoculum in the immediate vicinity of a host's roots. While storm events can result in very wet soil conditions on low-risk sites, there is usually no PL inoculum. Most PL inoculum is spread in flowing water downhill from introduction points and is channeled into drainages and especially streams. It tends to be very much concentrated in high-risk sites, and very seldom moves uphill to low-risk areas. When infection of POC does occur in low-risk sites, it primarily involves movement of inoculum in soil clinging to the feet of animals or humans, or on vehicles that are being driven across country. When inoculum is deposited in the

vicinity of a POC root by one of these carriers during very wet conditions infection can occur. POC on low-risk sites can be infected by PL, but at very low frequency, especially compared to rates of infection on high-risk sites.

Comment: *The draft SEIS discloses the fact that PL has four spore types but discusses only two of them and offers an unsupported conclusion that two of the spore types are not important for spread of POC root disease. [34-40]*

Response: The other two spore types are zoosporangia and oospores. Zoosporangia (also sometimes just called sporangia) are thin-walled sacs that form at the ends of mycelial branches. In some species of *Phytophthora*, these zoosporangia can be broken off the mycelia and blown in wind or spread in water. These are called caducous sporangia. Wind dispersal can result in rapid, wide-scale spread completely across a landscape. There is no evidence that PL forms caducous sporangia in nature, and the observed spread of PL clearly occurs via water and roads with no evidence of wind involvement. The oospore is the sexual stage of a *Phytophthora*. PL is homothallic and, in the laboratory on special media, occasionally produces oospores without involving two mating types. Oospores like chlamydospores can survive for considerable lengths of time and then, when conditions are right, germinate to form mycelia, sporangia, or zoospores. Oospores of PL have not been found in nature. If oospores do occur in the forest, they would function as long-term resting spores, that could, like chlamydospores, be involved in long-distance spread in soil.

Comment: *The draft SEIS indicates that there is very little spread of PL during the dry summer months but does not take into account the risk associated with rain storms during the summer. What about puddles or seeps on or along a road? [32-21, 34-41]*

Response: PL requires several hours of very wet conditions to infect a POC root. The likelihood of this occurring during the dry season is much lower than during the wet season of the year, but summer rain storms certainly can occur. The new Management Practice 15 in the SEIS (applicable to Alternatives 2, 3, and 6) seeks to address this concern by applying a permit or contract clause requiring project cessation of operations when conditions such as puddles in a roadway, water running in roadside ditches, or increases in soil moisture (as measured by moisture meter or the equivalent) indicate an unacceptable increase in the likelihood of spreading PL. Management Practice 9 lists road design and improvement features such as surfacing, removal of low-water crossings, and use of drainage structures to divert water away from roads that should be considered when dealing with wet spots or seeps on or along roads.

Comment: *Permanent closure of logging roads is by far the most direct and effective way to stem spread of PL. [33-22(S)]*

Response: The SEIS analysis shows that vehicle exclusion is the most efficient single way to prevent spread of PL. Closure of roads of any kind that enter uninfested high-risk areas is highlighted in the POC management strategies of Alternatives 1 and especially Alternatives 2, 3, and 6 in the SEIS.

Comment: *The draft SEIS gives equal weight to closing roads and not building roads at all for providing protection to POC. Isn't the latter more effective? [34-42]*

Response: Yes, but the difference is too subtle to show up in the ranking system discussed. Where possible, the option of not building a road at all into an uninfested high-risk area would be more effective than closing an existing road. In cases where a road already occurs in an uninfested high-risk area, closing the road will provide better protection than other options. The more completely the closed road can be blocked and/or obliterated, the better.

Comment: *The draft SEIS assigns a numerical risk rating to all factors except number of potential transport events. Won't this result in serious bias? [34-45]*

Response: The SEIS indicates that number of potential transport events should be considered in a cumulative effects analysis. However, no formula is supplied for how to do this. Certainly, if all else is equal, more potential trips increases probability of a successful introduction. Careful consideration will need to be given, however, to determine how to incorporate number of trips when comparing scenarios including different points of origin, types of potential carriers, weather conditions at the time of transport, and different types of carriers.

Comment: *The draft SEIS offers numeric probabilities of introducing PL without giving time frames or per unit context. [34-47]*

Response: The probabilities given in the SEIS are the relative probabilities that a given potential introduction event (a trip by a possible carrier) will result in deposition of viable PL inoculum along or at the end of the route taken during the timeframe of the particular trip, and that the inoculum will successfully infect a POC.

Comment: *Describe and rank the carriers of PL and focus management on the most effective prevention measures. [34-54]*

Response: Carriers are listed and essentially ranked in the section entitled Type of Carrier in the SEIS. Other factors such as route of carriers, weather at the time of carrier activity, and distances traveled, must be considered in determining the most effective prevention measures. Requiring management to focus on particular measures, however, would ignore the variable of individual sites. There are various conditions where almost any of the mitigation measures might be the best.

Comment: *The Agencies did not consider the likelihood that soil imbalances and particularly detrimental impacts of chemicals may predispose POC to root disease. [36-1, 36-2, 36-4]*

Response: There is no evidence that susceptibility to infection by PL or subsequent disease development is influenced by soil chemical imbalances. Rather, if PL inoculum is introduced in favorable high-risk sites where wet, cool conditions prevail, POC are infected on all kinds of areas irrespective of soil type or condition. In their range on Federal lands, POC have been infected on many sites where chemical fertilizers, herbicides, insecticides, or fungicides have never been used or have not been used for at least a decade prior to the infection event.

Comment: *Could alder planted in association with POC protect the tree from root disease? There is evidence that alder protects Douglas-fir from root disease. [36-3]*

Response: It was once postulated that the severity of laminated root rot, caused by the

fungus *Phellinus weirii*, was less on Douglas-fir in areas where that host was growing in association with red alder than where it was not. Subsequent research has cast doubt on the validity of this hypothesis, although removing all susceptible Douglas-fir and growing a rotation of alder (which is immune to *P. weirii*) on an infested site is a recommended treatment. There is no evidence that POC growing with alder are less susceptible to PL than hosts that are not growing with alders. PL and *P. weirii* are two very different pathogens with substantially different modes of action.

Comment: *The draft SEIS states "the progressive mortality of POC from an introduced pathogen that seems destined to spread over much of the range of POC" is inevitable under current management programs. The draft SEIS should place more emphasis on preventing spread of the disease to healthy trees. [38-2]*

Response: The actual quote is: "The disease appears destined to eventually spread to high-risk areas over much of the range of POC regardless of efforts to contain it." The statement captures the point that there is no way to prevent all spread, because some spread processses are outside the exclusive control of the Agencies. On the other hand, it did not intend to imply "all" high-risk areas, so the word "many" has now been inserted before "high-risk areas." The statement is not the Pathology conclusion, but the lead-in to the Need section to help focus the alternatives both on the need for, and the limitations of possible control strategies. In reality, the alternatives are variously projected to keep PL from spreading to a portion of a high-risk area, at least for the foreseeable (100 years) future.

Comment: *Permanent closure of logging roads is by far the most direct and effective way to stem the spread of PL. Long distance spread of PL needs to be investigated and the reasons for it simply eliminated, whether it be mining activity, bough collecting, or the transport of contaminated equipment. [33-22(S), 44-29]*

Response: Long distance spread of PL involves movement of infested soil from areas with diseased POC to areas with healthy POC, and vehicles are indeed the carriers in most cases. Animals and humans on foot also can act as carriers, but spread attributed to them is usually over relatively short distances. They are important in transport within a drainage, but are unlikely to act as carriers between drainages. All kinds of vehicles can serve as long-distance carriers, not just those used in mining, bough collecting, or timber harvest. Eliminating all vehicle activity within the entire range of POC in Oregon would not be an easy matter and is not desirable to many people. A strategy that protects POC in key uninfested high-risk areas and decreases likelihood of inoculum spread along roads in other areas seems more viable.

Comment: *Is it possible to predict which size trees will be hardest hit by the disease under each of the alternatives? [44-28]*

Response: Host trees of all sizes will be infected and killed on high-risk sites at times when favorable environmental conditions prevail and PL propagules contact their roots. Large trees take longer to die than small trees. There may be up to 4 years between infection and death for POC over 30 inches diameter at breast height while small POC (seedlings and saplings) may die in as little as a month or two after infection. The different alternatives will differ in the likelihood of inoculum being introduced into high-risk sites, not in the size of hosts impacted on those sites if an introduction does occur.

Comment: *Is use of chlorinated water necessary for fire suppression activities since the*

pathogen is not heat resistant? [44-31]

Response: Use of chlorinated water or water from a source that is known to be uninfested by PL is preferred for wildland fire operations in areas where POC occurs. In firefighting efforts, not all water used actually falls directly into the flames where it might be heated sufficiently to kill the pathogen. There is also the possibility of water spilling from helicopter buckets on the way to a fire. Use of chlorinated or clean water is considered under the current management direction prudent to avoid accidental PL introductions.

Comment: *What percentage of the Inland Siskiyou is infested with PL now? How do the percentages in the text at 3&4-33 and 34 compare with those in Table 3&4-9? The text appears to reflect the vegetation survey rather than the GIS data. [44-27]*

Response: The text reflects the current vegetation survey data because that is the data used to make the 100 year projections.

Comment: *Disease projections in acres are based on disease percentages on CVS plots that are done by tree frequency. Such an approach would overestimate PL infestations; GIS or other acres should be used to make future projections of infested acres. In the large amount of field verification work that I have completed, I have observed smaller dead trees not detectable on aerial photos but the amount of area they represent is small. In addition, the sample or database of aerial photos is continuous rather than the 1/7 mile grid of CVS plots. [2-23]*

Response: The CVS plots represent a recent random sample that includes trees of all size and location across the landscape. For this reason, it was considered as a generally better representation of the percent of infested trees, and therefore acres, than Agency maps. There might be a concern if smaller trees were more likely to die from PL and therefore represent more acres than actually infested, but such is not the case. The Pathology section indicates that, if anything, larger trees are more likely to be killed.

Comment: *The spread rate would vary not only by alternative but also by area (ecological conditions) and density of POC. [2-3]*

Response: The differences in spread rate by risk region are reflected in the amount of each region deemed high risk. There is not an observable difference in spread rate or susceptibility dependent upon stocking level.

Comment: *The "integrated management" portion of the Pathology affected environment section is far too optimistic and assumes every manager would magically choose a combination of practices that would reduce risk almost to zero. [34-43]*

Response: The section does describe one assumption, or circumstance, used by the Pathology effects authors in their overall estimates of disease spread for the various alternatives. Its likely effectiveness and use were estimated by the Pathology section authors according to the language of the Standards and Guidelines in each alternative, rather than assuming it would be applied maximally in every situation until the risk is zero. No action reduces the risk almost to zero, and no alternative is predicted to achieve zero PL spread.

The Pathology section has been edited to include effectiveness information for all of the

Management Practices listed above and below the risk key in each alternative. The "integrated management" discussion in this section provides additional information to managers about the effectiveness, or synergy, that can be achieved by applying two to several of the Management Practices where they are applicable. For this use, this section can best be described as a source of information for managers considering what, and how many, Management Practices to apply to best reduce the risk.

Ultramafic Soils

Comment: *The SEIS should address issues including secondary benefits that may result from actions to control PL. For instance, closing roads can help reduce erosion. [43-79(S)]*

Response: Indirect, or cumulative benefits of the various Standards and Guidelines are included in the various resource element discussions. For example, the benefits to water quality of closing roads is discussed in the Water and Fisheries section. The reduction of noxious weeds from vehicle washing is documented in the Botany section. A more detailed summary of cumulative effects appears early in Chapter 3&4.

Comment: *In the Ultramafic Soils section of the draft SEIS, the Agencies claim that none of the alternatives will have any major effects to soils. The draft SEIS states that POC's ability to utilize soil calcium does not enrich soils, and although litter fall places calcium in a more usable form and location for other plants (Zobel et al., 1985), the effect is small (Powers, personal communication). The underlying data or scientific evidence for "professional judgment" claims such as this must be disclosed in the draft SEIS. In addition, the soils section fails to disclose that POC's rot resistance helps prevent erosion and maintains soil moisture. In addition, the SEIS fails to disclose that litter and soil under POC are less acidic (have a much higher pH) than those under other conifers, and that this may have distinct effects on soil properties. (Zobel et al., Ecology, Pathology, and Management of Port-Orford-Cedar, GTR PNW-184, Sept. 1985). The capacity for other trees to grow on some ultramafic sites may result from the influence of POC on the soil. (Id.) [32-29]*

Response: The Ultramafic Soils section of the SEIS has been rewritten to address the issues that were raised with this comment. There is little scientific information concerning the direct relationship of POC and ultramafic soils. There is no scientific evidence that POC has the ability to enrich soil calcium on ultramafic soils, or that decaying POC helps prevent erosion or maintain soil moisture. Soil acidity is lower on ultramafic soils compared to other soils whether POC is present or not. The capacity of other trees to grow on ultramafic soils as a result of POC is also unknown.

Comment: *The draft SEIS minimizes the beneficial effect of POC on soil calcium cycling (p 3&4-82). The draft SEIS says that POC litter-fall makes calcium available in a form and location that may be beneficial to other plants. The draft SEIS does not seem to recognize that since POC is often the dominant overstory tree in ultramafic settings and it is not readily replaced by other large conifers, the calcium-bearing litter-fall provided by POC is of a magnitude that is unmatched by other plants. To that extent, it is unique and irreplaceable. [34-50]*

Response: The Ultramafic Soils section of the SEIS has been rewritten. There is no scien-

tific information showing a direct relationship of POC with calcium cycling on ultramafic soils.

Comment: *The draft SEIS does not adequately consider the value of POC in providing slope stability and mitigation of landslide risk. The draft SEIS must disclose the possible consequences of increased mass soil movements if PL is not prevented. [34-25]*

Response: When POC is abundant on ultramafic soils, it is usually near seeps, springs, and streams. The indirect impact of POC mortality on soil streambank stability is discussed in the Water and Fisheries section of the SEIS.

Ecology and Plant Associations

Comment: *POC is an important ecological component in many watersheds where its ability to survive on poor soils often results in this species being the only large component on the landscape. Mitigation by a disease resistance program will not be able to replace the ecological function that is provided by large old POC trees for many years, and it is still not known how successful disease resistance breeding may actually be in the long term. [4-4]*

Response: Under all alternatives the amount of POC is expected to decline over time. Complete elimination of effects of PL on POC is not practical by any known mitigation or control measure. Uncertainties about the resistance breeding program are described.

Comment: *It is obvious from the literature that POC is an extremely important element of our biodiversity, and it is in jeopardy due to POC root disease. In order to manage for functional ecosystems (Manley et al. 1995), the FS and BLM need to develop a conservation strategy that will insure its continued existence as an element of biodiversity. The Agencies appear to be choosing to ignore one of the key factors in the management of POC, the maintenance of its extremely high biological diversity (Atzet et al. 1996; Jimerson 199b; Jimerson and Creasy 1991; Jimerson and Daniel 1994; Jimerson et al. 1995; Jimerson et al. 2000; Jimerson et al. 1999). Clearly, managing for the maintenance of biological diversity is called for in NFMA (Section 6 B) and should be the driving issue in this EIS. [21-2, 32-74(S)]*

Response: The alternatives can each be thought of as conservation strategies for managing the continued existence of POC. They differ in their efficacy for meeting this need. Effects on maintaining the amounts, by plant association group, of POC are clearly articulated in Ecology section of Chapter 3&4.

Comment: *Little or nothing is said about maintaining the ecological and genetic diversity of POC (Jimerson and Creasy 1991, Millar and others 1991). These are the two most important aspects of maintaining POC across the range of the species. [21-16]*

Response: The Ecology and Plant Associations section of Chapter 3&4 has been rewritten to more clearly show the relationship of the alternatives to their effects on the diversity of POC ecosystems. Numerical inconsistencies in the Ecology section of the SEIS have been corrected. The Ecology section addresses structure, function, and composition of POC ecosystems at the relevant scales for the Purpose and Need of the SEIS.

Comment: *In the Intensively Evaluate Individual Plant Association Group (PAG) Sites and*

Implement PAG-Specific Management Criteria alternative in the Alternatives Considered but Eliminated from Details Study section of Chapter 2, the SEIS states "…analysis has determined that PL will not completely eliminate POC from any PAG…" This and similar statements seem to be used to justify doing less than is feasible to protect POC, and seem to imply that so long as POC does not go extinct, the need has been met. I agree that POC probably will not go extinct throughout its range due to PL. I doubt that all PAG's will retain POC over time, given no effective management of PL. Preventing extinction, in any case, is far from fulfilling the stated need. The stated need is appropriate, but in many places the document seems to confuse that with preventing extinction. [25-16]

Response: The explanation of this alternative that was considered but eliminated is that it would ". . . identify representative samples for each of the 90 PAGs . . . ", and protect some of each to have a sample. This "sample" aspect of this alternative would not necessarily meet the Need for maintenance of ecological significance, and is therefore not analyzed.

Comment: *The "Spacing objectives" for thinning in Alternative 2 are not conservative enough (why must POC populations be discontinuous?) [44-16]*

Response: Using thinning to effectively disperse POC (thus creating discontinuous populations) could lead to slower rates of infection and spread of PL. In natural stands POC often occurs in mixtures with other species, so thinning could lead to an approximation of this natural distribution.

