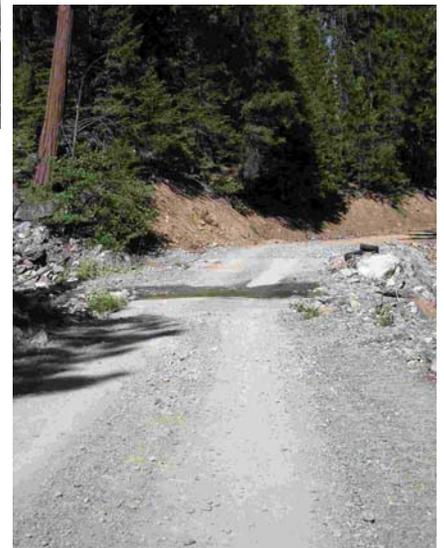


MANAGING FOR HEALTHY PORT-ORFORD-CEDAR IN THE PACIFIC SOUTHWEST REGION



**USDA FOREST SERVICE
PACIFIC SOUTHWEST REGION
FOREST HEALTH PROTECTION
NATURAL RESOURCES MANAGEMENT**

Executive Summary

This document describes the status of Port-Orford-cedar and Port-Orford-cedar root disease in California and the integrated strategies that will improve the survival potential of Port-Orford-cedar in California's forests. It consolidates, in a single source, information about the programs and existing direction from Forest Plans in the Region. It provides updated best management practices (BMPs) that forest managers may consider incorporating into project level planning and/or Forest Plan revision.

This description of programs was prepared jointly by Region 5 Forest Health Protection and Natural Resources Management, Silviculture and Genetics.

Introduction

The following is the current status of Port-Orford-cedar (POC) and the non-native pathogen *Phytophthora lateralis* (PL), which causes Port-Orford-cedar root disease, and major management-related activities in Region 5:

- POC root disease is present on the Six Rivers National Forest and extensive in the Smith River drainage. POC inventories show approximately 28,250 acres with POC on the Forest. About 2,850 acres (10.1%) are infested with PL.
- POC root disease has recently been discovered in the Klamath National Forest. The extent of the infestation is not known at this time. The Forest contains about 5,300 acres with POC.
- The Shasta-Trinity National Forest has about 1,200 acres of POC. POC root disease is present in eleven localized infestations in the Sacramento River drainage, but is not present in the Trinity River drainage. Less than 5 acres are infested on the Forest. Aggressive eradication is being pursued in the one infestation in the upper Sacramento River drainage, at Scott Camp Creek. This is the only infestation on the Shasta-Trinity National Forest.
- All forests have active prevention/suppression strategies in place to slow or prevent the spread of the pathogen.
- In 2005, the breeding zone map for POC throughout its range was updated, revising the number of Breeding Blocks from 6 to 5 and the number of Breeding Zones from 29 to 13. The Breeding Block/Breeding Zone map is attached as Appendix 1.

General Standards and Guidelines for the management of Port-Orford-cedar in California are contained within the individual Land and Resource Management Plans (LRMPs) for the Six Rivers, Klamath and Shasta-Trinity National Forests. This POC document describes many of the current programmatic and project-specific best management practices that may be used to reduce the spread of PL and maintain POC as an ecologically and economically significant species on National Forest lands in California. It also provides a framework to help identify where and when these practices might be used. This document draws from the Final Supplemental Environmental Impact Statement – Management of Port-Orford-Cedar in Southwest Oregon (USDA-FS; USDI-BLM 2004; <http://www.fs.fed.us/r6/rogue-siskiyou/projects/foresthealth/poc-seis.shtml>) and is consistent with existing direction for POC management found in the LRMPs for the three Forests. Most of the techniques described in this document are already being applied at planning, program, and project-specific levels. Practices not already incorporated in LRMPs are suggested practices that can be considered during project level planning/implementation and forest plan revision. The option to incorporate these practices as an LRMP amendment is left to the individual forests.

