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**Route To:**

**Subject:** Biological Evaluation of Proposed POC Root Disease Control Measures At Castle Crags State Park (FHP Report No. N03-01)

**To:** Woody Elliott, Resource Ecologist, Northern Buttes District  
Michael Gross, State Park Superintendent, Northern Buttes District/Cascade Sector

On several occasions over the last two years, Dave Schultz (entomologist), Don Owen (Forest Pest Specialist, CDF) and I have visited Castle Crags State Park to monitor the progress of the Port-Orford-cedar root disease infestation along the Sacramento River between Riverside Campground and the environmental camp. In May, 2000, Don Owen sent a memo to Fred Welcome detailing our initial walk-through survey for Port-Orford-cedar (POC) in the Park. At the time, no Port-Orford-cedar root disease was found, but actions were recommended to reduce the likelihood of disease introduction. However, in January, 2001, Dave Schultz noticed two fading trees near campsite #4 and identified stain characteristic of the root disease. Another fading POC was noted near the suspension bridge. It appeared that the disease was introduced by infested debris that was washed down in a flood (possibly the January 1997 flood). As 2001 progressed, many additional POC faded and died along the river at Riverside Campground and an additional infected tree was identified a short way downstream from the environmental camp. That year, barricades were put up to keep vehicles away from POC at Riverside Campground and improvements were made to the trail between the two camps to limit spread of the disease by hikers. Educational signs were also put up to inform the public about the disease situation and enlist their help in preventing further spread.

Our most recent survey of the Park was done in August, 2002. POC root disease is continuing to spread. Additional POC along the river in Riverside Campground are now infected, which is to be expected due to the close proximity between infected and uninfected trees. We also noted that the disease is now present just upstream of the footbridge. The disease has also spread further upstream at the environmental camp. Initially the disease was in one POC on the inland side of the trail, but now additional POC on the river's edge are also infected.

As the disease has spread and intensified in the Park, the management objective to address the situation has shifted from preventing the introduction of the disease into the park to slowing the spread and preventing its long-distance export of the disease to other areas. Long-distance disease transport is typically accomplished by the transport of infested organic matter in mud on vehicles, boots, horse hooves, etc. Of prime concern is the potential for the disease to spread to currently uninfested drainages in the upper Sacramento River, to the Trinity River drainage (which is currently the only uninfested major drainage within the range of POC), or to other



areas with POC. Several mitigation measures are recommended to lower the risk of this spread. In approximate order of effectiveness, they are:

1. Kill all POC in Riverside Campground with roots that reach the river. Once a site is infested, the only means of eliminating *Phytophthora lateralis*, the pathogen that causes POC root disease, is to eliminate the host from the site for a period of years. Studies to date (Roth, Harvey and Kleijunas, 1987; Hansen and Hamm 1996; Marshall and Goheen 2000) indicate that it takes about three to seven years for the pathogen's spores to die out following host removal or death. Girdling or removal of all POC within reach of the river would start the process of pathogen elimination from the Campground, where it is most likely to be picked up and transported elsewhere.
2. Improve access from the campsites to the river. Several "de facto" trails link the campsites at Riverside Campground to the river. Many of these are near infected POC and stay wet and muddy for most of the year. This is particularly true for the access to the river at the end of campsite #4 at the extreme downstream end of the campground. Improving some of these trails by installing stairways or by raising and hardening the surface with rock or gravel would reduce the potential for infested mud to be picked up and tracked out by tourists and fishermen. Another way to address the situation at the end of campsite 4 is to fence off or blockade that particular access.
3. Continue trail improvements. As mentioned above, several locations along the trail between Riverside Campground and the environmental camp have been improved by raising the trail above wet spots with rock by installing bridges. Several areas along the trail with seeps, springs and wet areas that are adjacent POC remain that need to be improved. These were pointed out to Woody Elliott when we met him at the Park on September 27. Improvement of the trail in these areas will help prevent the introduction of POC root disease to these areas, many of which are well above the river. This, in turn, will prevent the future export of the disease from these areas.
4. Raise, Harden or Resurface Campsites 4 and 5. Portions of Campsites 4 and 5 (the two furthest downstream sites), which are within 25 feet of infected Port-Orford-cedar, contain seeps and springs that keep parts of these campsites wet year round. Barricades have already been erected to keep vehicles out of these areas, but raising the surface to keep mud from collecting on visitors' shoes and other equipment would further reduce the amount of potentially infested mud that may leave the campground. The method by which the surface of the campsites is raised or hardened is unimportant. What is important is that water is not allowed to collect and produce mud in these areas where disease spores may be present. These improvements need not be permanent; they only need to last for about 5-7 years after adjacent POC are removed or killed as per recommendation #1.
5. Raise, Harden or Resurface Campsites 6-8 and 10. Campsites 6-8 and 10, the next set of sites upriver from sites 4 and 5, have fewer problems with surface moisture. However, each of these sites are within 25 feet POC that are along the river. Many of these are already infected with POC root disease, several more are undoubtedly infected but have not yet shown symptoms, and unless removed or girdled, the rest will undoubtedly become infected. Raising

the surface of these sites will provide additional protection against infested mud being picked up and transported elsewhere.

The above suggestions represent about all that can be reasonably done to lower the risk of spore export from the campground and to slow the spread of the disease within the campground. Implementation of any or all of these measures will help the situation, but will need to be integrated with the other management objectives of the campground (ie., maintaining an aesthetically pleasing campground). Measures 1-3 will provide the greatest amount of risk reduction. Measures 4 and 5 provide a somewhat lesser degree of risk reduction, because the campsites are slightly uphill from the adjacent POC along the river. Because most disease spores will flow away from the campsites, the amount of inoculum that may be expected to be present in any mud at the sites is likely to be limited. However, because at least small numbers of spores are typically present within 25 feet of infected trees, resurfacing would reduce the potential for transport of the smaller number of spores to the lowest degree possible. In the end, it is up to the Park managers as to whether the costs of resurfacing are worth the additional degree of risk reduction that will be gained.

As was discussed in previous meetings with Michael Gross and Woody Elliott, cooperative Forest Pest Management Suppression/Prevention funds are available to assist in the planning or implementation of these disease control measures. However, any dollars that are supplied by the USDA Forest Service must be matched 50:50 with state funds or in-kind project contributions. Applications for FY 2003 funds are due to our office by October 11, and I know that you have been working on a proposal. We welcome the chance to cooperate on this project and are willing to provide any assistance that is possible.

If you have any questions or comments, please feel free to contact Dave Schultz or me.

/s/ Peter A. Angwin  
Plant Pathologist  
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cc: Don Owen  
Dave Schultz  
John Kliejunas  
Frank Betlejewski  
Jim Harvey

References:

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