Comment: *Table 3&4-12 has a significant typographical error. "% of total infected" should read "High risk as % of total", comparing the data to Table 3&4-17. Also, the last vertical colum [sic] should be labeled the same in the two tables, probably "East Disjunct" since the broader category is "California". [44-30]*

Response: Tables in the Ecology section of Chapter 3&4 have been corrected.

Comment: *The draft SEIS should have disclosed the Forest Service's obligations to protect diversity pursuant to NFMA and its implementing regulations. The proposed action does not satisfy these obligations. [32-7]*

Response: Chapter 1 has been revised to show compliance with all applicable laws to be part of the Purpose statement. Effects of the alternatives on diversity are disclosed in the SEIS, particularly in the Ecology and Botany sections.

Comment: *The draft SEIS fails to assess the fact that mature and old-growth POC will be eliminated in infected areas, and that other types of downed woody debris do not last as long in the water and on the ground (this is particularly important for fisheries, providing long lasting downed woody debris to stream systems), especially in ultramafic ecosystems. [32-14, 32-24, 32-80(S), 32-47, 21-19]*

Response: The Ecology and the Water and Fisheries sections have been edited to reflect this comment.

Replacement of POC snags and logs by other species depends on the particular POC ecosystem. Some POC communities in the ultramafic riparian group do not feature other conifer

species and may become dominated by shrubs if the POC canopy is lost. Most other POC communities include Douglas-fir, white fir, Jeffrey pine, or other overstory conifers. In the larger-size classes, these species could be expected to provide wood to streams, although their wood will not last as long as that of POC.

Because POC wood is exceptionally resistant to decay, POC logs could be expected to contribute to stream function for a considerable amount of time. Storm events in the high-gradient streams of this region, however, could result in the logs moving downstream (Mellen, K., *personal communication*).

Based on research and monitoring data, dead POC trees cannot be expected to fall over quickly. Jules et al. (2002) documented uninfected POC snags still standing up to 200 years since their death. Monitoring data from the Agua-Stimpy project area (Medford BLM District, Grants Pass Resource Area) shows no infected POC falling over. This area has been infected since the mid-1970s (Betlejewski, F.B., *personal communication*).

On many POC riparian sites a lag time can be expected where alder, tanoak, or other pioneer hardwood species invade openings. Alder and other hardwoods will sometimes provide shade over streams within 3 to 5 years of colonization. Hardwoods, as they mature, are less desirable as downed material for stream function because they are often of smaller diameter than conifers and do not last as long. Whether conifers eventually become established in these streamside areas depends on site conditions and disturbance history.

Comment: *In Chapter 3&4, Riparian Effects section, it states that "…[the loss of POC] would be least deleterious in the Northern Coast, where western red cedar may be able to fulfill some of the downed wood role. Western red cedar is not abundant on the other geographic areas." Thus, the draft SEIS Water and Fisheries sections concludes no impact to fish based on speculation about western red cedar's potential ("may be able to") to replace the downed wood function of POC. Even if western red cedar does replace dead POC along streams many generations of salmonids, including coho salmon, would experience less than optimum conditions because the western red cedar would take decades to hundreds of years to attain the size and optimum function of old-growth POC. [32-52]*

Response: Western red cedar cannot be expected to replace POC in most cases. The statement in the draft Ecology section on red cedar has been corrected, and related edits to the Water and Fisheries section have been made.

Comment: *The assumption that mortality on low-risk sites will be replaced by regeneration or increased POC growth is not supported by evidence. Along some high-risk roadsides POC does regenerate, and mortality appears to be replaced by regeneration, although the average stand age seems to be held constant by the mortality. Away from roads, however, I believe that available evidence suggests that POC regenerates effectively only after certain disturbances. The tree can produce seed at a relatively young age, when open grown. It grows more slowly than most associated species, and is quickly overtopped. Trees continue growing slowly, but reproduction appears to be essentially nil. There is little or no data to support any assumptions about POC population dynamics in young stands. [31-10]*

Response: The assumption has been modified to say "at least partially" replaced. Regeneration and young stand development of POC are detailed in Zobel et al. (1985). Growth varies

greatly depending on plant community (a reflection of site conditions). In clearcuts POC was found to grow favorably compared with other conifers, at least until it reached breast height. Around age 20 to 25 years POC is usually overtopped in mixed stands.

Comment: *Describe the Port Orford Cedar species and its role in the ecosystem, with special attention to riparian areas, ultramafic soils, and fire-adapted ecosystems. [43-75(S)]*

Response: POC in riparian areas and on ultramafic soils was detailed in the Ecology and Plant Associations section of Chapter 3&4. A discussion of fire and its effects on POC has been added to the Ecology and Plant Associations section.

Comment: *There are now many publications and documents that discuss the ecological and cultural values of Port Orford cedar and its habitat.*
[32-77(S)]

Response: Yes, this work is respected and has been drawn from in developing the SEIS document.

Botany

Comment: *The SEIS needs to examine the likelihood of extirpation and extinction of endemic plants growing on ultramafic-derived soils if the PO cedar is no longer there either due to root rot or "sanitation" logging. [27-2]*

Response: The potential for endemic plants being extirpated and becoming extinct if POC is no longer present is discussed in the Biological Evaluation in Appendix 7, and in the Botany section in Chapter 3&4.

Comment: *The Botany section in Chapter 3&4 states that sensitive plants are in good shape, but goes on to say that these plants are threatened by grazing, mining, off-highway vehicles, fire, noxious weeds, timber harvesting, roads and fire suppression. The SEIS cites "Frost," but no other reference to that cite is found in the SEIS. The cumulative effects on sensitive plants of PL killing POC, along with these additional threats should have been thoroughly analyzed in the SEIS. [32-26]*

Response: The discussion in the Botany section has been clarified; the items cited can cause indirect effects, but all actions are mitigated before an activity takes place. Known populations of listed plants are always protected by project design, such as buffers, to protect the microclimate. With some impacts, like wildland fires, there is very little control. A relationship between the loss of POC and rare plant species could not be drawn; therefore cumulative effects could not be discussed.

Comment: *The draft SEIS fails to describe the consequences of the alternatives on the BLM and FS special status species in the range of POC. [34-53]*

Response: Additional discussion of the potential effects to FS sensitive species and BLM special status species (Bureau sensitive and Bureau assessment) have been added to the SEIS. The Biological Evaluation in Appendix 7 already contained discussion of these species.

Comment: *Baseline data regarding rare plant species distribution and abundance in the*

uninfested 6th field watersheds would greatly increase understanding of how the watersheds will provide for these plant species and what effects the loss of Port-Orford-cedar will have on rare species and ecosystems. The SEIS contains almost no information on the characteristics of the 32 6th field watersheds and how those watersheds compare to infected watersheds with respect to sensitive resources and Port-Orford-Cedar vegetation diversity. It is evident from viewing the maps that the watersheds differ widely in allocated land uses, types of access (roads or trails), traffic volume, distance to infected stands, and stakeholders interest. From these general differences, it appears that these watersheds would also vary greatly in their response to protective measures, impacts to riparian ecosystems, direct costs of protection, and direct costs in the form of foregone harvest and employment. The alternatives and analysis presented in Chapters 2 through 4 do not provide sufficient information or flexibility to allow for site-specific considerations or decisions among the watersheds. The option for decision-makers are artificially constrained by treating all of these watersheds as a collective entity. [45-1]

Response: Known special status species locations were overlayed with these watersheds, and a summary of the results has been added to the Botany section in Chapter 3&4. However, it is unclear how this will aid the decision-makers in making a choice between the alternatives. First, no relationship between the loss of POC and rare plant species could be drawn from the analysis in the SEIS. There is not enough information available to connect the known rare plants within POC plant communities to those communities only. Since there is evidence of unique species benefiting from the removal of POC, additional protection for these watersheds may or may not benefit unique species in the same areas. Second, Alternatives 3 and 6 either provide additional protections for all uninfested watersheds or they do not; there is no expectation the decision-makers will choose certain watersheds. Third, most special status species surveys are project-driven, and the uninfested watersheds are, as a group, characterized by a lower level of management activity than infested areas; that is one of the reasons they are uninfested. For this reason, known (but not necessarily actual) species sites will be less prevalent in such watersheds. Fourth, protection of special status species sites will be considered at the project scale. Even under Alternative 2, the presence of special status or listed species, and whether or not they would be affected by the loss of POC, will be one item considered in the risk key.

Comment: *The SEIS needs to describe the wide range of secondary benefits that may result from actions to control P. lateralis: for instance, closing roads can help reduce the spread of invasive species. [43-79(S)]*

Response: Secondary effects of road closure/seasonal restrictions were discussed in the botanical analysis. Additional information has been added.

Water and Fisheries

Comment: *Loss of POC, especially in high-risk riparian areas, will result in loss of shade, bank stability and long-term wood recruitment to the stream. The EIS should disclose how the Agencies failure to control the spread of PL will meet the NWFP Aquatic Conservation Strategy goals and objectives and the Clean Water Act. [34-16, 34-17, 34-19]*

Response: Stream shading response, as affected by POC that succumbs to PL, varies by risk region. In the North Coast Risk Region and non-ultramafic portions of the Siskiyou and

Inland Siskiyou Risk Regions, the Water and Fisheries section text has been clarified to show spaces in the canopy would be filled rapidly by adjacent trees broadening their canopies, release of understory trees, or seeded trees. Therefore, loss of shade that may translate into an increase in stream temperatures is not expected in these areas. The Water and Fisheries section text discloses that there would be short- to long-term decreases in stream shade in the mid-drainage and valley streams within ultramafic areas of the Siskiyou and Inland Siskiyou Risk Regions. However, this effect is variable because (1) POC in microsites set back from the stream where standing water cannot reach the trees will not be affected by the pathogen, and these POC will continue to cast shade because they tend to be tall and cast longer shadow lengths, shading the stream, except for midday; (2) species richness of POC stands with assemblages of other trees that are not susceptible to the pathogen varies; (3) the pathogen migration is predicted to be slow and in a downstream direction; upstream areas above roads would be much less affected; and (4) POC killed by PL would be replaced by Douglas-fir, Jeffery pine, western white pine, or hardwoods which would eventually increase shading. Also refer to responses to comments 32-70 and 32-48 on page A-151 for additional discussion.

Bank stability is expected to remain within the range of natural variability. This is because POC has tremendous decay resistance including large roots. The mass of large roots form a matrix that will persist for years (Burroughs and Thomas 1977) and resist the action of flowing water along streams, thus binding streambanks. In the meantime, a replacement stand would be increasing root strength. In the ultramafic soils areas, the underlying bank material includes cobble-sized rock that is very resistant to erosion, thus preventing the lateral migration of streams.

POC would have very long and variable temporal inputs to the streams as standing POC snags have been aged in excess of 800 years old (Jimerson 1999). The turnover rate of forest stands for conifer or mixed conifer/hardwood of other species would be considerably faster (expected to be in the range of 60 to 100 years for hardwoods and 80 to 300 for noncedar conifers).

Within the ultramafic soils areas, there may be a future gap in large wood recruitment for POC killed close to the stream. However this short-term lower recruitment rate is not expected to be significant because (1) durable POC material will be standing as snags on streambanks that would be future downed wood, (2) healthy POC trees not subject to infection or the influences of standing water in riparian areas should provide some contribution of POC woody material, (3) POC log structure in streams will considerably out last other tree species holding together stream structural integrity and habitat diversity, and (4) a Douglas-fir, Jeffery pine, western white pine, or red alder or tanoak replacement stand will likely begin providing large wood recruitment to streams within 80 to 200 years.

The Agencies have been aggressively implementing management actions since the early 1990s to limit the spread of the disease, including actions along roads and ditches, streams, wetlands, and in riparian areas. The SEIS indicates that the pathogen cannot be completely stopped from migrating through high-risk sites, but it can be slowed (refer to Introduction and Pathology sections).

The BLM and USFS have been addressing the four components of the NWFP Aquatic Conservation Strategy since 1994, by establishing a system of Riparian Reserves and Key

Watersheds, completing comprehensive watershed analysis, and systematically completing restoration projects. This includes many restoration projects to slow the spread of PL through high-risk stream and riparian area. Measurement of the applicability of a project compared with specific Aquatic Conservation Strategy Objectives are completed on a project by project basis and normally developed for informal consultation with the National Marine Fisheries Service for Federal salmonid listings.

The "Clean Water Act" nonpoint source sections direct the EPA through the Oregon Department of Environmental Quality (ODEQ) to periodically assess the States' water quality conditions and either list or delist stream segments that are outside ODEQ's Water Pollution Division 41 Water Quality Standards, Beneficial Use Policies and Criteria for Oregon. To be in compliance with applicable water quality criteria ODEQ, through a load allocation total maximum daily load process for point and nonpoint sources on impaired waterbodies, may require a water quality management plan or best management practices for forestry and agricultural lands. Agencies are cooperating in this effort. Many of the elements of the Aquatic Conservation Strategy including a system of Riparian Reserves and Standards and Guidelines, and restoration efforts are considered sufficient strategies that protect, to the degree feasible within economic limitations, water quality conditions in streams, lakes, and wetlands.

Comment: *The draft SEIS did not list ODEQ temperature limited 303(d) streams affected by PL. The DEIS failed to disclose that PL would cause the listing of additional streams for temperature. Modeling results form ultramafic streams suggest that temperature increases caused by POC infestations would either degrade currently listed 303(d) listed streams or cause unlisted streams to become listed. The DEIS did not explain what management practices may be used to recover 303(d) listed streams to current state standards. [32-70, 32-48]*

Response: The text has been modified to indicate the miles of 2002 ODEQ water quality limited 303(d) streams for temperature. Areas of POC infestation, uninfected sites, and ultramafic derived soils are also displayed. Intersection of the 2002 ODEQ Streams 303(d) coverage with Map 4, Port-Orford-Cedar Occurrence and Range, and performing applicable queries shows (1) presence of POC along 8 percent of identified 1,020 miles of 303(d) streams for temperature in the POC range in Oregon, (2) 3 percent of 303(d) streams for temperature are currently infested, and (3) POC presence and infestation are about equal along 303(d) streams for temperature in ultramafics and nonultramafics.

Whether the spread of PL will cause additional listings for streams is unclear, but less likely based on several factors. The listed streams for temperature are generally in lower valleys, along wide streams that cannot be fully shaded by trees or forest vegetation and receive little topographic shade. Many of these listed streams are outside Federal lands and the analysis, and receive anthropogenic nonpoint source warming from other sources besides forestry, including agricultural and point sources. In contrast, mid-valley and headwaters streams that have POC presence are in canyons and landscapes that receive some topographic shade, have narrower stream widths to be shaded, and do not have other warming sources. The POC spatial distribution and stand composition varies from scattered POC amongst other trees to stand assemblages of 40 percent or more POC. These mid-drainage and headwater streams have limited floodplains, and PL infestations by waterborne spores would only affect streamside trees; while trees standing further back from the waters edge would continue to provide shading. In the North Coast and Siskiyou Risk Region, gaps in the canopy from scattered

POC killed by PL will be filled rapidly by adjacent trees broadening their canopies, release of understory trees, or seeded trees. Gaps causing shade loss, in these regions, would not be large enough to change stream shading because of the residual canopy. In the Siskiyou Inland Risk Region POC killed by PL on the nonultramafics would have a similar shade response as the aforementioned two regions. In the ultramafics soils area, some shade loss could be expected to occur (refer to responses to comment 34-16 on page 100, and comments 34-17 and 34-19 on page A-149 for additional explanation).

The modeling results given in Appendix 9 are meant to display a worst-case scenario for temperature increase resulting form POC mortality (that is, ultramafic soils areas and a homogenous stand of POC). However, POC averages less than 50 percent of the overstory in riparian ultramafic plant associations. Although one could conclude that the modeling may indicate more temperature listings, the current modeling programs predicting shade do not allow variable stand types resulting in variable canopy densities as inputs. Therefore, the predicted loss of shade and stream warming is overestimated. The current distribution of listed streams and site factors also need to be considered. Continuous summer field monitoring is normally completed to assess a stream's water temperature profile and range of conditions. Refer to the above shade/temperature discussion and responses to comment 34-16 on page 100, and comments 34-17 and 34-19 on page A-149 for further explanation.

Management practices to address ODEQ 303(d) temperature listed streams are beyond the scope of this EIS. Normally passive and active restoration is discussed in applicable water quality management plans prepared for or by ODEQ for EPA approval. These management plans specify benchmarks and goals for water quality attainment and in some cases allow natural conditions exemptions from the basin standard, when waterbodies cannot meet goals using best available science, and cost effective management techniques.