Overall management objectives for POC are as follows:

- Maintain POC on uninfested sites and sites where the risk for infection is low.
- Reduce the spread of the pathogen and intensification of root disease in high-risk areas and retain the ecological function of POC to the extent practicable.
- Reestablish POC in plant communities where their numbers or ecosystem functions have been reduced.
- Reduce the likelihood of root disease becoming established in disease-free watersheds.

This document divides currently known POC and PL best management practices into those that are applied programmatically (such as community outreach) and those that are applied to specific project-level management activities (such as fuel management projects, special use permits, road maintenance, mining plans/operations, timber sales, etc.). They are further divided into those that address both protection and restoration-related objectives, and those that address only protection or restoration objectives. Additional information on these best management practices can be found in the Rangewide Assessment of Port-Orford-cedar On Federal Lands (USDA-FS and USDI-BLM 2003); www.fs.fed.us/r6/rogue-siskiyou/projects/foresthealth/poc/poc-range-wide-assess.pdf) and in the above-mentioned Final Supplemental Environmental Impact Statement – Management of Port-Orford-Cedar in Southwest Oregon.

Programmatic POC Root Disease Best Management Practices

Protection and Restoration

- 1. Integrated Management Approach.** An integrated approach to deal with the spread of PL 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 and prescribed burning, snag retention, project-specific direction, management practices, and monitoring.

Except for the Smith River drainage, POC root disease in California is either absent or is present in only a limited number of places. Where the disease is absent, preventing the establishment of new infestations is the most prudent and effective management practice available. Eradication treatments may be considered. However, in areas where POC root disease is well established (primarily in the Smith River drainage), localized damage can be significant and the potential for spread to nearby

areas is increased. Measures to limit disease spread and restore POC may be considered in these affected areas.

2. **Planning.** Consideration of how to achieve the POC management objectives may 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.
3. **Adaptive Management.** Adaptive management is a continuing process of action-based planning, monitoring, researching, evaluating, and adjusting with the goal of improving the implementation and achievement of the POC management objectives stated previously. Under the concept of adaptive management, new information is evaluated and a decision is made whether to make adjustments. USDA Forest Service Region 5 will continue to develop and evaluate techniques to protect POC, prevent new infestations in uninfested areas, and prevent disease intensification and pathogen spread within and around areas where PL infestations already occur.
4. **Interagency Coordination.** USDA Forest Service Region 5 staff will continue to coordinate management practices, including research, genetic resistance breeding, and public education with USDA Forest Service Region 6 staff, and other Federal, State, and County agencies, along with other affected stakeholders.
5. **Community Outreach.** Several practices may be used to improve public awareness of the root disease and the need to control it. These practices include issuing 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. These efforts may focus on user groups most likely to engage in activities that increase the risk of spreading PL. Coordination with state, local, industrial, and small woodland owners can help meet overall POC management objectives.
6. **Inventory and Mapping.** Contingent on available funding, inventory and mapping standards will be updated so they are consistent with those developed in Region 6 as part of the Biscuit Fire Recovery Project (Appendix 2).

Protection

1. **POC Bough Cutting.** To reduce or eliminate the spread of PL by POC bough cutters, POC bough cutting may be limited to roadside sanitation, commercial thinning, and precommercial thinning units, or stewardship contracts with specific provisions to protect and enhance POC. Under these restrictions, POC bough collection would be by permit only, and would 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
 - Easily identifiable areas where boughs are to be collected
2. **Non-POC Special Forest Products.** Special forest products collection permits, including firewood permits, may be suspended and/or not issued in the wet season where POC is present, unless administration previously mentioned above for Bough Cutting can be implemented. The public may also be educated on the risks associated with collecting in areas with POC.
 3. **Disease Export.** Requirements stipulating the washing of heavy equipment (including road maintenance equipment that has left rocked or paved roads) upon leaving infested project areas may be instituted when this equipment has been working in infested stands and will next travel to or through uninfested public or private watersheds, administrative units, or other areas with POC. This will minimize the transport of infested soil to POC in uninfested areas.