Comment: *The watersheds selected in Alternative 3 should have recommendations about coho salmon streams and ODEQ temperature listed 303(d) streams needing additional protection at the seventh field drainage (1,000-10,000 acres) or lower level. [32-50]*

Response: A new Alternative 6 has been constructed showing 162 7th field watersheds that include 100 acres or more uninfected POC. This alternative is basically a refinement of Alternative 3 taken to the smaller drainage level. Overlaying the current ODEQ 2002 303(d) water quality streams listing for temperature shows that 24 of these watersheds involve 303(d) stream segments. Specific recommendations about ODEQ temperature listed 303(d) streams are developed though a ODEQ waterbody total maximum daily load process, and are beyond the scope of this analysis. Future Federal actions in uninfested 7th field watersheds will be evaluated for the potential of impacts to coho salmon streams. Individual project-level consultation with National Oceanic and Atmospheric Administration (NOAA)-Fisheries will tier to the plan-level consultation and management measures to minimize impacts to coho. Refer also to responses to comment 34-16 on page 100, and comments 34-17 and 34-19 on page A-149.

Comment: *The draft SEIS fails to assess the longevity of downed POC in stream systems, which are important for fishes. Other types of woody debris (for example, red alder) do not last as long in the water. Even if western red cedar does replace POC along streams, it would take decades to hundreds of years to attain size and optimum function. This may lead to many generations of salmonids experiencing less than optimum habitat conditions. [32-*

14, 32-25, 32-52, 32-53]

Response: POC longevity is discussed in the SEIS Water and Fisheries and Ecology and Plant Associations sections under Riparian Effects. Other types of woody debris, although not as decay resistant as POC, can last for decades to centuries depending on submergence in the water or burial by stream sediments.

Recruitment to the stream by other hardwood or coniferous species, such as red alder, tanoak, Jeffery pine, western white pine or Douglas-fir would be faster than POC because they are not as long lived. Agents of mortality or wind would spatially topple trees into streams and wet areas. These forest trees may have smaller diameters than POC. Smaller sizes coupled with less decay resistance would lead to faster depletion rates in streams. However, the forest stand would have greater numbers of smaller-diameter trees, so the treefall rate and the forest stand turnover rate would be higher. When streamside POC is killed by PL new regeneration by other shorter-lived tree species will gradually occupy the site, except in some ultramafic areas. Existing POC pieces in streams will last for decades to centuries, while new stands reach maturity. Non-streamside POC within the recruitment area, but not susceptible to infection, will continue to provide temporal and spatial inputs of POC to streams, but on a long-term basis (decades to centuries). Therefore, it is anticipated that the future wood supply to streams would include a mixture of greater amounts of smaller diameter woody debris, and some large POC pieces with variable depletion rates. Because of this forest stand heterogeneity, these changes in wood supply are still expected to maintain suitable complex habitat for fishes.

Comment: *The draft SEIS omits to inform the decisionmaker that controlling PL may have indirect benefits, such as better protection for coho salmon. For example, closing and decommissioning roads may reduce erosion and protect water quality from sediment failures from roads during floods. [43-79(S), 32-49]*

Response: These benefits are likely, particularly for winter use roads. Management measures in the risk key in Alternative 2, including seasonal and permanent road closures, and no vehicle entry in POC cores and transportation analysis and management objectives for POC buffers in Alternatives 3 and 6, would have secondary benefits. Text has been added to the Water and Fisheries section to clarify this connection between the mechanism for PL transport (see Pathology section) and the indirect benefits.

Comment: *The presentation of Table 3&4-18 and Table 3&4-19 are unclear. Please explain how to read them. [34-48]*

Response: Both tables are divided on the idea of the stream continuum starting in the upper watershed with small ephemeral and intermittent streams, and working downstream to perennial mid-drainage and valley streams. Table 3&4-18 is read from top to bottom starting from the left. Sequential attributes are shown in the left most column. The second column shows the landscape position of the stream (for example, the headwaters). The third column shows the relationship of PL to the attribute in this watershed region. This same sequence is repeated for the mid-drainage to valley streams, except the same attributes in the left most column are reused. Table 3&4-19 is read in the same manner, except instead of attributes in the left most column, the risk regions are compared.

Comment: *POC infestations should be reported as "perennial miles infested" or "fish*

bearing stream miles infested" because streams are linear. This would provide an accurate indicator of ecological effects to streams and riparian reserves, and would allow a comparison of alternatives by their impacts to cold water fishes (e.g., coho) and amphibians. Reporting acreage infested instead of stream miles may be giving the impression that the impact of the infestation is relatively low. The percent of infestation affecting anadromous fish streams is probably very high, especially if ultramafic geology streams are excluded. The DEIS did not estimate the miles of fish habitat in ultramafic soils that have been infected by PL, nor estimate future infections. The DEIS can not conclude that the area affected is "very limited" without making this calculation. [32-51, 32-46, 32-55]

Response: Using the best available information, including BLM/USFS datasets and GIS maps, POC infestations by stream miles in the POC range within Oregon have been calculated. Because the Federal Agencies have captured the streams at differing densities, 2nd order and greater streams on BLM were used in conjunction with the USFS stream classes I, II, and III to arrive at a similar looking and comparable streams coverage. This coverage was intersected with the SEIS Map 4; Port-Orford-Cedar Occurrence and Range, to arrive at stream miles of POC presence and infestation. The text has been clarified to show that there are 295 miles of stream infestation, representing 2.5 percent of the total stream miles within the natural range of POC. There are 166 stream miles of infestation, if the ultramafic soils are excluded, comprising 1.5 percent of the total stream miles. Anadromous fish streams make up a lesser percentage of the total stream miles, because of natural barriers and unsuitable habitat in many upper reaches. Therefore, the percent of infestation affecting anadromous stream miles within the natural range of POC is actually very low (less than 1.5 percent of the total stream miles).

Comment: *Many headwater streams are perennial, indicated as blue line streams on USGS topographic maps, and BLM or USFS riparian stream surveys. Intermittent streams usually do not have POC. POC killed by PL in headwater areas would lead to rapid stream warming. This in turn may reduce or eliminate coho salmon populations. [32-59]*

Response: U.S.Geological Survey mapping normally shows only the main trunk streams and excludes the tributary feeder streams in an attempt to keep the map from looking too busy. As such, these included "blue line streams" that are normally always perennial. When the SEIS text refers to headwater streams, the meaning is ephemeral and intermittent stream channels that have a duration of flow less than all year, and are not shown on USGS maps. Potential effects to perennial streams, including effects on temperature, are addressed in the Mid-Drainage to Valley Moderately Confined and Unconfined Stream Channels section.

Comment: *The draft SEIS did not state that floodplains and wetlands will be affected by PL, as required by Executive Orders 11990 and 11998. The DEIS did not disclose the impacts of PL to wetlands. Landform influences on the distribution of POC have not been characterized adequately. [32-71]*

Response: Executive Orders 11990 and 11998 are a furtherance of NEPA in regard to an evaluation process for activities or actions Federal Agencies may take in order to minimize harm to wetlands and floodplains. Actions, including location or new construction in a floodplain or wetland are site-specific plans evaluated at a project level, where alternatives can be developed including conservation practices to minimize harm to the environment. Although the SEIS alternatives could benefit floodplains and wetlands, they do not constitute actions for purposes of these Executive orders (see also Critical Elements of the Human

Environment section in Chapter 3&4).

Due to data coverage availability and GIS analysis processes, the USFWS wetland mapping was not included in this effort. The USFWS mapping resolution is to 2.5 acres. Many wet and depressional areas associated with POC are smaller in extent and would be missed. However, the NWFP includes Riparian Reserve areas around all wetlands regardless of size and the Standards and Guidelines include specific management criteria.

Distribution of POC by landform and microsites is discussed in the Pathology section in Chapter 3&4. Any area where water collects and POC roots are present is at high risk of infection, and would be managed accordingly.

Comment: *The draft SEIS indicates that the effect of decreased root strength would be localized and not significantly increase slumps or entry of colluvial material into the channel. However, Table 3&4-19 indicates + (increased) episodic mid-drainage inner gorge slides partly due to the loss of root strength. Please clarify. Increased landslides would be likely to adversely affect coho salmon. [32-61]*

Response: The SEIS referred to intermittent streams in headwaters landscape positions. Table 3&4-19 shows regional hydrologic differences by risk region. In the Siskiyou Risk Region, a subset of the entire POC range, an effect of mid-drainage POC streamside mortality may be either no change or slightly increased inner gorge slides that seldom occur. The term *episodic* is used to mean an infrequent large precipitation and runoff event (such as a 100-year storm). Some local root strength declines in select areas may occur in the short term, but not in the long term. This depends on forest stand streamside riparian species and arrangement, POC pathogen spread of infection, and time since mortality.

Comment: *A suggestion is made in the DEIS that POC snags and logs can be replaced by other tree species, especially on high-risk sites, or with resistant POC. This is inaccurate, does not adequately disclose the functions of these species in riparian areas in comparison to POC, and shows a lack of understanding of the role of POC in the environment. Also, the SEIS presents conflicting information about the impacts of PL on non-ultramafic streams. For example, the fisheries section asserts that non-significant impacts will occur to coho salmon because PL killed trees will be replaced by other trees. However, information from stream modeling and the ecology section contradict this premise. [21-19, 32-24, 32-47]*

Response: The Ecology and Water and Fisheries sections were edited to reflect this comment.

Replacement of POC snags and logs by other species depends on the particular POC ecosystem. Some POC communities in the ultramafic riparian group do not feature other conifer species and may become dominated by shrubs if the POC canopy is lost. Most other POC communities include Douglas-fir, white fir, Jeffrey pine, or other overstory conifers. In the larger-size classes, these species could be expected to provide wood to streams, although their wood will not last as long as that of POC.

Because POC wood is exceptionally resistant to decay, POC logs could be expected to contribute to stream function for a considerable amount of time. Storm events in the high-gradient streams of this region, however, could result in the logs moving downstream

(Mellen, K., *personal communication*).

Based on research and monitoring data, dead POC trees cannot be expected to fall over quickly. Jules et al. (2002) documented uninfected POC snags still standing up to 200 years after their death. Monitoring data from the Agua-Stimpy project area (Medford BLM District, Grants Pass Resource Area) shows no infected POC falling over. This area has been infected since the mid-1970s (Betlejewski, F.B., *personal communication*).

On many POC riparian sites a lag time can be expected where alder, tanoak, or other pioneer hardwood species invade openings. Alder and other hardwoods will sometimes provide shade over streams within 3 to 5 years of colonization. Hardwoods, as they mature, are less desirable as downed material for stream function because they are often of smaller diameter than conifers and do not last as long. Whether conifers eventually become established in these streamside areas depends on site conditions and disturbance history.

Comment: *The draft SEIS should adequately disclose and analyze the effects of the alternatives, especially on anadromous fisheries (including in the Klamath/Siskiyou region, where it could be the essential ingredient for the survival of some native fishes and amphibians). Since POC supplies key habitat features for listed salmonids (shade to streams, streambank stability and large woody debris), the SEIS should discuss the consequences of the loss of POC to aquatic habitat. [21-18, 27-1, 27-7, 34-22, 32-27]*

Response: Text has been added to the document to clarify the ecological role of POC and the effects of PL as they pertain to stream and riparian functions.

The intent of the Water and Fisheries section is to describe the aquatic environment that would be affected by the proposed management strategies and to compare the impacts of the alternatives on physical and biological components of that affected landscape. The physical attributes of stream habitat are described, and the role of POC in stream channels and riparian areas is explained in the Water and Fisheries section and elsewhere (see Ecology section). The current status of salmonid stocks and the factors limiting them are presented because salmonids are recognized as good indicators of watershed health and the impacts of human activities. The attention to physical habitat is intentional because it is the infrastructure on which aquatic biota depend. The anticipated impacts to salmonids are described by region, with discussions of the physical habitat factors as they relate to fish and amphibians (see Wildlife section).

Comment: *Aquatic benefits may diminish from continued POC loss, and may trend towards ESA listings. The draft SEIS does not disclose whether loss of POC and salmonid habitat will cause jeopardy (under the Endangered Species Act), or reduce options for future recovery of coho. Choosing between Alternative 2 or Alternative 3, or another alternative that better protects POC in ultramafic salmonid areas has implications for ESA compliance. Cumulative effects must be considered in order to adequately assess the significance of the loss of POC and salmonid habitat values. Because the management actions involve coho salmon critical habitat, the USFS and BLM must formally consult with NOAA-Fisheries. [34-18, 34-20, 34-21, 32-45]*

Response: A biological assessment for impacts to coho has been included in Appendix 7 of the SEIS. The Water and Fisheries section of the SEIS contains a discussion of the cumula-

tive effects of proposed POC management to salmonids, and these effects have been included in the biological assessment whenever they apply to coho. The impact assessment presented in the biological assessment will be evaluated by NOAA-Fisheries in regard to the effects on coho salmon. NOAA-Fisheries will determine if the management plan would be likely to jeopardize the recovery of coho. Consultation with NOAA-Fisheries for a management plan will be completed prior to signing of the record of decision. Subsequent Federal actions within the range of POC will tier to this record of decision and will consult with NOAA-Fisheries on an individual project basis. At that time, the impacts to coho of a given proposed action would be evaluated on the project scale.

Comment: *The draft SEIS fails to specify management that adequately protect streams providing habitat to coho salmon. [32-48]*

Response: Management measures included in the preferred alternative will be evaluated by NOAA-Fisheries when the plan-level consultation takes place. The adequacy of these management measures to protect coho and coho habitat will be determined during this process. Subsequent Federal actions will tier to this decision when consulting on individual projects. Text has been added to the document specifying how management of POC affects coho salmon.

Comment: *The SEIS understates the impacts to salmonids from the loss of POC on ultramafic soils. [32-54]*

Response: The impacts to salmonids (especially coho, steelhead, and resident trout) from the loss of POC on ultramafic soils are discussed by region and alternative in the Water and Fisheries section of the EIS. Further analysis has been done to refine the understanding of the magnitude of temperature increases, and text has been added to the SEIS to clarify the relationship between POC loss and stream temperatures in the ultramafic soils.

Comment: *The coho habitat miles of PL could be calculated, and the stream miles with increased stream temperatures could be estimated with GIS mapping. This information could be used in the draft SEIS fisheries section for a more precise discussion of the impacts to coho(e.g., in non-ultramafic soils). [32-56, 32-57]*

Response: GIS analysis has been completed to estimate miles of coho habitat affected by PL and a discussion of the impacts to coho based on the analysis has been added to the text. Table 3&4-18, Riparian and stream attributes in differing morphologies and relationship to PL, has been edited to clarify that much increased summer temperatures are not anticipated for streams in nonultramafic soils. Also see response to comment 32-51 on page A-154 for stream mile analysis discussion, and responses to comments 32-70 and 32-48 on page A-151 for further explanation of temperature modeling.

Comment: *The draft SEIS indicates that temperature impacts will occur primarily on ultramafic soils where coho salmon populations are low. Even if coho salmon densities are low on PL affected ultramafic streams, increased stream temperatures may limit production thus reducing distribution of coho salmon. If there are fewer viable populations this may adversely affect the Southern Oregon Northern California (SONC) coho salmon. [32-58]*

Response: GIS analysis has been done to estimate miles of coho habitat in ultramafic

streams affected by PL, and a discussion of the impacts to coho based on the analysis has been added to the text. Also see response to comment 32-51 on page A-154. Further analysis has been done to refine the understanding of the magnitude of temperature increases, and text has been added to the SEIS to clarify the relationship between POC loss and stream temperatures in the ultramafic soils (also see responses to comments 32-70 and 32-48 on page A-151). Plan-level consultation with NOAA-Fisheries will be conducted to determine the adequacy of management measures to minimize adverse effects to coho and avoid jeopardizing the southern Oregon/northern California coho. Subsequent Federal actions will tier to this decision when consulting individually on a project, and effects to southern Oregon/northern California coho would then be considered by NOAA-Fisheries as the approved management measures are applied on a local watershed scale.

Comment: *Under the NWFP, it can be assumed that salvage logging will occur as in the past and large wood recruitment to streams will be decreased. The draft SEIS did not assess the impact of past and future salvage logging on PL killed POC, and so cannot conclude that "the streamside large woody debris recruitment rate would remain within the range of natural variability." As currently worded, the "Snag Retention" section of the SEIS would allow commercial logging of dead POC from Riparian Reserves by specifying an arbitrary number of snags along each 100 feet of stream. [32-60, 32-69]*

Response: Salvage is only permitted when wood levels for Aquatic Conservation Strategy objectives are met. The Standards and Guidelines do not specify a number of snags per segment of stream.

In addition, NEPA analysis of proposed actions would incorporate by reference watershed analysis and would be evaluated for consistency with the Aquatic Conservation Strategy. Consultation for individual projects involving logging within a Riparian Reserve would include an evaluation of the adequacy of instream large woody debris at the project scale. NOAA-Fisheries standards for the natural range of variability and the desired condition for large woody debris is not arbitrary, but has been established within ecological provinces based on best available science. See responses to comment 32-14 on page A-152, and comments 21-19, 32-24, and 32-47 on page A-155 for further analysis on the recruitment of large woody debris and snags following PL infestation, and responses to comment 34-16 on page 100, and comments 34-17 and 34-19 on page A-149 for a discussion of Aquatic Conservation Strategy consistency.

Comment: *The Agencies choice between Alternative 2 or 3 or another alternative that better protects POC in ultramafic/salmonid areas has implications for ESA compliance that are not disclosed in the draft SEIS. NEPA requires disclosure of information necessary to determine compliance with legal requirements such as the ESA, Clean Water Act, NFMA, and applicable Forest plan S&Gs. [34-21]*

Response: The Water and Fisheries section has been edited, and the biological evaluation for fish has been added to Appendix 7.

Wildlife

Comment: *Information presented in the table entitled "Summary and comparison of the environmental consequences (effects) of the alternatives" and the table entitled "Numbers of*

wildlife species associated with the Southwest Oregon-Mixed conifer habitat type" is incomplete. [25-17, 44-34]

Response: Corrections and additions were made to the two tables and associated text.

Comment: *The draft SEIS analysis failed to adequately address the role POC as a large diameter tree, snag, and down wood provider in mature and old-growth forests and what the loss of that component would mean to the forest ecosystem. [32-14, 32-28, 34-26, 44-32, 44-33]*

Response: The analysis was expanded to provide a more in-depth discussion on the effects of changes to the large-diameter tree, snag, and down wood dynamics predicted to result under each alternative.

Comment: *The Wildlife discussion is inadequate; it fails to list species except by category. The SEIS does not adequately address the effects of the alternatives on specific species, especially Special Status species. [34-49, 34-53]*

Response: A review of the available literature and query of field biologists working in southwestern Oregon failed to identify any wildlife species that are directly dependent upon POC. Just as with the overall suite of wildlife species, the special status species list did not contain any species specifically tied to POC. Given the absence of a direct tie between any particular species and POC, and the limited effects to the overall mixed conifer habitat generally, it is appropriate to consider effects to species that are associated with large-diameter trees, snags, and down wood as a group, by habitat component.

Comment: *The draft SEIS analysis did not adequately address the secondary effects of management actions; especially wildlife disturbance. [32-49, 43-79(S)]*

Response: The secondary effects of road closure/seasonal restriction and Clorox bleach use were discussed in the wildlife analysis. Additional analysis has been done and that information is now included.

Pacific Yew

Comment: *The EIS should evaluate the economic and non-monetary values of Pacific yew trees, also susceptible to PL. [38-16(S)]*

Response: In September 1993, The FS, BLM, and the USDHH Food and Drug Administration released the final EIS for the management of Pacific yew. This document provided a comprehensive analysis of Pacific yew including inventories, autecology, occurrence, reproduction and growth forms, effects of management, genetics, ecosystem function, and response to damaging agents including PL. At that time, a total of 19 infected Pacific yew trees had been identified, all in areas with infected POC. While PL can infect Pacific yew, this continues to be rare.

Comment: *Since the Pacific Yew tree is also susceptible to P. lateralis, it should receive careful consideration in the prevention of the spread of P. lateralis. In recent months, there*

has been renewed collection of Yew bark and boughs for medical purposes. The collection of yew bark and boughs has the potential to spread P. lateralis during collection procedures. Yew harvest should be prohibited within the range of Port Orford-Cedar. [38-7, 34-23, 38-6, 43-81(S)]

Response: Because Pacific yew is much less susceptible to PL infection than POC, the potential for infection is much less as well. Measures to reduce the spread of PL could include working in areas without POC. For example, Pacific yew is found in 40 plant associations on the Rogue and Umpqua NFs where POC does not grow. While Pacific yew and POC can occur together, Pacific yew also grows in areas within the range of POC that do not contain POC. Depending upon the alternative selected, mitigation measures prescribed by that alternative to reduce the spread of PL would be applied, similar to that implemented during the harvest of other special forest products in areas where POC is present.

Genetics and Resistance

Comment: *The draft SEIS is overly optimistic regarding the development and success in breeding for disease resistance. The breeding program has yet to develop a line that is 100% resistant, and it is not known how successful resistance breeding will be in the long-term. [4-7, 11-9, 33-11, 38-1, 44-36]*

Response: There are reasons to be very optimistic about the durability of PL resistance in POC. As noted in the Genetics and Resistance section (Chapter 3&4), the genetic variation in PL is very low when compared with other forest pathogens; the PL spread mechanisms, although efficient, do not supply so much inoculum as to overwhelm resistance; and, rooted cuttings of parent trees (such as CF1) with the putative major gene resistance show virtually 100 percent survival in trials so far (up to 16 years). Mortality in trials was virtually all concentrated in the first 2 years, and the cause of early mortality is unknown. Seedling families also show moderate to very high survival levels contrasted with the 100 percent or near 100 percent mortality of the most susceptible seedling families.

Comment: *The draft SEIS says little or nothing about maintaining the ecological and genetic diversity of POC. [21-16, 32-74(S)]*

Response: The section on Conservation Genetic Considerations discusses genetic diversity issues. This section addresses some in situ and ex situ genetic conservation considerations in addition to deployment of resistant stock as a conservation measure. The section also includes a discussion of the general effects of the various alternatives on the genetic resource. The alternatives maintain the genetic diversity of POC to differing degrees. The SEIS further clarifies some ex situ conservation genetic considerations which relate to genetic diversity issues.

The Ecology and Plant Associations section of Chapter 3&4-3 has been rewritten to more accurately describe the relationship of the alternatives to their effects on the diversity of POC ecosystems. Numerical inconsistencies in the Ecology section have been corrected. The Ecology section addresses structure, function, and composition of POC ecosystems at the relevant scales for the Purpose and Need sections of the SEIS.

Comment: *Known resistance is sparse for much of the range and its effectiveness remains to*

be proven. There exist uncertainties about which geographic areas will produce resistance, whether there will be sufficient genotypes with resistance to support a wide program of planting, and whether that resistance will hold up over a rotation or is durable across the array of environments. [21-23, 25-3, 25-19, 25-22, 29-12, 31-20, 44-37]

Response: Resistance is low in natural stands (perhaps 1 percent). The potential for selection of resistant trees is a function of the frequency of resistance, the number of selections made, and whether selections are made in stands with moderate to high mortality from PL or from stands with essentially no mortality. The highest number of resistant trees has been found in the breeding blocks (Breeding Blocks 1 and 4) from which the most field selections have been tested. Although the program to develop genetic resistance is relatively recent, under all alternatives (except Alternative 5) much more information should become available in the next 5 to 10 years. In addition, except Alternative 5, more field selections are planned (see Table 3&4-21 for timeline under the different alternatives). In breeding zones where there might still be too few resistant selections, use of traditional breeding to incorporate the resistance from neighboring breeding zones is possible. Monitoring of the current series of field plantings as discussed in Chapters 3&4 will continue to update the potential utility of resistant planting stock across a wide array of environments. Continued selection and breeding may provide additional natural resistance mechanisms.

Comment: *There exist uncertainties in how to assure success of planted resistant seedlings, how many resistant trees need to be planted to improve stand resistance sufficiently, and where POC genotypes can be successful if planted outside their native habitat. [21-23, 25-3, 25-19, 25-22, 29-12, 31-20, 44-37]*

Response: A discussion of the assumed planting policies and rates, along with discussion of likely growth rates, has been added to the assumptions section in Chapter 3&4 and to Appendix 6. For reasons discussed in the Genetics section, including the apparent strength of the resistance mechanism, the narrow genetic variation within PL (limiting its ability to adapt to resistant POC), the relatively slow rate of spread of PL, and the naturally wide genetic variability among POC trees even from the same stand, long-term durability of at least a portion of planted stock is considered likely. This would be adequate; planted seedlings routinely experience a certain level of mortality, and trees naturally thin as they grow older. Plantings of resistant POC will include many more trees per acre than would be needed in the mature stand to meet management objectives such as shading streams. Finally, breeding zones are designed to identify a general area in which local seed should be fully adapted. Movement of seed outside of these areas, if needed, reduces the percentage of trees likely adapted to the site, but does not automatically mean all trees will suffer. The results of moving seed to adjacent breeding zones is well studied with other species, and some data is available for POC, so likely effects can be considered in the context of need. However, only Alternative 5 is unlikely to have resistant seed from most zones.

Uncertainties in resistance durability do exist as described in the analysis. In any event, there is an acknowledged time lag between POC loss and potential replacement in kind and function. Those factors are recognized in the analysis of effects in the various alternatives. Negative ecological effects stemming from possible failure of long-term resistance and from the time lag to grow mature trees are clearly less in alternatives that also include measures to limit the spread of PL.

Comment: *Only one resistant gene has been identified, and that evidence has yet to be*

subjected to peer review. The current resistant gene is present in approximately 100 parents, but most reside in only one breeding zone. A mutation for virulence against this one gene will be unhindered by the genetic background. [21-23, 25-3, 25-19, 25-22, 29-12, 31-20, 44-37]

Response: As indicated in Chapter 3&4, the resistance program is young and there are acknowledged unknowns, but evidence to date shows resistance holding up well, with all known visited resistant selected trees alive after 10 to 20 years in high-hazard areas infested with PL. Additional parents with strong resistance are expected to be found in the next 3 years as many more candidates undergo testing. At least one gene is responsible for the strong resistance in these approximately 100 parents confirmed so far. Studies to examine the nature and inheritance of resistance are underway. The survival shown by resistant families in young field trials as well as the continued survival of older resistant parent trees (after 10 to 20 years in high hazard areas infested with PL) indicates no breakdown of resistance. The resistant parents have survived 10 to 20 years, regardless of the how few resistant mechanisms (or the underlying inheritance of those mechanism) they might have. In the last 3 years, a series of field plantings have been established to confirm the short-term and long-term durability of genetic resistance across a range of sites, investigations of inheritance of resistance have begun, and a Ph.D. project to investigate mechanisms of resistance is underway. Finally, even if a mutation for virulence were to occur, there is no reason to believe it would spread rapidly across the landscape. The disease control mechanisms of Alternatives 1, 2, 3, and 6, plus an almost certain early recognition of the mutation, would subsequently limit its spread.

Comment: *Is it likely that rare alleles will be lost, and is not protection of rare alleles important? [25-18, 34-51]*

Response: While PL-caused mortality does not remove all trees over large areas, it is likely that some rare alleles will be lost as mortality spreads across the landscape. This also happens in nature where rare alleles are formed and lost over time. Loss of rare alleles was acknowledged in the section on Conservation Genetic Considerations. The exact extent of rare alleles is unknown due to the rarity of these alleles and having no known systematic way to survey or quantify across the species range. It is desirable to conserve alleles throughout a species genome. This is most often done via the natural populations in the natural environment, in addition to other in situ and ex situ conservation measures. These conservation measures help conserve both common and rare alleles.

Comment: *The putative natural resistance of POC to PL is touted throughout the draft SEIS. Hansen and Sniezko found that "The branch lesion test suggested that most of these trees were lucky 'escapes', and indeed many have subsequently died." [29-9]*

Response: Over 9,500 POC trees from natural stands or forests have been evaluated using the quick preliminary branch lesion test. Parents that exhibited small lesions were selected for a second more definitive root dip test. The parents surviving well in the root dip test have done as well (generally 100 percent survival as rooted cuttings) as the resistant control parent (CF1) that has been tested many times, and thus they would also be expected to do well in field plantings. Almost all the root dip testing of new resistant candidates has taken place since 2000, and there are still many parents to test. Resistance is rare in natural populations (less than 1 percent of trees), and the breeding zones with the most selections tend to have the

most parents confirmed as resistant in the root dip test. There are about 100 confirmed resistant parents, but many breeding zones have less than 5 resistant parents and thus many more field selections are needed to meet the objectives of Alternatives 1, 2, 3, and 4, and Alternative 6 if resistance is a tool to be used. The timing to achieve this depends on the alternative selected, continuation of funding, and the geographic distribution and frequency of genetic resistance (see Table 3&4-21 for timeline under the different alternatives).

Comment: *What happens if the resistant breeding stock becomes more susceptible to other environmental stresses, such as drought, in the natural environment? More than resistant stock is needed to save POC as a viable component of various ecosystems. [44-17]*

Response: There is no evidence that resistant seedlings (or trees) will become more susceptible to other stresses. There is in fact evidence indicating that resistant trees survive many years in diverse environments. In addition, the parent trees confirmed as resistant come from a range of environments. If resistant stock is from parent trees representative of the geographic area of a particular breeding zone they would be expected to carry-forth the general adaptive traits necessary to survive and grow. The performance of resistant breeding stock will be monitored in the future over a range of conditions.

Comment: *How can it be said that "the genetic structure over the species' range would probably not be changed much" when the infested level is expected to be so great under Alternative 4, with infested areas to be replaced by resistant stock? Does this imply that that the structure is not changed much by the introduction of the resistant gene, or that the resistant POC will not be that widespread? If the percentage of trees with complete resistance is less than 1 %, how will re-introduction of resistant trees in large numbers not change the overall genetic structure of POC within its range? [44-35]*

Response: Generally, resistant POC will be planted on high-risk sites within each risk region. Using the acreage found in Table 3&4-4 for each risk region, however, only one-third of the range of POC is in high-risk sites. In the North Coast Risk Region this represents 20 percent, in the Siskiyou Risk Region, 40 percent, and in the Inland Siskiyou Risk Region, 60 percent of the range of POC. This will limit the introduction of large numbers of resistant trees across its range. If every high-risk acre were eventually planted with resistant POC, then there would still be a genetic reservoir of POC to draw upon in the future.

Additionally, there are genetic population dynamics at work. Populations of resistant stock will have an amount of genetic variation which can compliment and/or add to the diversity in the various locales where deployed. The exact degree to how much genetic diversity will be inherent in these populations cannot be answered in a simple statement. It depends on such factors as the underlying quantitative structure of the genome, how the "resistant genes" have coevolved with other genes, and the degree to which these genes are scattered across the species range and/or degree of localization of said genes. The planting of the stock represents the initial introduction of the genes into the local system. These genes will then become part of the gene pool (via pollen, seed formation at maturity) which becomes part of the genetic process that disperses, recombines, and creates genetic variation via the population genetic forces in nature. The cumulative change in genetic structure across the range depends on the pooled impacts that occur over thousands of populations/subpopulations. It takes many generations to change genetic structure to an appreciable degree over a large macrogeographic range, due primarily to the evolutionary forces at work (such as migration,

selection, mutation, and drift) in combination with the complex environmental heterogeneity that exists.

Fire and Fuels

Comment: *The draft SEIS states that Alternative 3 could have the greatest potential effect on fire suppression and fuels management due to road closures or seasonal road restrictions in POC buffers and cores. Alternative 3 relies on existing reserves, and it "may" or "could" result in decommissioning parts of the road system. Whether access would be reduced is speculative. [32-30]*

Response: The SEIS describes Alternative 3 in Chapter 2 and the measures that apply to the POC cores and buffer areas in uninfested 6th field watersheds. A key measure is conducting a transportation analysis to determine road needs. A majority of these watersheds outside of wilderness contain roads. Management objectives are to minimize the road system within the POC cores and minimize the road system available for public use within and entering these 6th field watersheds (buffers). The analysis "could" result in decommissioning roads and reducing the total number of road miles. There are many roads within these watersheds, and it is reasonable to foresee that some would be decommissioned or closed with barricades to meet POC management objectives.

Comment: *The SEIS states that Alternative 3 (the most protective alternative) would have the most adverse effects on fire suppression due to reduced access. The draft SEIS should have disclosed that reduced road access would result in fewer fires since human caused fires occur most often along roads. [32-30, 32-32]*

Response: The SEIS describes in Chapter 3&4 the fire occurrence within the range of POC. A majority of the fires are lightning caused (52 percent), as are most fires larger than 1,000 acres (79 percent). Most human-caused wildland fires occur near residences, major roads and highways (debris burning, children, equipment, miscellaneous), and dispersed recreation sites. Fires caused by recreational users (such as campfires and smoking) were only 22 percent of all fires, and only a small percentage of these would be in the POC core and buffer areas. Roads do increase public use of wildlands, and there could be an increased risk of human-caused wildland fires from such use. However, when fires occur near the roads, initial attack resources also have good access to suppress fires. Roads also provide access, fire control lines, and escape routes for fires that escape initial attack and/or become large fires. Acreage is often given up on wildland fires to use roads as the primary firelines. In general, well-roaded areas may have more human-caused wildland fires, but they are more often kept small. The total number of acres burned from all wildfire causes is probably less in roaded areas than in those with poor access. In any event, the most acreage burned in wildfires occurs from nonhuman causes (lightning).

Comment: *The conclusion that Alternatives 1 and 3 would result in increased costs and reduced effectiveness for fire suppression resources is speculative. In the Biscuit Fire, for example, adding bleach to a tanker of water took approximately seven seconds, not enough time to noticeably affect fire suppression efforts. [32-32]*

Response: The Fire and Fuels section in Chapter 3&4 provides a detailed discussion of the potential for increased costs and reduced wildland fire operations effectiveness due to POC

management practices. Those effects are greatest with helicopter use, during extended attack or large fire operations. The SEIS used the Biscuit Fire as an example of a large fire where current POC management practices added 1 to 2 percent to the total cost of a very large and expensive wildland fire.