Restoration

1. **Restoration of Port-Orford-cedar.** Restoration of POC in affected areas within its natural range may be considered where the species contributes to meeting Land and Resource Management Plan objectives. POC restoration can be accomplished using resistant stock for reforestation and other elements of the integrated management approach (i.e. prescribed burning and host removal prior to planting).
2. **Eradication.** In watersheds or other geographic areas where PL infestations are new, localized or infrequent in comparison to the amount of POC, eradication may be tried as a management technique to prevent/reduce spread of the pathogen and reduce the need for other management practices in the long term. Additional tools for eradicating PL in the soil will be sought, developed and implemented.
3. **Genetics.** Region 5 is participating with Region 6 in a program to develop resistant POC stock and make it available for reforestation and restoration projects. In California, most of the efforts have focused on the coastal area known as Breeding Block 2 (Appendix 1). Pending available funding, collections for testing for disease resistance will be completed in FY07 if carried out at the current investment rate of \$10,000-\$15,000/year.

For Breeding Blocks 4 and 5, which are solely in California, Region 5 has determined that except for continued testing of potentially resistant POC material that has already been collected, an accelerated breeding program for POC will not be pursued. The reasons for this determination include a lack of budget and budget priority for an

accelerated breeding program in California and the limited number of acres of POC to select from within specific breeding zones. Instead of pursuing an accelerated breeding program, the Region will rely on its base level genetics program and seed collection to maintain the species. However, whenever new disease introductions are discovered and access allows, branch and seed collections will be made and tested, selecting healthy POC in diseased areas as a first indicator of potential resistance. Collections will occur prior to the implementation of eradication or other disease control methods.

In Breeding Block 5 and Breeding Zone 450 in Breeding Block 4, a “POC Maximum Regeneration” approach may be used. When stand manipulation (density management, prescribed fire, etc.) is implemented, any treatment regime that creates a seedbed and allows for establishment of a new POC cohort may be encouraged. Maximizing POC regeneration maximizes genetic recombination and increases the potential for development of durable resistance in these POC populations while maintaining broad genetic diversity within the species (Schoettle and Sniezko in review).

- 4. Wildland Fire Operations.** Management strategies to prevent/reduce spread of PL may be a part of wildland fire preparedness planning. When practicable, these measures will be incorporated into firefighting activities. Such practices may include using firefighting water with Clorox bleach or other registered material to kill waterborne PL spores, washing vehicles, and washing tools and clothing.

Note: On the Six Rivers National Forest, water treated with chlorine bleach will not be used to make fire retardant as per the 2005 LRMP amendment (USDA-FS 2005). Clorox bleach still may be used to make retardant on the Shasta-Trinity and Klamath National Forests.

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, along with protection of property and the fireline are always a higher priority.

During wildland fire operations, existing or “in-place” disease-controlling management practices such as road closures may be compromised. These disease-controlling measures will be reinstated following suppression and emergency rehabilitation unless changed circumstances indicate otherwise. Fire rehabilitation efforts should include POC and PL considerations.

- 5. Snag Retention.** Because they are resistant to decay, the retention of POC snags and the resultant down logs in Riparian Reserves may be emphasized. This can provide durable structural components for both aquatic and terrestrial ecosystems. Retention numbers may 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 ultramafic soils and other locations where POC can be some of the largest and most

abundant trees. Suggested target retention levels for POC snags are as follows (Jimerson 1989):

Plant Series	Large POC Snags/acre	Medium POC Snags/acre	Small POC Snags/acre
Tanoak/Douglas-fir	0	0	1.0
POC	1.01	.54	5.75
White fir	1.0	0	1.0

Large POC are greater than 50' tall and >20" dbh; Medium POC are 20 to 50' tall and > 20" dbh; all other snags are defined as small

Snag and down log targets for ultramafic sites remain to be determined.