Comment: *The draft SEIS states that Alternative 3 would affect the ability of the Agencies to meet hazardous fuels treatment objectives in the wildland-urban interface areas (WUI). The EIS should disclose the location of the affected WUI's and explain how Alternative 3 would hinder the ability to treat hazardous fuels. Reducing road density or increasing seasonal road closures in POC buffers and cores would not necessarily limit access for fuel treatment projects and prescribed burning crews and resources. Seasonally closed roads could be used for "administrative use", provided that equipment was washed and personnel were free of mud and debris that might contain PL. [32-32]*

Response: The SEIS discloses the number of acres of both POC cores and buffers by alternative that could be affected within the wildland-urban interface. The SEIS also discusses in detail the reasons why POC management practices would increase the cost of fuels treatment operations. There is a cost associated with gate installation, inspection and maintenance; washing vehicles and equipment; cleaning personnel; inspection of personnel, vehicles, and equipment; project specific risk analysis; documentation; and monitoring. These costs translate into higher unit costs per acre treated, and into fewer acres treated when there is a finite amount of fuels treatment dollars. Administrative use, particularly on a daily basis during the wet season, could be a high-risk activity for POC. Mitigation measures may not be adequate to allow the project or reduce the risk without again incurring higher costs. Most of the acres are along the western edge of the Grants Pass-Caves Junction corridor.

Comment: *The SEIS failed to consider that protection of POC may help prevent unnaturally intense fires. Loss of POC from ultramafic areas may increase hazardous fuels due to replacement by more ladder fuels and brush. [34-46]*

Response: The Fire and Fuels section in Chapter 3 & 4 discusses the need for integrated vegetation management and hazardous fuels reduction within the range of POC (potentially tens of thousands of acres per year). Treatment objectives are to change fire behavior by reducing its rate of spread or intensity, and reduce unwanted fire effects. Although protecting large POC could prevent more understory ladder fuels and brush, at the landscape scale, there is already an excessive amount of downed woody fuels, ladder fuels, and brush compared to historic conditions. Outside of the recent Biscuit Fire area, wildland fires would continue to be unnaturally severe until existing hazardous fuels are reduced.

Comment: *I do not understand the statement in the Fire and Fuels section that "many of these (fuel) treatments are accomplished on the same acre." [44-38]*

Response: Fuel treatments are often a sequence of specific treatments that can occur at different times of the year or over several years. For example, understory vegetation maybe cut (in a 100-acre stand), handpiled (100 acres), the hand piles burned (100 acres), and the entire area understory burned (100 acres) in separate treatments at different times. Depending on the funding and timing, these may all be claimed as separate accomplishment acres (400 acres of accomplishment), but done on the same acres (same 100 acre stand treated).

Air Quality

No substantive comments were received.

Recreation, Visual, Wilderness, and Wild and Scenic Rivers

Comment: *The Recreation, Visual, Wilderness, and Wild and Scenic Rivers section of the draft SEIS did not adequately analyze the effects to non-motorized recreation activities and was biased toward effects to motorized access. [32-31]*

Response: Access to the public lands is most commonly achieved by motorized means. Mitigation activities included in the Standards and Guidelines of the various alternatives that affect levels of public access are key to evaluating impacts. The effects to nonmotorized activities are directly related to levels of public access. One activity (achieving access) must occur before the other (recreation activities).

Comment: *The effects to Wilderness and Wild and Scenic River values were not discussed adequately. [32-31]*

Response: The text has been modified to reflect wild and scenic river values as being similar to wilderness values. Both areas are managed in a way that allows natural processes to occur and dominate, with the quality of visual and aesthetic values being both the primary resource and the elements at risk from PL.

Comment: *The draft SEIS is biased toward allowing motorized access in POC areas. [32-43]*

Response: Levels of access for recreation opportunities, commercial activities, or silvicultural management functions are all affected by the varying degrees of mitigation (road closures/decommissioning). No one user group is singled out for exceptions to access limitations. Activities would be subject to the risk key (Alternatives 2, 3, and 6) depending upon the level of risk they posed, with motorized access more likely to be restricted than other travel. Similarly, the POC core and buffer areas in Alternatives 3 and 6 have additional vehicle restrictions.

Comment: *Public education efforts should be employed to inform/instruct off-highway vehicle users regarding the need for closures that affect their use. [44-9]*

Response: The Community Outreach provision in Alternative 2 (also applicable to Alternatives 3 and 6) has been changed to include ". . . consider focusing theses efforts on user groups most likely to engage in activities at more risk for spreading PL . . . " precisely to focus education efforts where they are most needed. The land management Agencies all share the tool of public education as an effective measure to reduce user impacts to the land. As off-highway vehicle enthusiasts (if unrestricted) are the most likely recreation group to contribute to PL infestation due to the nature of the activity, positive education and management efforts would be employed with this user group to reduce their impacts to the land.

Comment: *For all alternatives, the author states that "the visual quality of the characteristic landscape could suffer degradation until stands recover with replacement conifer spe-*

cies." This is not an accurate statement for ultramafic areas. [44-39]

Response: The text has been changed to reflect that ultramafic soils will be slower to recover.

Areas of Critical Environmental Concern and Research Natural Areas

Comment: *Appendix 8 should include only those areas that support POC. Please clarify the meaning of the POC/PL column and indicate the proportion of PL infestation of the protected POC stands. [25-31]*

Response: Table A8-1 has been modified to show only those areas of critical environmental concern and research natural areas that contain POC.

The POC/PL column is meant to show whether or not the ACEC or RNA is infested or uninfested with PL. The letters "POC" indicate uninfested ACECs or RNAs and the letters "PL" indicate the ACECs or RNAs are infested. The table has been modified to reflect this comment.

The number of acres with healthy POC or the number of acres infested with PL for each ACECs or RNA has not been determined for this analysis. This detail is not needed for the programmatic nature of the alternatives.

Comment: *Appendix 8 shows five ACECs or RNAs currently have root disease, and four of these special status areas were selected at least partially for the presence of POC associated plant communities. The ACEC designation is restricted to "areas containing truly unique and significant resource values" (Appendix 8). Management plans should be developed to reduce the spread of PL in these areas, primarily be eliminating those activities which foster its spread. They should be closed to ORV use, mineral entry, and timber harvest, even those areas not currently infested. Foot traffic should be subject to regulations which are designed to keep PL out of these areas. [44-40]*

Response: Each ACEC and RNA retains its designation regardless of which alternative is selected under the POC SEIS. Each ACEC and RNA will continue to have a management plan that has specific direction for activities permitted within the ACEC or RNA. These management plans already provide some restrictions, and they could be revised to provide the protections suggested in this comment if the individual situation warrants such restrictions. Details for the individual ACEC or RNA management plans are outside the scope of the programmatic alternatives in this SEIS.

Comment: *The Research Natural Area mentioned for the Powers Ranger District is substantially infested with PL. This needs to be clarified in the SEIS. [25-28]*

Response: The Distribution Across the Range section was not intended to describe specific locations of PL, but rather broadly depict POC in large geographic regions. Appendix 8, however, does acknowledge the presence of PL in the Coquille River Falls RNA.

Culturally Significant Products for American Indian Tribes

No substantive comments were received.

Special Forest Products

Comment: *POC on Federal forest lands is not a major source of special forest products. Commercial bough cutting from these lands composed only 4 percent of the total commercial activity. Since this is a higher risk activity for PL spread, it should be eliminated on Federal forest lands as the economic consequences would be slight. [44-41]*

Response: The resource management plans of the land management Agencies within the range of POC direct these Agencies to manage their respective lands for multiple uses while maintaining the health of ecosystems within those lands. This approach provides for the preservation and restoration of the biological elements within ecosystems while also recognizing and providing important food, fiber, recreation, and jobs. Commercial, Tribal, and personal use cutting of POC boughs are valid activities consistent with ecosystem management goals. Additionally, the NWFP directs the development of special forest product programs to support the economic diversity of local resource dependent communities. Therefore, an effort was made not to eliminate all Federal commercial bough harvest. However, bough harvest is permitted in Alternatives 2, 3, and 6 only under very specific and controlled circumstances. In Alternatives 3 and 6, it is not permitted in core areas at all.

Comment: *Special forest product activities should be permitted in low-risk areas only, preferably areas without POC and/or during dry seasons, and permit conditions strictly enforced. Gatherers should not be allowed to travel between infested and uninfected areas, either by car or on foot. [44-41]*

Response: Currently, permits for special forest products are only issued if, after an evaluation of the activity, it is consistent with the land use objectives, it will not affect the sustainability of the product, and potential adverse effects on other resource values have been considered. Stipulations or conditions are made a part of these permits and enforced to ensure these goals are achieved. Alternative 2, 3, and 6 include a Management Practice that, when a need is indicated by the risk key, restricts operations to the dry season or requires strict administrative measures. Under Alternatives 3 and 6, no permits will be issued in the POC core areas. Mushroom gathering, firewood cutting, and Christmas tree cutting, in addition to hunting or hiking by adjacent property owners, are considered lower risk activities for the spread of PL. Restricting the travel of gatherers between infested and uninfected areas may not be logistically possible depending on road systems, checkerboard ownership, and where people live in relation to the area. Permitted gatherers may be required to wash boots and vehicles to mitigate the risk of spread.

Comment: *If bough gatherers are allowed to use the boughs from roadside sanitation products in the core buffer areas, the boughs should be brought to outside the buffer areas by Federal Agency workers, rather than allowing contracted workers to come in and thereby risk the increase of PL infestation. The by products of roadside sanitation should be dealt with in a manner that reduces their impact on uninfected areas including no commercial use. [44-42]*

Response: Roadside POC sanitation projects will likely be conducted by contracted workers, therefore a distinction between contracted workers cutting and piling trees for burning, contract workers delimbing trees and gathering boughs, or Agency workers gathering and transporting boughs may not be practical or logical with regard to risk of spread. With the restrictions imposed by the Standards and Guidelines for Alternatives 2, 3, and 6, roadside sanitation is regarded as a measure with benefits outweighing drawbacks with respect to PL spread. Secondly, it produces post, wood, and bough commodities that are valued by the public and defray the cost of the sanitation.

Timber Harvest

Comment: *The impact of partial suspension yarding is much different than that of tractor logging and the impacts should be analyzed either separately or in conjunction with full suspension. [2-24]*

Response: These statistics have been broken out into three categories in the Timber Harvest effects section for clarification. The Management Practice in Alternatives 2, 3, and 6 has been changed to lump partial-suspension with other aerial or cable systems.

Costs

Comment: *Economic mechanisms of the timber industry, the changing economic base and role of Federal lands, or opportunities to create jobs were not considered. [29-4]*

Response: These topics have already been discussed in the associated land and resource management EIS for each respective administrative unit.

Comment: *Cost considerations when using the Risk Key described in Alternative 2 are needed. [45-5]*

Response: As stated in the Purpose section, management strategies are considered if, among other criteria, they are cost effective. While not a specific risk key element, cost can be a factor in the selection of one or Management Practices to mitigate that risk. Selection of specific Management Practices stemming from use of the risk key is determined based on site-specific conditions. The cost-effectiveness of various Management Practice options or combinations can also be considered outside the key in the site-specific analysis.

Comment: *Historical expenditures of implementing Alternatives 2 and 3, and their relative effectiveness of limiting the rate of spread of the disease, are not disclosed. [45-6]*

Response: Because Alternatives 2 or 3 will take place in the future if selected, direct future costs of these alternatives are estimates. These estimates are based upon actual historical expenditures of past individual actions and associated unit costs (for example, sanitation treatment on a per mile basis). Effectiveness of various management techniques on minimizing the spread of PL is currently being evaluated.

Environmental Justice

No substantive comments received.

Civil Rights Impact Assessment

No substantive comments received.

Critical Elements of the Human Environment

No substantive comments received.

Other Environmental Consequences or None

Comment: *The draft SEIS does not consider that climate change may alter PL infection mechanisms by altering temperature and precipitation patterns. [34-36]*

Response: While not discussing climate change or global warming per se, the Pathology section does describe the conditions favoring the spread of PL. With this information, managers can respond to any changes in climate, like shorter dry seasons for example, during project planning and site-specific application of mitigating Management Practices. Monitoring of PL spread rates, however, will likely be a more important way of dealing with climate changes. If spread rates increase, monitoring will reveal a need to modify the strategy.

Comment: *The way in which the draft SEIS is organized makes it exceedingly difficult to follow. In particular, the combining of the Affected Environment and Environmental Consequences sections is confusing. [32-9]*

Response: Other readers, and authors in particular, find benefit to having the affected environment described along with the effects for the same resource. The combination was done to ". . . more clearly present information to readers . . . " (Chapter 3&4, page 1), and copies the format used in the 1994 NWFP SEIS, the 2000 Survey and Manage SEIS, the 2003 Survey and Manage Draft SEIS, the 2003 Aquatic Conservation Strategy SEIS, and others.

Comment: *The SEIS is missing the required distribution list. [44-48]*

Response: The distribution list for the final SEIS has been added to Chapter 5.

Chapter 5

Preparers

No substantive comments received.

References

Comment: *Some of the references should be checked for correctness and relativity to the subject. [21-22]*

Response: References have been checked and corrected as necessary.

Glossary

No substantive comments were received, except those answered as part of another comment.

Index

No substantive comments received.

Appendices

Port-Orford-Cedar Management Guidelines

Comment: *Appendices 1 and 3 contain POC management direction for all administrative units except the Siskiyou National Forest, but it is not apparent from reading that language how any of it can be applied with any consistency in using the risk key. [45-4]*

Response: The management direction for the Siskiyou NF is in Chapter 2 under Alternative 1. Appendix 3 just includes the current management direction for cooperating units and the Suislaw NF, which are not among the action Agencies. The risk key is a feature of Alternative 2 and would only apply to the action Agencies. An explanation of the relationship of Appendix 3 to the alternatives has been added to the beginning of Appendix 3.

Summary of Agency Actions for Fiscal Year 2001–2002 Under the Existing Direction for Port-Orford-Cedar

Comment: *The average size of POC that have been removed as a result of roadside sanitation treatments has not been described. [44-7, 44-11]*

Response: The average size of POC removed from sanitation project areas has not been documented and therefore unknown. However, few POC logs are removed unless they are of merchantable size (equal to or larger than 8 inches diameter at breast height), and in the past, most sanitation treatments have excluded merchantable volume.

Comment: *The SEIS does not disclose whether mining operators are required to follow the same mitigation techniques as the Agencies. [44-8]*

Response: A mining section has been added to Chapter 3&4.

Comment: *Field selection (i.e. removal) of resistant trees is not described. [44-10]*

Response: The discussion of the Interagency Port-Orford-cedar Breeding Program in Appendix 2 says that vegetative material is collected, but does not fully describe what vegetative material is being collected. Approximately 10 to 15 limbs about 12 inches in length are collected from each candidate tree and, when available, 50 to 100 mature cones are also collected.

Comment: *If heat kills the pathogen, why is Clorox-treated water necessary for wildfire management? [44-10]*

Response: Clorox bleach-treated water is used for wildland fire operations, including water used to wash equipment, water roads for dust abatement, and for helicopter drops on the fire itself. Although some research indicates heat kills PL in certain conditions, it has not been demonstrated whether this happens in waters dropped on fires. Also, since water is often dropped on hot spots along the fire perimeter, some of that water may land on areas that have healthy POC outside the fireline where the water delivery itself could serve as a spread mechanism for PL. Other areas where infested water may be dropped may be inside the fireline, but go unburned, get only lightly burned, or the water may even run off into ditchlines and watercourses where it could infest roadside POC or be channeled through culverts and threaten healthy POC downstream.

Comment: *The eradication treatments being planned for the Shasta-Trinity National Forest in 2003 are not explained. [44-12]*

Response: Appendix 2, Summary of Agency Actions, is not meant to explain specific actions in detail and all reasons for possibly using them, but is intended to serve as a brief encapsulation of Federal Agency POC actions. A general description of eradication treatments can be found on in the Standards and Guidelines for Alternative 2.

POC Standards and Guidelines in the Land and Resource Management Plans in Region 5, SEIS Cooperating Agencies, and the Siuslaw National Forest

Comment: *Monitoring results should be provided and clearly summarized to date in the SEIS regarding how effective current management practices may be and how to improve their effectiveness for future management of Port-Orford-cedar. [45-2]*

Response: Agency knowledge about the effectiveness of the various root disease mitigation measures is described in the Pathology section of Chapter 3&4. Potential limitations on this knowledge are described in the Incomplete and Unavailable Information section early in Chapter 3&4. Many of the practices are well founded in science and other root disease control experience and are therefore reasonably expected to work as prescribed. Implementation monitoring assures that required actions are actually done at the project scale. This is reviewed annually and indicates a very high degree of compliance. Specific results of various trials are not directly part of this SEIS, as they have been developed over several years as POC root disease management has evolved.

Comment: *We have heard that vehicle washing doesn't really happen, even if required. We have often asked Roseburg BLM for washing monitoring or inspection reports, but there are none. We have personally witnessed logging equipment moving in and out of areas with no washing being done, even though the EA had promised it would be required. [38-13(S), 4-3, 37-3]*

Response: The pathology and other effects described in the SEIS are based in part on Agency experience with the current direction, and in part on an expectation that direction will be followed as written. Annual implementation monitoring indicates a high degree of consistency with EA requirements. The Agencies would appreciate questions about apparent departures from EA-agreed direction being directed to local managers.

Existing Direction — Six Rivers National Forest

No substantive comments received.

Existing Direction — Klamath National Forest

No substantive comments received.

Existing Direction — Shasta-Trinity National Forest

No substantive comments received.

Existing Direction — Siuslaw National Forest

Comment: *All areas of the Oregon Dunes National Recreation Area that have POC need to be closed to off-highway vehicles to reduce the risk to unique POC "island" communities in the dunes. [34-38]*

Response: Management direction in the Oregon Dunes is outside the scope of the SEIS. The Oregon Dunes were not included as an action Agency or cooperator in part because their POC was so limited, and because it is covered by the relatively recent management plan for the Oregon Dunes. Under that plan however, as explained in the Distribution Across the Range section of Chapter 3&4, the older POC in island communities in the dunes are in a management category designed to maintain, restore, or enhance its condition. Off-highway vehicle use is prohibited near these communities.

Clorox Use, Toxicity, Potential Environmental Effects, and Label Information

Comment: *The application of water treated with Clorox (sodium hypochlorite) to fires in the presence of organic aromatic compounds, and the heat of combustion, is likely to lead to the production of dioxin. [36-5]*

Response: There is considerable debate as to how much of the dioxin occurring in the environment can be attributed to natural sources such as wildland fire versus that generated by humans (Gordon 1994). Dioxin is a product of the incomplete combustion of biomass due to the natural occurrence of chlorine in plant tissue, and can be produced through the combustion of waste, fuel wood, and in this case wildland fire (EPA 2001). Expressed as a portion of dry weight, there is approximately 100 parts per million chlorine in plant tissue (Epstein 1972). It is therefore unlikely that the application of a 50 parts per million water solution of chlorine to portions of a fire would result in a significant increase in dioxin production above that already being produced by the fire.

Comment: *How much Clorox would be used during the life of the EIS, what is the fate of the Clorox treated water, and would there be a negative environmental effect? [38-14(S)]*

Response: The use of Clorox bleach is described in the Standards and Guidelines section of Chapter 2. The Standards and Guidelines call for water to be treated with Clorox bleach where PL-free water is not available for wildland fire operations, equipment and tool washing, and road

watering, to limit the spread of PL. Appendix 4 describes the past and anticipated future use rates of Clorox bleach, and provides environmental hazard information. Appendix 4 states that during the Biscuit Fire on the Siskiyou NF in 2002 approximately 26,700 gallons of Clorox bleach were used in accordance with the label during fire suppression and restoration activities. The Biscuit Fire, however, was a fire of unprecedented scale in recent Oregon history. The average annual use rate for fire use is projected to be 1,000 to 5,000 gallons with other uses less than that. This is consistent with future wildland fire predictions included in the Fire and Fuels section of Chapter 3&4.

Sodium hypochlorite, the active ingredient in Clorox, is a strong oxidant and 97 to 99 percent of the material will quickly break down to produce water, chloride ions, and disinfection byproducts such as chloramines. Chloramines may persist in an upland setting for a few days and in an aquatic setting for up to a week.

Sodium hypochlorite is a well known and widely used compound and has been extensively studied. Clorox bleach is of relatively low toxicity to nonhuman mammals and birds. In 1991, the EPA determined that human risks from chronic and subchronic exposure to low levels of Clorox bleach were minimal and without consequence to human health (EPA 1991).

Clorox, however, is highly toxic to aquatic organisms. The freshwater criteria for the protection of most aquatic species and their uses are 11 micrograms per liter total residual chlorine as a 4-day average (0.011 parts per million) and 19 micrograms per liter as a 1-hour average (EPA 1984). Toxicity levels for several relevant fish species were added to Appendix 4. In addition, following the EIS going to press, it came to the attention of the authors that there had been three fish kills during the Biscuit Fire. These were all due to the release of freshly chlorinated water at fill sites and are now described in Appendix 4. If Clorox bleach is added after tanks have been filled and away from the fill site, future events such as these would likely be avoided.

Monitoring Plans for Each Alternative

Comment: *Current POC management direction is either not implemented or, when it is, does not work. [21-7]*

Response: Monitoring of compliance with Standards and Guidelines is conducted by both Agencies annually, and this monitoring continues to find a very high level of compliance with land and resource management plan Standards and Guidelines. Additionally, as alluded to in both the Pathology section and the Monitoring section (Appendix 5), various root disease control practices are systematically investigated for their effectiveness. Evaluation of specific Management Practices is ongoing. Relative effectiveness of various Management Practices is shown in the Pathology section.

Comment: *The effectiveness of gates as a mitigation measure is suspect. [32-19]*

Response: Jules et al. (2002) have shown that 72 percent of the infection events they studied were the result of vehicle traffic. Reducing vehicle access by gates or other means reduces the potential to spread PL. The monitoring plans for the Action Alternatives require Agencies to ". . . continue to evaluate and coordinate existing management techniques to reduce the occurrence of PL and retain healthy POC." Recent evaluations specifically for gate closures

are described in the Pathology section.

Comment: *In the Monitoring Plan, the Effectiveness and Validation question says "has the spread or non-spread of the disease significantly departed from the predictions made in this SEIS that were used to select a management strategy?" Since the SEIS elsewhere explains there is an "S" curve that describes a variable rate of infestation over time in infested watersheds, what numbers will be used to identify departures? [34-33]*

Response: While the infestation in any given area or watershed follows an "S" curve, the overall spread across the range or entering into uninfested watersheds, and thus the acres of PL infestations for large areas such as the entire range in Oregon, should be relatively lineal. Nevertheless, it may take several years to detect a departure or even decades to detect a small departure. An important criterion for spread rates is not only where individual sites of infestation are on the "S" curve, but how many new sites occur during a given period of time. Continuation of current mapping, and mitigation practice effectiveness monitoring, will help reveal if there are significant departures in the short term.

Comment: *We are concerned about monitoring requirements. While forest will be required to report on their efforts, how often will the overall strategy for management of POC be reviewed? Will sufficient data be gathered about the efficacy of approaches so that we can be sure that managers are taking the best approaches and conditions are not changing in ways that are difficult to detect. The fundamental idea behind adaptive management is to be able to shift gears if new evidence appears; this approach depends on good monitoring. [39-4]*

Response: To answer the question of whether the spread or non-spread of the disease has significantly departed from the predictions made in this SEIS (that were used to select a management strategy), the monitoring plan says that as new inventory data (CVS and FIA) and local mapping become available, it will be evaluated for current levels (acres and/or number of trees) of infected and uninfected POC and corresponding trends. Inventory plots are typically reinventoried on a 3- to 10-year cycle, depending upon location.

Port-Orford-Cedar Seed and Seedling Deployment Strategy

The Port-Orford-Cedar and Seedling Deployment Strategy has been replaced by the Resistant Port-Orford-Cedar and Growth Assumptions.

Biological Evaluations

Comment: *An analysis of the effects to fisheries was lacking in the biological evaluation. [21-20, 34-52, 45-7]*

Response: A fisheries section has been added to the biological evaluation.

Comment: *Consultation for effects to threatened and endangered species will be needed. [21-20, 32-45, 45-8]*

Response: Consultation with the USFWS and NOAA-Fisheries will be completed prior to the release of the record of decision.

Comment: *The EIS does not disclose the degree of ESA "take" or whether the loss of salmonid habitat values will cause jeopardy or reduce options for future recovery of listed coho. [34-20]*

Response: *Take* and *jeopardy* are components of the processes dealing with consultation upon the effects of a proposed action to threatened and endangered species. The determinations are made in conjunction with, or by, the regulatory Agencies (USFWS, NOAA-Fisheries) during the consultation process, as prescribed, for compliance with the "Endangered Species Act."

Comment: *The table entitled "Summary and comparison of the environmental consequences (effects) of the alternatives" in the Summary section of the SEIS presents information that does not agree with that presented in the Biological Evaluation. [44-2]*

Response: The table and associated text have been corrected to match the information in the biological evaluation.

Comment: *Information presented in the Biological Evaluation regarding the effects of the alternatives to the northern spotted owl, marbled murrelet, and bald eagle were incomplete or unclear. [44-45, 44-46, 44-47]*

Response: The biological evaluation was rewritten to more clearly identify the effects of the preferred alternative to threatened and endangered species.

Areas of Critical Environmental Concern and Research Natural Areas and Requirements for Designation

No substantive comments were received.

Summary of Modeled Stream Temperature Increases Resulting from Port-Orford-Cedar Mortality

No substantive comments were received.

Maps

No substantive comments were received.

Appendix 11: Reprinted Comment Letters from Governmental Entities

This appendix contains comment letters received on the Draft SEIS from Federal, state, and local government agencies; American Indian Tribal organizations; and elected officials.

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 at the beginning of this appendix. An explanation of the EPA rating criteria is also included.

These are the letters that follow:

1) U.S. Environmental Protection Agency, Region 10 (#48)
2) U.S. Department of the Interior, Fish and Wildlife Service, Roseburg Field Office (#45)
3) Douglas County (Oregon) Board of Commissioners (#47)
4) Oregon State Department of Forestry (#49)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

SEP 23 2003

Reply To
Attn Of: ECO-088

Ref: 03-011-BLM

Ken Denton, SEIS Team Leader
Port-Orford-Cedar SEIS Team
P.O. Box 2965
Portland, OR 97208

Dear Mr. Denton:

The U.S. Environmental Protection Agency (EPA) has reviewed the Draft Supplemental Environmental Impact Statement (DSEIS) for the proposed **Management of Port-Orford-Cedar in Southwest Oregon** pursuant to our responsibilities under Section 309 of the Clean Air Act and the National Environmental Policy Act (NEPA) as amended. Section 309, independent of NEPA, directs U.S. EPA to review and comment in writing on the environmental impacts associated with all major federal actions.

Stands of Port-Orford-Cedar, an economically and ecologically important forest species, have become affected by the exotic root pathogen, *Phytophthora lateralis* (PL). PL is nearly always fatal to the cedars it infests. PL is spread by the transport of spore-infested soil by humans and other vectors. Currently, PL has infested 9-15% of the federally administered land within the project area. This DSEIS was prepared as a response to a decision by the U.S. Court of the District of Oregon. The Court found that BLM's previous environmental analysis had not adequately considered the "direct, indirect, and cumulative impacts on PL and Port-Orford-Cedar" over the entire range where it naturally occurs.

The DSEIS evaluates five different strategies to manage Port-Orford-Cedar within southwest Oregon on Bureau of Land Management (BLM) and National Forest lands. For baseline purposes, the DSEIS has proposed the No Action Alternative (Alternative 1) which is the current management approach. The four Action Alternatives are Alternative 2, 3, 4 and 5. The DSEIS identifies Alternative 2 as BLM's Preferred Action Alternative.

Based upon our review of the preferred alternative, EPA has rated the EIS EC-2 (Environmental Concerns - Insufficient Information). The rating and a summary of our comments will be published in the *Federal Register*.

1

Our main concern is that Alternative 2:

(1) Will provide nominal prevention from infestation compared to the current management direction (Alternative 1). Under Alternative 1 projections, the estimated area of infestation in 100 years will be 35% of the acres where Port-Orford-Cedar is prominent. Under the Preferred Alternative (Alternative 2) projections, the estimated area of infestation in 100 years will be 33% of the acres where Port-Orford-Cedar is prominent. The difference between the two Alternatives is nominal, only 2%. In comparison, Alternative 3 projects that infestation levels will cover 28% of the areas where Port-Orford-Cedar is a prominent element of the forest composition, a more substantive 7% difference.

(2) Does not provide additional protection of uninfested areas from PL. These areas can act as a refugia of diversity and abundance of an unimpaired Port-Orford-Cedar ecosystem. Since PL is nearly always fatal and since the resiliency and robustness of Port-Orford-Cedar resistance stock has not been adequately proven at the landscape level, we strongly recommend that the preventive elements of Alternative 3 (providing access limitations and restricting timber harvesting in Port-Orford-Cedar stands to 32 currently uninfested watersheds) be incorporated into the finalized Preferred Alternative developed for the FSEIS.

I encourage you to contact Tom Connor at (206) 553-4423 if you would like to discuss our comments and how they might best be addressed. Thank you for the opportunity to review this Draft SEIS on the Management of Port-Orford-Cedar in Southwest Oregon.

Sincerely,

Judith Leckrone Lee, Manager
Geographic Unit

Enclosure

2

United States Department of the Interior

FISH AND WILDLIFE SERVICE
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File Name: POC_DSEIS_Comments.doc
TS Number: 03-5397

September 16, 2003

Ken Denton
Port-Orford-cedar SEIS Team Lead
Bureau of Land Management
P.O. Box 2965
Portland, OR 97218

Subject: Comments on the Port-Orford-cedar Draft Supplemental Environmental Impact Statement

Dear Mr. Denton:

Staff in the Fish and Wildlife Service's (Service) Roseburg Field Office and Arcata Field Office, have reviewed the Port-Orford-cedar Draft Supplemental Environmental Impact Statement (DSEIS). This letter has been prepared under the authority of, and in accordance with provisions of the National Environmental Policy Act of 1969 [42 U.S.C. 4321 *et seq.*; 83 Stat. 852], as amended, the Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 *et seq.*; 48 Stat. 401], as amended, the Endangered Species Act of 1973 [16 U.S.C. 1531 *et seq.*; 87 Stat.884], as amended, the Migratory Bird Treaty Act (16 U.S.C. 7003-711), as amended, and other authorities mandating Service concern for environmental values. Based on these authorities, the Service offers the following comments for your consideration.

General Comments

- The DSEIS indicates that restricting entry in the uninfected core and buffer areas as described in Alternative 3 will more effectively maintain functioning ecosystems for plant communities and any threatened and endangered plant species. Restricting entry is unquestionably the most effective method for minimizing the spread of disease and noxious weeds. Alternative 4 and 5 do not have proven methodology to support utilizing resistant stock to replace Port-Orford-cedar killed by disease and it is unknown if resistant stock would be effective, if used.

  As a result of the improved efficacy at containment, stated increase in conservation of sensitive resources, and relatively modest increase in cost over Alternative 2, we recommend that Alternative 3 should be the preferred alternative

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- Baseline data regarding rare plant species distribution and abundance in the 32 uninfested 6th field watersheds would greatly increase our understanding of how the watersheds will provide for these plant species and what effect the loss of Port-Orford-cedar will have on rare species and ecosystems. The DSEIS contains almost no information on the characteristics of the 32 6th field watersheds and how those watersheds compare to infected watersheds with respect to sensitive resources and Port-Orford-cedar vegetation diversity. It is evident from viewing the maps that the watersheds differ widely in allocated land uses, types of access (road or trail), amount of access (number of entering roads or trails), traffic volume, distance to infected stands, and stakeholder interest. From these general differences, it appears that the 32 watersheds would also vary greatly in their response to protective measures, impacts to riparian ecosystems, direct costs of protection, and indirect costs in the form of foregone harvest and employment. The alternatives and analysis presented in Chapters 2 through 4 do not provide sufficient information or flexibility to allow for site-specific considerations or decisions among the 32 6th field watersheds. The options for decision-makers are artificially constrained by treating the 32 watersheds as a collective entity.

- Monitoring results should be provided and clearly summarized to date in the DSEIS regarding how effective current management practices may be and how to improve their effectiveness for future management of Port-Orford-cedar.

Specific Comments

- Page 2-14, the risk key is subjective and open to interpretation. The risk key is difficult to understand and could be re-worded to place emphasis on the stated need of the DSEIS. Appendices 1 and 3 contain Port-Orford-cedar management direction for all administrative units except the Siskiyou National Forest, but it is not apparent from reading that language how any of it can be applied with any consistency in using the risk key. Much of the cost-advantage of Alternative 2 over Alternative 1 is attributable to site-specific decision-making and cost-avoidance resulting from use of the risk key, but there is no discussion how those predictions of field decisions were made.

- There does not appear to be a significant difference regarding the cost-benefit ratio comparing Alternative 2 and 3. Table S-2 shows less acres infested in 100 years in Alternative 3 and only an increased cost of $35,000 with job decreases for both alternatives. The DSEIS provides some discussion of the basis for direct costs, but no assessment as to whether those historical expenditures were considered adequate in limiting the rate of spread of disease, or whether those expenditures simply reflected the amount of funding that was available at the time.

- Impacts to fish species should be included in a biological evaluation as part of the Appendices.

- We anticipate there will be a need to proceed with Section 7 consultation to address potential effects upon listed species. Representatives of the Forest Service, Bureau of Land Management, NOAA Fisheries and the Service met on September 11, 2003 to

initiate Level 1 Streamlining Consultation Team discussions. This group will identify and prepare the information necessary for the biological assessment and subsequent consultation, if needed.

If you have any questions about this letter, please contact Lynn Gemlo at (541) 957-3473 or me at (541) 957-3470. Thank you.

Sincerely,

/s/ Craig A. Tuss

Craig A. Tuss
Field Supervisor

cc: Michael Long, AFWO, Arcata, CA (e)
Brendan White, OFWO, Portland, OR (e)
Jon Hale, RO, Portland, OR (e)

BOARD OF COMMISSIONERS

DOUG ROBERTSON JOYCE MORGAN DAN VANSLYKE

1036 S.E. Douglas Ave., Room 217 • Roseburg, Oregon 97470 • (541) 440-4201

September 9, 20003

Port-Orford-cedar SEIS Team
P.O. Box 2965
Portland, OR 97208

RE: Draft Supplemental Environmental Impact Statement for Management of Port-Orford-cedar in Southwest Oregon 3400FS/5820(BLM)(OR-935)

Dear SEIS Team:

The Board of Commissioners of Douglas County, Oregon appreciates this opportunity to review and comments on the "Draft Supplemental Environmental Impact Statement for Management of Port-Orford-cedar in Southwest Oregon" ("DSEIS"). The DSEIS is a thorough and in depth compilation of the natural history of the Port Orford cedar and its pathogen, *Phytophthora lateralis*.