Project-Specific POC Root Disease Best Management Practices

Existing LRMP direction on the affected Forests stipulates that a risk analysis will be completed for all projects within the range of POC to determine if POC root disease best management practices need to be employed. Existing budget and workforce considerations are factors in considering which management practices may be implemented.

One or more of the best management practices from the list below may be selected and implemented when there is a need indicated by risk analysis. No priority is assumed by the order listed below. One or a combination of specific management practices best fitting the nature of the risk and the site-specific conditions may be applied. The management practices may be modified or partially implemented if such changes still meet risk reduction objectives and/or better fit site conditions.

As always, the staff at the Forest Health Protection Service Area office in Redding (Pete Angwin and Dave Schultz) and the Port-Orford-cedar Program Manager at the Southwest Oregon Forest Insect and Disease Service Center in Central Point, OR (Frank Betlejewski) are available to assist Forest personnel with the risk analysis and selection of best management practices for specific management situations. Contact information is given in the "Assistance Sources" section below.

The best management practices listed below are designed to:

- Prevent/reduce the import of the pathogen into uninfested areas (offsite spores picked-up and carried into an uninfested project area);
- prevent/reduce the export of the pathogen to uninfested areas (onsite spores moved offsite to an 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.

Restoration and Protection

- 1. Incorporate POC Objectives into Prescribed Fire Plans.** POC management objectives (such as sanitation or eradication) may be incorporated into prescribed fire treatment plans. These objectives may be fulfilled by using uninfested or treated water sources, and potentially, aiding with sanitation and eradication treatments.

Protection

- 1. Routing Recreation Use.** New trails (off-highway vehicle, motorcycle, mountain bike, horse, and foot) may be routed away from areas with POC or PL. Trailheads may likewise be relocated, and established trails rerouted, where significant risk to POC is present. Other mitigations and treatments, such as seasonal closures and site hardening, may also be considered.
- 2. Project Scheduling.** Projects may be scheduled during the dry season or incorporate unit scheduling (Best Management Practice Protection Measure 3) as part of project design. Vehicle and equipment washing (Best Management Practice Protection Measure 10) may also be incorporated into the project design.
- 3. Unit Scheduling.** Work in all timber sale and other activity units or areas where PL is not present may be conducted before working in units or areas infested with PL. Large project areas may be subdivided by sub-watersheds or road systems.
- 4. Public Information.** Public awareness of the root disease and the need to control it may be increased by using informational signs on or at trailheads, gates, and other closures, and holding coordination meetings with adjacent industrial and small woodland landowners.
- 5. Utilize Uninfested Water.** Uninfested water sources may be used for planned activities such as equipment washing, road watering, and other water-distribution needs, or when consistent with Forest LRMP direction, water may be treated with Clorox bleach to prevent/reduce the spread of PL. To reduce the likelihood of getting Clorox in streams, Clorox should be added to fire trucks and road watering equipment only after they have left the stream area where they were just filled. Clorox label information can be found on page 62 of the Record of Decision and Land and Resource Management Plan Amendment for Management of Port-Orford-cedar in southwest Oregon, Siskiyou National Forest at: www.fs.fed.us/r6/rogue-siskiyou/projects/foresthealth/poc-rod-fs.pdf (Appendix 3).
- 6. Access.** Access and egress routes may be designated to minimize exposure to PL.
- 7. Fuels Management.** Boots and vehicles may be cleaned, and other management practices may be incorporated to avoid moving infested soil out of treatment areas. Project and unit scheduling (Best Management Practice Protection Measures 2 and 3), and vehicle and equipment washing (Protection 10) may be incorporated as part of project design. Water sources may be selected as described in Best Management

Practice Protection Measure 5. Travel routes may be selected as described in Best Management Practice Protection Measure 6.