While it is recognized that *P. lateralis* is a management concern, the Port Orford cedar is not at risk of extirpation. The slow spread of *P. lateralis* is notable and affords the land managers not only an opportunity to manage the disease in a deliberate manner, it also provides an opportunity to develop seedlings with genetic resistance.

Of the five alternatives presented in the DSEIS, the management strategies presented in Alternatives 1 and 2, best serve to balance the degree of risk with the need for maintenance of the Port Orford cedar as an ecologically and economically significant species on Bureau of Land Management and National Forest System lands.

Douglas County does not support Alternative 3, in that it does not meet the purposes set forth for the DSEIS nor the objectives of the Northwest Forest Plan. Alternatives 1 or 2 best meet the balance of the Northwest Forest Plan.

If you have any questions on these comments please don't hesitate to contact this office.

Respectfully submitted,
The Board of Commissioners
Douglas County, Oregon

Joyce Morgan, Chair

Dan Van Slyke, Commissioner

Doug Robertson, Commissioner

Oregon
Theodore R. Kulongoski, Governor

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"STEWARDSHIP IN FORESTRY"

Ken Denton
Port-Orford-cedar SEIS Team
P.O. Box 2965
Portland, OR 97208

October 26, 2003

Dear Mr. Denton:

Thank you for the opportunity to comment on the draft SEIS for the management of Port-Orford-cedar (POC) in southwest Oregon.

The Oregon Department of Forestry (ODF) has a strong interest in maintaining POC as an ecologically and economically significant species on all ownerships in southwest Oregon. The SEIS provides an excellent synthesis of existing information on the species and the pathogen that threatens it, and reflects years of practical management experience.

We support Alternative 2, which provides for an integrated approach to reducing damage from *Phytophthora lateralis*. Alternative 3 also is attractive because it affords the greatest degree of protection to currently uninfested areas. However, substantial practical difficulties and possible inequities likely would result from adopting all 32 core areas. Within the scope of Alternative 2, it might be possible to identify a subset of core areas listed in Alternative 3 that would receive a very high level of protection. Selection of this subset could be based on criteria such as representation in POC genetic breeding blocks, or abundance of unique plant communities.

In southwest Oregon, little or no POC naturally occurs on State Forest lands. Clearly much POC exists on private forestland in the northern part of the POC range. The SEIS correctly characterizes the situation with regards to checkerboard private and BLM land ownership, shared road access, and lack of regulations specifically addressing Port-Orford-cedar root disease. Alternative 2 does, however, include private lands in the solution through community outreach and by making available disease-resistant seedlings. Private landowners could play a larger role in POC management in this zone if the Federal agencies cooperated with ODF to provide assistance and incentives to private landowners and operators. The appropriate channel for this is through the ODF Private and Community Forests Program. This newly formed program promotes voluntary investments in management of private and community forests through technical and financial assistance, education, and other incentives.

POC root disease is not specifically addressed in the Oregon Forest Practices Act. However, during inspections of Forest Activities, ODF has the opportunity before and during operations to make written recommendations to operators. These recommendations are not requirements, and failure to comply would not be a violation of law, but they are a very effective and specific means of communicating project level management practices.

We do not support alternatives 4 or 5, primarily because they would result in unnecessary loss of resource values, and possibly POC genes, and compromise the overall effort to minimize losses to this exotic pathogen. Although we have become accustomed to *P. lateralis* in southwest Oregon ecosystems and in landscapes throughout the state, it is not "naturalized" and should be treated as an exotic pathogen. It follows that the USFS and BLM should make all reasonable efforts to mitigate losses and especially to reduce spread of the disease.

Sincerely,

Alan Kanaskie

Alan Kanaskie
Forest Pathologist

akanaskie@odf.state.or.us

Appendix 12: Port-Orford-Cedar Disease-Free Watersheds

Table A12-1.—*Port-Orford-cedar disease-free 6th field [Alternative 3] watersheds* [1]

Watershed number	Watershed name	Core Matrix/ Riparian Reserve/ Adaptive Manage-ment Area acres	Core reserve acres [2, 3]	Port-Orford-cedar buffer acres	Total sub-water-shed acres [4]	% Federal owner-ship
Roseburg						
171003021204	Shields	5	105	6,773	25,561	27
Total	[1 watershed]	5	105	6,773	25,561	27
Medford						
171003100105	Rogue River/Lower Hellgate	0	285	10,954	12,847	87
171003100401	Rogue River/Whiskey Creek	0	779	13,266	15,090	93
171003100406	Rogue River/Missouri Creek	6	2,000	11,485	14,850	91
171003110501	Upper Deer Creek	6	1,902	9,319	14,347	88
171003100101	Rogue River/Upper Hellgate	359	45	17,742	32,936	55
171003110405	Lower West Fork Illinois River	354	137	3,285	12,161	30
171003110502	Middle Deer Creek	0	106	7,799	18,390	43
171003110504	Lower Deer Creek	479	94	10,529	23,224	48
171003110601	Illinois River/Kerby	429	101	7,611	18,279	45
Total	[9 watersheds]	1,633	5,449	91,990	162,124	61
Siskiyou						
171003100103	Taylor Creek	106	305	15,484	17,649	90
171003110101	Upper East Fork Illinois River	0	1,775	8,537	10,312	100
171003110404	Rough and Ready Creek	34	2,013	21,260	23,852	98
171003110602	Josephine Creek	236	4,627	22,867	27,773	100
171003110602	Sixmile Creek	136	577	13,326	14,319	98
171003110604	Baker Creek	0	440	20,388	21,302	98
171003110702	Lower Briggs Creek	178	1,773	15,276	19,104	90
171003110801	Florence Creek	0	144	11,739	11,883	100
171003110802	Klondike Creek	0	537	9,491	10,028	100
171003110804	Middle Illinois River	0	416	21,857	22,273	100
171003110901	Upper Silver Creek	676	395	26,294	27,484	100
171003111003	North Fork Indigo Creek	0	361	18,905	19,287	100
171003120103	Box Canyon Creek	0	146	9,406	9,552	100
171003120104	Tin Cup Creek	0	1,062	16,690	17,752	100
171003120105	Chetco River/Sluice Creek	0	488	13,991	14,479	100
171003120106	Boulder Creek	0	987	12,987	13,974	100
171003120108	South Fork Chetco River	1	147	27,743	28,811	97
180101010101	Chrome Creek [Upper North Fork Smith River]	0	2,861	21,650	24,511	100
180101101102	Baldface Creek	0	3,355	16,441	19,796	100
171003090604	Slate Creek	917	0	15,322	28,409	57
171003110701	Upper Briggs Creek	1,488	647	22,044	24,626	98
Total	[21 watersheds]	3,772	23,055	361,703	407,179	95
Grand total	**[31 watersheds]**	**5,419**	**28,609**	**460,464**	**594,863**	**83**

[1] Uninfested 6th field watersheds with at least 100 acres of Federal POC serve as the basis for POC core and buffer areas under Alternative 3. Acres reflect stands assumed lost in Biscuit Fire [see Map 1].
[2] Data is approximate, based on current Agency mapping analyzed with GIS systems. Actual size of core and buffer areas may vary based on actual field conditions.
[3] Reserves include Late-Successional Reserves, Congressional Reserves, and Administratively Withdrawn.
[4] Includes private acres.

Table A12-2.—*Port-Orford-cedar disease-free 7th field [Alternatives 2 and 6] watersheds* [1]

Watershed number	Core Matrix/ Riparian Reserve/ Adaptive Manage-ment Area acres	Core reserve acres [2, 3]	Port-Orford-cedar buffer acres	Total sub-water-shed acres [4]	% Federal owner-ship
Roseburg	0	0	0	0	0
Total [0 watersheds]	0	0	0	0	0
Medford					
17100310010536	0	227	951	1,178	100
17100310010539	0	950	504	1,454	100
17100310010545	0	546	836	1,382	100
17100309050103	2	514	621	1,251	91
17100309050218	0	188	3,139	5,152	65
17100310010603	0	115	450	781	72
17100310040103	0	174	2,065	2,929	76
17100310040106	0	605	2,038	2,643	100
17100310040212	0	239	747	986	100
17100310040215	0	324	2,781	3,105	100
17100310040612	0	113	1,201	1,314	100
17100310040618	6	1,076	2,670	3,752	100
17100310040630	0	797	620	1,417	100
17100310040727	0	109	248	357	100
17100311050106	0	217	690	941	96
17100311050115	0	460	847	1,615	81
17100311050121	0	377	1,241	1,986	81
17100311050203	0	106	552	1,170	56
Total [18 watersheds]	8	7,137	22,201	33,414	88
Siskiyou					
03B01F	0	103	2,836	2,939	100
03B02F	0	286	1,304	1,590	100
03B04W	0	219	1,877	2,096	100
03B08W	0	136	1,688	1,824	100
03L01W	0	196	1,557	1,753	100
03L02F	0	122	1,567	1,689	100
03M05W	0	212	1,347	1,559	100
03T01W	0	557	1,438	1,995	100
03T05F	0	168	2,888	3,056	100
03T07F	0	140	2,308	2,448	100
03U11W	0	416	695	1,111	100
03U12W	0	127	1,360	1,487	100
03U15W	0	310	1,060	1,370	100
04H02F	118	22	2,378	2,518	100
04M01F	0	119	1,444	1,570	99
04M04W	0	297	1,018	1,315	100
04M05W	1	146	1,191	1,338	100
05E06W	0	746	1,726	2,472	100
07L04W	0	205	207	412	100
07L05W	0	184	574	758	100
07L08W	136	89	368	593	100

Watershed number	Core Matrix/ Riparian Reserve/ Adaptive Manage-ment Area acres	Core reserve acres [2, 3]	Port-Orford-cedar buffer acres	Total sub-water-shed acres [4]	% Federal owner-ship
07L13W	0	119	417	536	100
07L14W	0	323	1,123	1,446	100
07M06F	0	140	1,506	1,646	100
08N01F	0	160	2,520	2,680	100
09U14W	89	79	958	1,126	100
09U16W	259	70	1,307	1,636	100
10C02F	0	105	2,194	2,299	100
10C03W	44	362	2,170	2,576	100
10C07W	2	170	879	1,051	100
10C09W	0	173	1,399	1,572	100
10C10W	40	682	960	1,682	100
10K01W	0	290	3,601	3,891	100
10K03W	0	168	3,022	3,190	100
10L01F	0	151	2,478	2,629	100
11B02W	7	170	1,536	1,802	94
11B03F	0	273	1,889	2,162	100
11B05W	0	113	889	1,002	100
11B06F	0	101	1,276	1,377	100
11B08W	25	232	1,552	1,809	100
11O05F	63	240	1,936	2,241	99
11S01F	0	370	1,434	1,804	100
11S03W	0	149	859	1,198	84
11S04W	43	251	1,945	2,508	89
11U01F	32	180	1,492	1,704	100
11U02W	71	35	474	580	100
11U03F	191	7	2,067	2,265	100
11U07W	149	1	1,213	1,363	100
11U11F	191	0	786	980	99
11U12W	112	36	804	952	100
11U13W	155	1	854	1,010	100
12J02W	0	154	2,295	2,450	99
12J03F	29	127	1,530	1,686	100
12J05W	0	218	1,668	1,886	100
12J07F	0	202	1,147	1,349	100
12J09W	0	645	2,013	2,658	100
12J10W	4	149	1,355	1,508	100
12J12W	0	128	635	763	100
12J13W	19	204	1,169	1,392	100
12J14F	83	58	2,074	2,235	99
12J15F	76	817	1,578	2,488	99
12J16W	0	769	1,323	2,092	100
12J17W	0	1,051	1,103	2,155	99
12L11W	0	171	1,073	1,244	100
12U09F	0	163	2,329	2,650	94
13D06W	227	8	724	1,021	94
13D10W	6	719	959	2,212	76
14E08W	37	132	1,484	2,272	73
14E10W	0	216	612	1,578	52
14M04W	165	0	1,102	1,296	98

Watershed number	Core Matrix/ Riparian Reserve/ Adaptive Manage-ment Area acres	Core reserve acres [2, 3]	Port-Orford-cedar buffer acres	Total sub-water-shed acres [4]	% Federal owner-ship
14M06W	0	250	293	565	96
14M07W	8	1,056	548	1,612	100
14R01F	18	154	2,111	2,561	89
14R04F	0	256	1,200	1,457	99
14R06F	0	165	1,995	2,160	100
14R08W	0	397	1,544	1,941	100
14R09F	0	104	1,388	1,492	100
14R13W	0	351	1,965	2,316	100
14R14F	0	289	2,071	2,360	100
14W02W	43	358	1,394	2,453	73
14W03W	0	750	413	1,163	100
14W05W	0	674	469	1,616	71
15D01F	36	139	1,818	2,134	93
15D04W	1	447	626	1,074	100
15D05W	80	55	846	981	100
15D09W	70	77	1,315	1,462	100
15U01W	0	143	269	412	100
15U02F	0	187	2,242	2,429	100
15U03W	0	525	844	1,369	100
15U04F	0	165	1,975	2,140	100
15U05W	0	438	705	1,143	100
15U06W	0	313	2,314	2,627	100
16A08W	273	7	419	699	100
16A09F	658	318	1,061	2,037	100
16A10W	146	312	1,770	2,228	100
16A11F	664	50	822	1,536	100
17C03F	0	200	1,719	1,919	100
17G04W	0	142	1,187	2,028	66
17G07W	164	10	544	718	100
17G13W	12	335	621	968	100
17L03W	9	98	1,850	1,986	98
17S16F	0	110	1,460	1,570	100
18S02W	109	0	1,240	1,520	89
18S04W	179	0	993	1,172	100
18S06F	180	0	1,976	3,207	67
18S07W	113	0	876	989	100
18S09W	157	0	1,412	1,636	96
20N02W	217	120	1,169	1,506	100
20N07F	7	421	649	1,077	100
20S08W	0	226	1,822	2,702	76
22M01F	0	108	2,647	3,040	91
22M09W	0	1,212	951	2,235	97
23L03W	38	123	876	1,099	94
23L06W	1	347	1,017	1,377	99
26F08W	84	45	1,215	1,344	100
26F11W	136	0	1,457	1,674	95
26G06W	160	10	796	966	100
26G10W	0	230	617	847	100
26T10W	28	115	1,289	1,432	100

Watershed number		Core Matrix/ Riparian Reserve/ Adaptive Manage-ment Area acres	Core reserve acres [2, 3]	Port-Orford-cedar buffer acres	Total sub-water-shed acres [4]	% Federal owner-ship
30M05W		0	215	439	852	77
30S07W		0	103	612	715	100
31A04W		0	193	448	807	79
31B01W		4	235	1,440	1,699	99
31C01W		0	106	1,726	1,832	100
31C04W		0	243	71	314	100
31C08W		0	108	1,013	1,121	100
83E07W		314	0	1,292	2,091	77
90B01F		0	269	2,603	2,872	100
90B02W		0	263	1,569	1,832	100
90B03F		0	447	2,893	3,340	100
90B04W		0	130	2,491	2,621	100
90B05W		0	321	1,165	1,486	100
90B06W		0	231	538	769	100
90B08W		0	894	572	1,466	100
90B09W		0	423	1,973	2,396	100
90B10W		0	297	1,805	2,102	100
90C01F		0	208	2,027	2,235	100
90C03W		0	338	952	1,290	100
90C06W		0	282	1,285	1,567	100
90L02F		60	1,228	468	2,231	79
90L05W		0	748	105	853	100
90L06F		0	105	939	1,044	100
90L07F		0	617	165	782	100
90N09W		0	163	1,864	2,027	100
Total	[144 watersheds]	6,343	35,881	193,799	244,867	96
Grand total	**[162 watersheds]**	**6,351**	**43,018**	**216,000**	**278,281**	**95**

[1] 7th field watersheds with at least 50 percent Federal ownership, at least 100 acres of POC, and either uninfested or infestation limited to the lowermost 2 acres of the watershed, serve as the basis for POC core and buffer areas under Alternative 6 and are linked to the risk key in Alternative 2. Acres reflect stands assumed lost in Biscuit Fire [see Map 3].
[2] Data is approximate, based on current Agency mapping analyzed with GIS systems. Actual size of core and buffer areas may vary based on actual field conditions.
[3] Reserves include Late-Successional Reserves, Congressional Reserves, and Administratively Withdrawn.
[4] Includes private acres.

Appendix 13: Equipment Cleaning Checklist

This checklist (for optional use) is referenced in the Washing Project Equipment management practice described in Chapter 2, Alternative 2.

The purpose of this checklist is to provide guidance in the cleaning of equipment, as stipulated in contracts, to control or prevent the spread of noxious weeds and PL. The checklist directs attention to specific areas on equipment that are likely to accumulate soil and organic material. Questions to ask about overall equipment cleanliness are:

1) Does the equipment appear to have been cleaned?
2) Is the equipment clean of clumps of soil and organic matter?