- 8. Road Management Measures.** Proactive disease-prevention measures may be implemented, including not building new roads, not using existing roads, instituting seasonal or permanent road closures, and/or implementing the sanitation removal of roadside POC to help reduce the likelihood of spreading the pathogen. These prevention measures are especially applicable to high-risk areas, and may be identified at site-specific or drainage-specific levels. Road design features to consider 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.
- 9. Rock Sources for Construction and Maintenance.** Rock and fill materials for construction and maintenance may be utilized from uninfested sites. POC in and around rock pits, quarries, and crushing and storage facilities may be inspected for signs of POC root disease prior to approving these areas for extraction or use. Questionable POC may be tested for PL before approval.
- 10. Wash Project Equipment.** Project equipment may be washed 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 may include 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 the pathogen (generally project area secondary roads around diseased POC). Project areas may be compartmentalized by road system in areas with mixed ownership (Federal and private). Washing areas are most effective if placed at optimum locations for minimizing spread, such as at entry/exit points of the road system with Federal control. Washing is likewise most effective if it takes place as close as possible to infested sites. Wash water is best taken from uninfested water sources or, when consistent with Forest LRMP direction, is treated with Clorox bleach. Wash water should not drain into watercourses or into areas with uninfested POC. Ideally, equipment should not travel for any substantial distance prior to being washed unless it is transported on surfaced roads. Equipment moving into uninfested areas may be washed miles away as long as it does not travel through infested areas to reach their destination.
- 11. Logging Systems.** Non-ground-based logging systems (cable or helicopter) may be used.
- 12. Spacing Objectives for POC Thinning.** POC spacing objectives during thinning projects (commercial or precommercial) may be designed to create discontinuous POC populations across the management unit.

- 13. Summer Rain Events.** Permit or contract clauses may be applied or cessation of operations may otherwise be required 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.
- 14. Roadside Sanitation.** POC removal or girdling along both sides of the road may be implemented to prevent the establishment of new POC root disease infestations or to reduce roadside inoculum levels in areas that are already infested with the disease. Recommended minimum treatment 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 greatest risk and receive the greatest benefit most from sanitation treatment. Maintenance is essential to retain benefits. To maintain treatment effectiveness, it is best to re-treat areas with POC regeneration as soon as possible after the new seedlings reach a height of 6 inches above ground level. Sanitation treatments may be incorporated as part of routine road maintenance.
- 15. Emphasize POC On Low Risk Sites.** Where possible, management of POC may be emphasized 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.

Restoration

- 1. Resistant POC Planting.** Resistant POC may be planted 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 can 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. The highest priority for reforestation is best given to replacing POC where its ecological function is most critical, such as along streams on ultramafic soils, and replacing stands lost to wildfire.

Assistance Sources

Assistance with program and project-level endeavors involving Port-Orford-cedar and POC root disease management is available from a variety of sources, including:

Northern California Shared Service Area; Pete Angwin, Plant Pathologist, phone (530) 226-2436, e-mail pangwin@fs.fed.us; and Dave Schultz, Entomologist, phone (530)226-2437, e-mail dschultz01@fs.fed.us.

Southwest Oregon Forest Insect and Disease Service Center; Frank Betlejewski,

Interregional Port-Orford-cedar Program Manager, phone (541) 858-6127, e-mail fbtlejewski@fs.fed.us.

Region 5 Regional Office; Phil Cannon, Regional Forest Pathologist, phone (707) 562-8913, e-mail pcannon@fs.fed.us.

Institute of Forest Genetics; Tom Blush, Regional Geneticist, (530) 295-3022, e-mail tblush@fs.fed.us.

References

Jimerson, Thomas M. 1989. Snag densities in old-growth stands on the Gasquet Ranger district, Six Rivers National Forest, California. Res. Paper PSW-196. Berkeley, CA: Pacific Southwest Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture; 12p

Schoettle, A.W.; Sniezko, R.A.(in review). Proactive intervention to sustain high elevation pine ecosystems threatened by white pine blister rust. Journal of Forest Research (accepted pending revision).

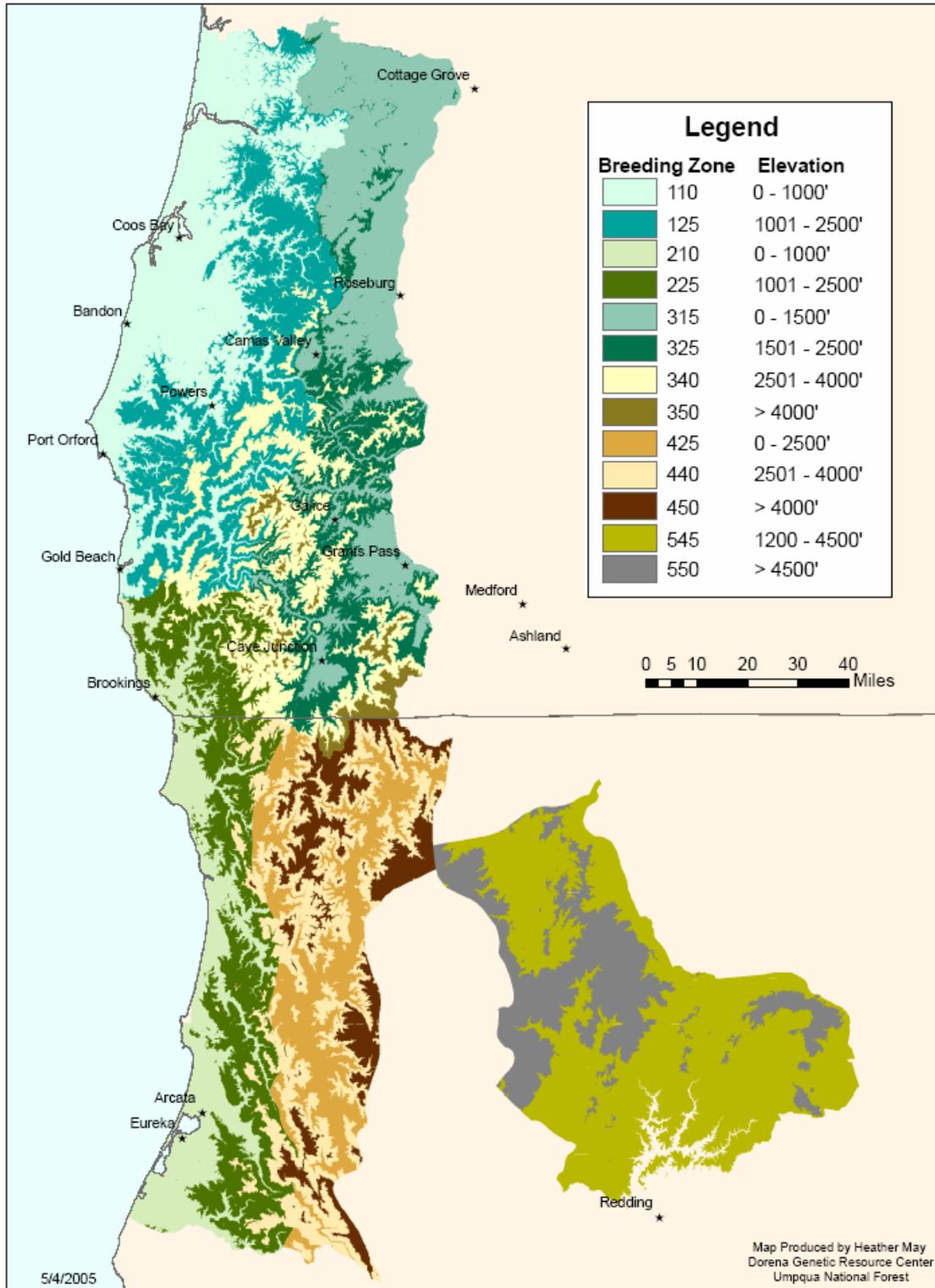
USDA-FS; 2005. Decision Notice & Finding of No Significant Impact Six Rivers National Forest Plan Amendment for Port-Orford Cedar Management During Fire Suppression, Eureka, CA, 15p.

USDA-FS; USDI-BLM. 2004. Final Supplemental Environmental Impact Statement – Management of Port-Orford-Cedar in Southwest Oregon Portland OR 485p.