Rubber-Tired Vehicles

- ☐ Tires
- ☐ Wheel rims (underside and outside)
- ☐ Axles
- ☐ Fenders/wheel wells/trim
- ☐ Bumpers

Track-Laying Vehicles

- ☐ Tracks
- ☐ Road wheels
- ☐ Drive gears
- ☐ Sprockets
- ☐ Roller frame
- ☐ Track rollers/idlers

All Vehicles

- ☐ Frame
- ☐ Belly pan (inside)
- ☐ Stabilizers (jack pads)
- ☐ Grapple and arms
- ☐ Dozer blade or bucket and arms
- ☐ Ripper
- ☐ Brush rake
- ☐ Winch
- ☐ Shear head
- ☐ Log loader
- ☐ Water tenders (empty or with treated water)
- ☐ Trailers (low-boys)
- ☐ Radiator/grill
- ☐ Air filter/pre-cleaner
- ☐ Struts/springs/shocks
- ☐ Body seams

Maps

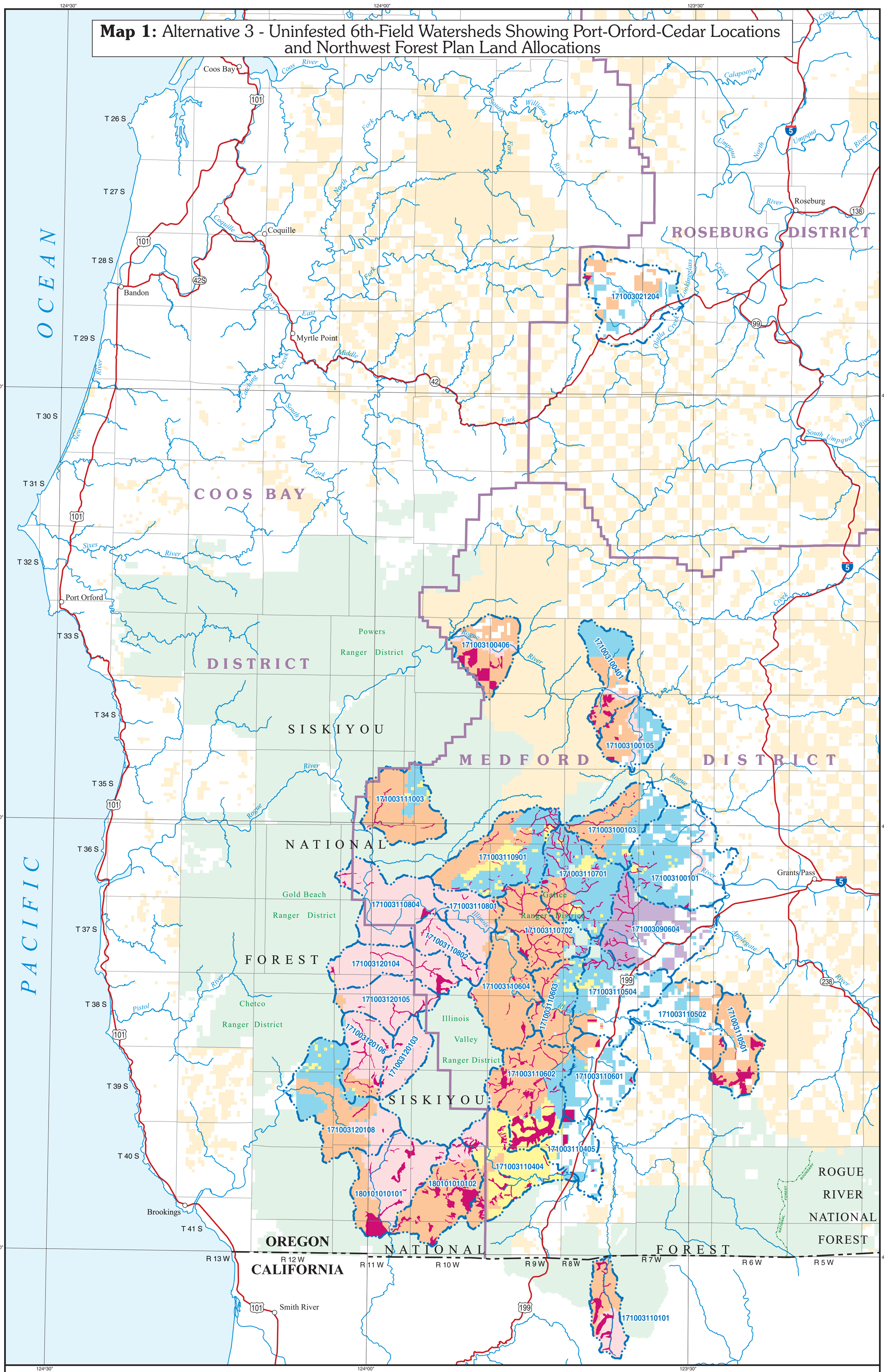
Map 1: Alternative 3 – Uninfested 6th-Field Watersheds Showing Port-Orford-Cedar Locations and Northwest Forest Plan Land Allocations

Map 2: Alternatives 2 and 6 – Uninfested 7th-Field Watersheds, Showing Port-Orford-Cedar Locations and Northwest Forest Plan Land Allocations

Map 3: *Phytophthora lateralis* and Port-Orford-Cedar by Northwest Forest Plan Land Allocation for the Oregon Portions of the Range

Map 4: Port-Orford-Cedar Occurrence and Range, and Ecoregions

Map 1: Alternative 3 - Uninfested 6th-Field Watersheds Showing Port-Orford-Cedar Locations and Northwest Forest Plan Land Allocations



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Forest Service
Siskiyou National Forest

Management of Port-Orford-Cedar in Southwest Oregon

Final Supplemental Environmental Impact Statement

December 2003

LEGEND

Federally Administered Land

- Port-Orford-Cedar Core Uninfested with Root Disease
- Northwest Forest Plan Land Allocation
  - Adaptive Management Area
  - Administratively Withdrawn
  - Congressionally Withdrawn
  - Late-Successional Reserve
  - Riparian Reserve / Matrix

Other Federally Administered Land Outside Uninfested 6th-Field Subwatershed

- Bureau of Land Management
- U.S. Forest Service

- Uninfested 6th-Field Subwatershed Boundary
- BLM District Boundary
- Major Stream (Order 1-5)

5 0 5 10 Miles

5 0 5 10 Kilometers

N W E S

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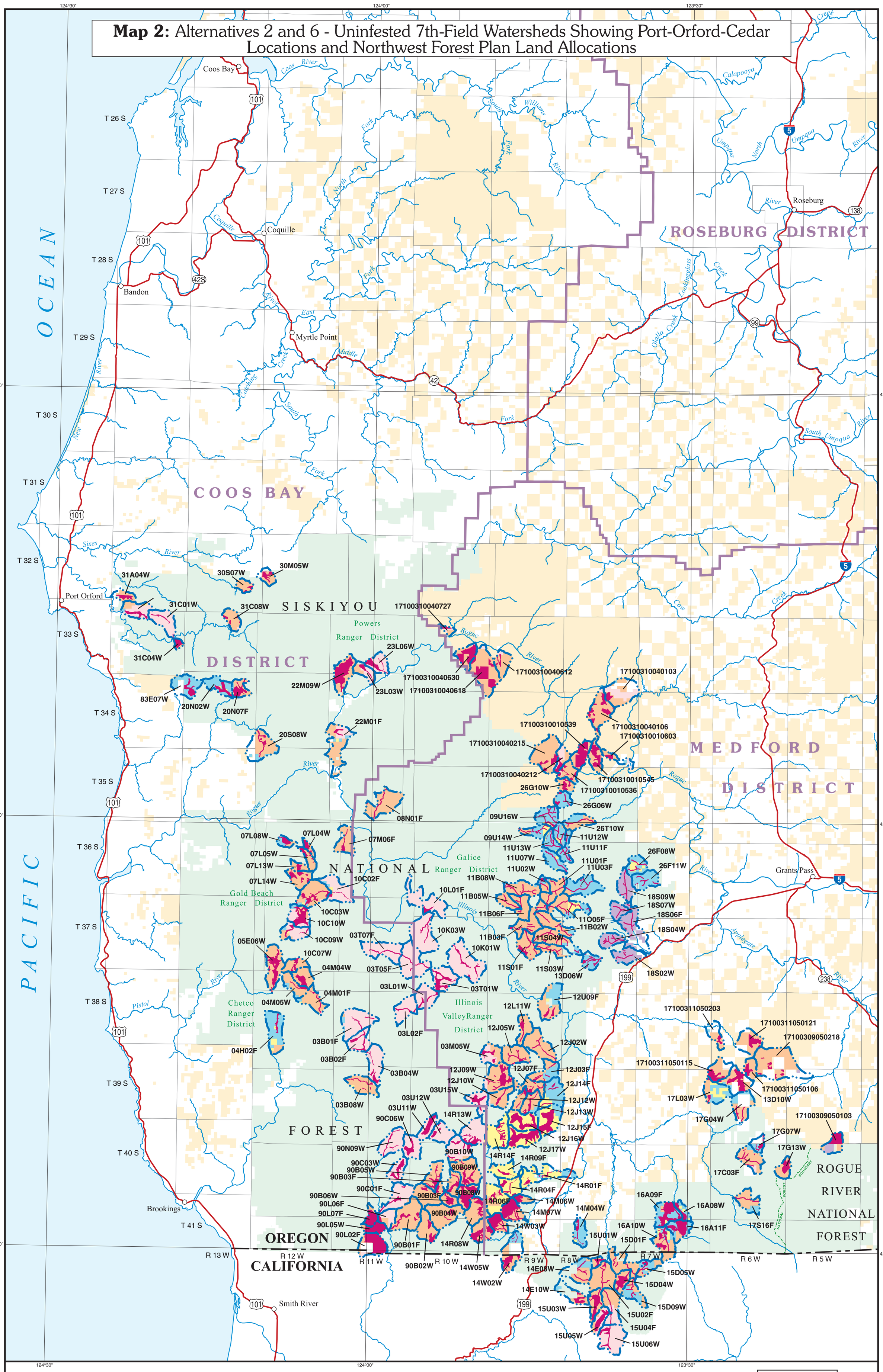
Map 2: Alternatives 2 and 6 - Uninfested 7th-Field Watersheds Showing Port-Orford-Cedar Locations and Northwest Forest Plan Land Allocations



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LEGEND

Federally Administered Land

- Port-Orford-Cedar Core Uninfested with Root Disease
- Northwest Forest Plan Land Allocation
  - Adaptive Management Area
  - Administratively Withdrawn
  - Congressionally Withdrawn
  - Late-Successional Reserve
  - Riparian Reserve / Matrix

Other Federally Administered Land Outside Uninfested 7th-Field Subwatershed

- Bureau of Land Management
- U.S. Forest Service

- Uninfested 7th-Field Subwatershed Boundary
- BLM District Boundary
- Major Stream (Order 1-5)

5 0 5 10 Miles

5 0 5 10 Kilometers

N W E S

Oregon
Area of Map
California

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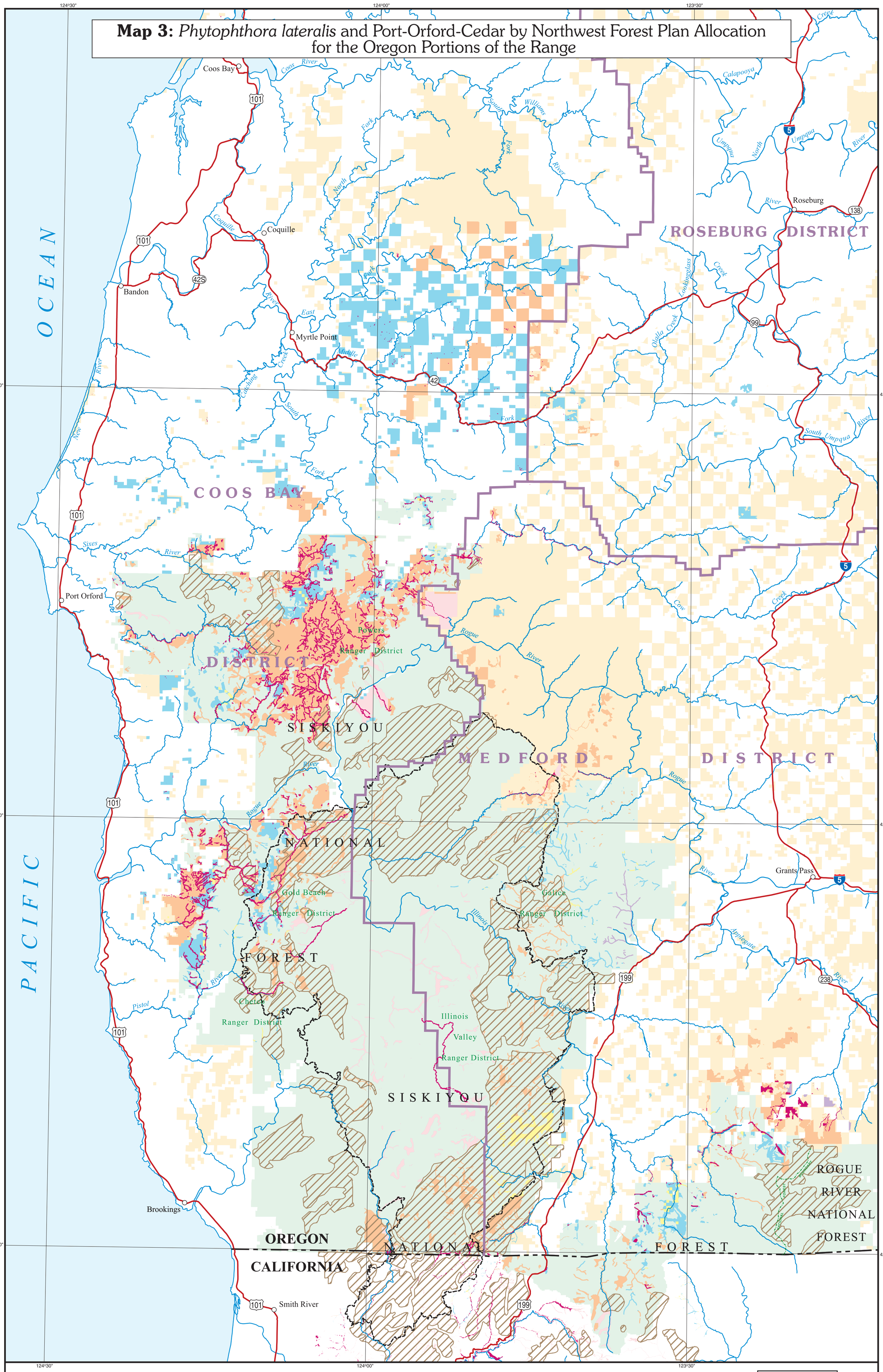
Map 3: *Phytophthora lateralis* and Port-Orford-Cedar by Northwest Forest Plan Allocation for the Oregon Portions of the Range



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Final Supplemental Environmental Impact Statement

December 2003

5 0 5 10 Miles

5 0 5 10 Kilometers

LEGEND

Federally Administered Land

- *Phytophthora lateralis* Infestation

Port-Orford-Cedar Presence in their underlying Land Use Allocations [1]

- Adaptive Management Area
- Administratively Withdrawn
- Congressionally Withdrawn
- Late-Successional Reserve
- Riparian Reserve / Matrix

Other Federally Administered Land

- Bureau of Land Management
- U.S. Forest Service
- Roadless Area
- Biscuit Fire Perimeter
- BLM District Boundary

[1] *The Port-Orford-Cedar areas inside the Biscuit Fire perimeter in areas greater than 75% topkill have been removed.*

N W E S

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Map 4: Port-Orford-Cedar Occurrence and Range, and Ecoregions

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Final Supplemental Environmental Impact Statement
December 2003

LEGEND

- Port-Orford-Cedar Range - Used for Current Vegetation Survey Plots
- Port-Orford-Cedar on Federal Lands
- 4d Ecoregion

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PACIFIC OCEAN

1b Coastal Uplands
1a Coastal Lowlands
1g Mid-Coastal Sedimentary
78c Umpqua Interior Foothills
1h Southern Oregon Coastal Mountains
78d Serpentine Siskiyous
78f Coastal Siskiyous
78e Inland Siskiyous
78b Siskiyou Mountains
78a Rogue/Illinois Valleys
4f
4d
4e
4g
M261An Red Butte
OREGON
CALIFORNIA
M261Ao
M261Dk
M261Da
M261Ae
M261Db
M261Dc
M261Ah
M261Al
M261Ag
M261Ap
M261Aq
M261At
M261Ar
M261Au Rattlesnake Creek
M261Ab Gasquet Mountain Ultramafics
M261Ad Siskiyou Mountains
M261Af California Other
M261Aa Western Jurassic
M261Ba Eastern Franciscan
M261Bb California Other
M261As Pelletrean Creek
M261Aj Upper Scott Mountains
M261Ak Lower Scott Mountains
M261Ai Eastern Klamath Mountains
262Aa
263Ab Northern Franciscan
263Ad
263Af
263Ae

124°00" 123°00" 43°00" 42°00" 41°00"

N W E S

5 0 5 10 Miles
5 0 5 10 Kilometers

Oregon
Area of Map
California