USDA Forest Service; USDI Bureau of Land Management. 2003. A rangewide assessment of Port-Orford-cedar (*Chamaecyparis lawsoniana*) on Federal Lands. Oregon/Washington State Office, Portland, OR. 182p.

Appendix 1- Port-Orford-cedar Breeding Blocks and Breeding Zones

JR13 Port-Orford-cedar Breeding Zones



Appendix 2 - Interregional Port-Orford-cedar Inventory and Mapping Standards

Polygon Attribute Table Data Dictionary

Polygon #: This number is composed of the flight line, roll and frame number for the aerial photo on which a polygon is delineated. The last digit/digits is the unique number of the polygon on that photo.

POC Root Disease Presence/Absence: If coded 66 then POC Root Disease (*Phytophthora lateralis* presence) has been detected and delineated within the polygon. If coded 00 then no POC root disease has been detected or delineated on the aerial photo

Live POC Canopy Cover: This is the percent of the land within a polygon which is estimated to be covered by POC foliage. It represents the density or concentration of POC within a polygon and is done during photo interpretation with field verification in some cases. The codes used are:

0 - It is very likely there are no live POC within this polygon. Code 0 polygons will not be attributed.

1*- Canopy cover of POC within this polygon is 2 to 5%.

2 - Canopy cover of POC within this polygon is 6 to 20%

3 - Canopy cover of POC within this polygon is 21 to 40%

4 - Canopy cover of POC within this polygon is 40%+

* 2% is the lowest canopy cover of POC that can be reliably mapped on aerial photos. POC may be present outside of such classified polygons but its concentration is low.

Survey Date: This is either the date when a polygon was field verified or the date of photo interpretation.

Estimated # of Live POC By Size Classes: This data is normally estimated during photo interpretation but for some smaller polygons the trees were counted during field verification. The size classes employed are: S = Small (less than 22" dbh); M = Medium (22" to 32" dbh); L = Large (32" +).

Estimated # of Dead POC By Size Class: Trees killed by POC root disease will have a whitish appearance. The size classes are the same as for Live POC.

Field Verification Level This is the reliability of field verification to validate the work of photo interpretation and data integration on a given polygon. Learning the ecology of where POC is present and absent and applying this knowledge to areas away from roads is the main value of field verification. The codes used are: 1 - Field verification where the field person is reasonably confident that the polygon classifications are correct. 2- Field verification where the polygon is large and only a very small sample was examined or where distances observation (with and without binoculars) was done. 3 - Field

verification was not done but the results of field verification elsewhere were applied to the identification and attributing of this polygon.

Interregional Port-Orford-cedar Mapping
Polygon Attribute Table

Photo & Flight Line:

Polygon #	POC Root Disease Presence/Absence	Live POC Canopy Closure	Survey Date	Est. # Live POC By Size Class	Est. # Dead POC By Size Class	Field Verification Level	Remarks

Appendix 3 - Clorox Label Information

The following information is copied verbatim from the Clorox label is pertinent to POC 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, and 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. [FSEIS-adopted mitigation measure: To reduce the likelihood of getting Clorox in streams, add Clorox to fire trucks and road watering equipment only after they have left the stream area where they were just filled.]

DILUTION TABLE

Approximate available Chlorine	Volume of Bleach	Volume of Water
50 ppm	16 drops	1 quart
	$\frac{3}{4}$ tsp.	1 gallon
	1 Tbsp. (1/2 oz.)	4.5 gallons
	2.5 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.

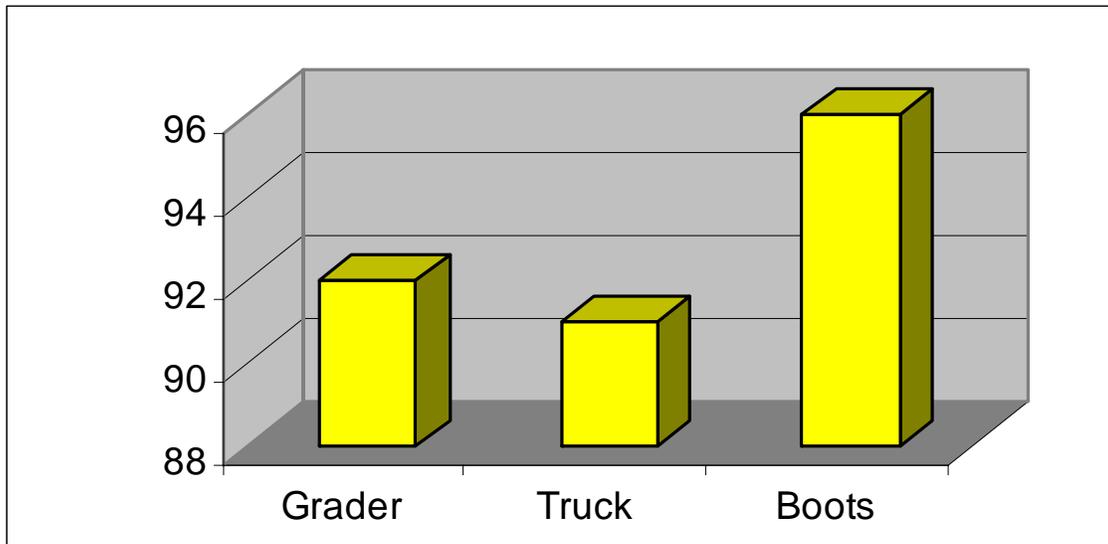
CLOROX CUSTOMER ASSISTANCE (800) 292-2200

Appendix 4 – Cost / Benefit Analysis of Two Common Port-Orford-cedar Best Management Practices

Vehicle Washing

Vehicle washing to remove infested soil or organic matter is a common best management practice on National Forests in the range of Port-Orford-cedar. This practice reduces the potential for exporting the pathogen off infested sites. An evaluation to test the effectiveness of washing treatments was conducted by the Southwest Oregon Forest Insect and Disease Service Center on the Grants Pass Resource Area, Medford District, BLM, in early June, 1999 (USDA-FS and USDI-BLM 2003).

A road grader, pickup truck, and a pair of high top rubber boots were exposed to infested soil and washed separately at two staged wash sites. Wash water was collected from both washings and susceptible POC seedlings were exposed to the wash water. The second washing showed a 90%+ decline in infested seedlings indicating a substantial reduction in inoculum due to washing. Current daily contract cost for a Type 6 engine (150 to 400 gallon capacity) and a crew of two is \$780.00 (Boothe, D. *personal communication*).



90+ percent decline in infested seedlings after washing

Roadside Sanitation

Roadside Port-Orford-cedar are considered high risk sites for future PL infection (USDA-FS; USDI-BLM, 2004). Jules et al. (2002) showed that the incidence of new POC infection was positively associated with distance to the nearest POC and host abundance. By decreasing the number of potential host trees and increasing the distance of the

nearest POC to the road, the potential for new infestation can be reduced. Effectiveness monitoring of this management practice was conducted by staff on the Illinois Valley Ranger District, Rogue River - Siskiyou National Forest from 2003 to 2005.

Preliminary analysis of approximately 20.5 miles of roadside sanitation showed 100% removal of all POC stems smaller than 7 inches dbh. Stocking survey plots (1/100 acre) were established every tenth of a mile along the road to be sanitized and the number of Port-Orford-cedar present was taken before and after roadside sanitation. Eighty-seven out of 205 plots (38.4%) had POC less than 7 inches dbh present pre-treatment. None of the plots had POC less than 7 inches dbh present post treatment. The plots with POC averaged 13 stems / acre pre-treatment and ranged from 1 to 200 stems per plot. The work was accomplished by service contract at a cost of \$300 to \$400 per acre or \$2,700 to \$3,600 per road mile (9 treatment acres / road mile).

References

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