

# ***Phytophthora ramorum* in Oregon Forests: Six Years of Detection, Eradication, and Disease Spread<sup>1</sup>**

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## **Abstract**

*Phytophthora ramorum* was first discovered in Southwest Oregon forests in 2001, where it was killing tanoak (*Lithocarpus densiflorus*) and infecting Pacific rhododendron (*Rhododendron macrophyllum*) and evergreen huckleberry (*Vaccinium ovatum*). At that time there were nine infested forest sites totaling 16 ha. Aerial photographs suggest that *P. ramorum* probably was killing tanoak trees at one of these sites as early as 1998. In fall of 2001 eradication of the pathogen from infested sites began by cutting, piling and burning infected plants and all host vegetation within 30 to 100 m. of infected or symptomatic plants. Upon completion of burning most sites are planted with non-host or conifer seedlings. After one year it was clear that tanoak stumps sprouted prolifically following treatment and that *P. ramorum* occasionally was recovered from these sprouts. Follow-up treatments were necessary to destroy residual host material and stump sprouts that potentially harbored the pathogen. In 2003 and subsequent years all tanoaks in treatment areas were injected with herbicide prior to cutting in order to prevent sprouting (except on USDI-BLM lands where herbicide use was banned). Eradication treatments have been completed or are underway on approximately 560 ha of forest land, at a cost of \$2.6 million dollars. Nearly all eradication costs have been paid by federal and state agencies, with much cooperation by landowners. There is no compensation to landowners for loss of timber or other values as a result of the eradication treatments.

Early detection surveys are conducted year-round using a combination of aerial surveys, ground surveys, and stream water baiting with rhododendron and tanoak leaves. During the first 4 years of the eradication effort (2001-2004), the number of new infested sites and infected trees decreased each year, suggesting modest success at containment and eradication. That trend ended in 2005. In 2006 and 2007 the extent of the disease increased considerably. In 2007, six new sites were found outside of the quarantine area, and several of these sites were 3 to 4 km from the nearest other infested site (the quarantine area will be enlarged in 2008). Most of the other new sites were small (less than 0.2 ha) and scattered near the center of the quarantine zone. We attribute this disease expansion to consecutive years of unusually wet spring and early summer weather which appears to favor long distance spread of *P. ramorum*. All surveys to date have failed to detect the pathogen anywhere in Oregon forests except in or very near the 65 km<sup>2</sup> Curry County quarantine area (figs. 1 and 2). The nearest known SOD infestation outside of Oregon is 200 km to the south in southern Humboldt County, CA.

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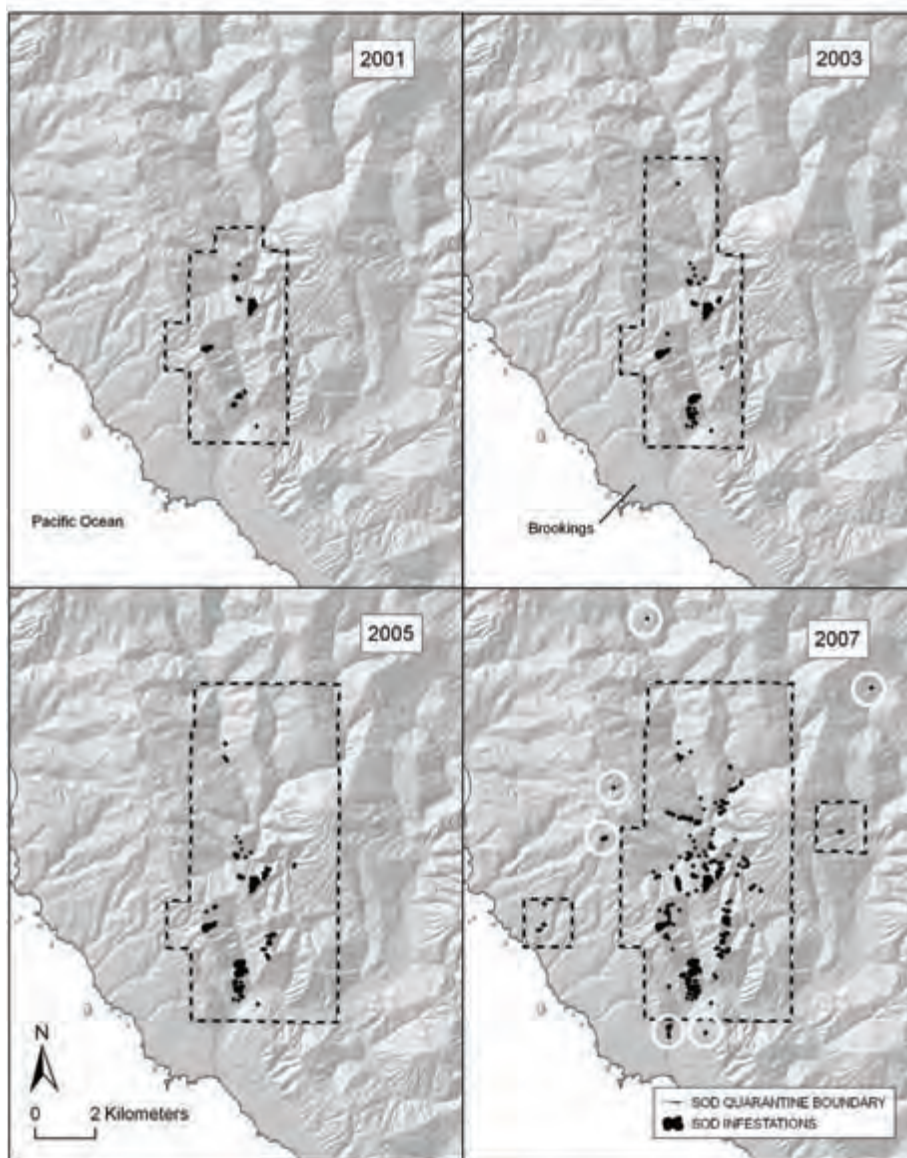


Figure 1—Expansion of sudden oak death in Oregon forests: 2001 2003, 2005, and 2007. Black blotches indicate infested areas, all of which have been treated in an effort to eradicate the pathogen. Dashed line is the *P. ramorum* quarantine boundary. White circles highlight 2007 infestations outside of quarantine boundary. Curry County, Oregon.

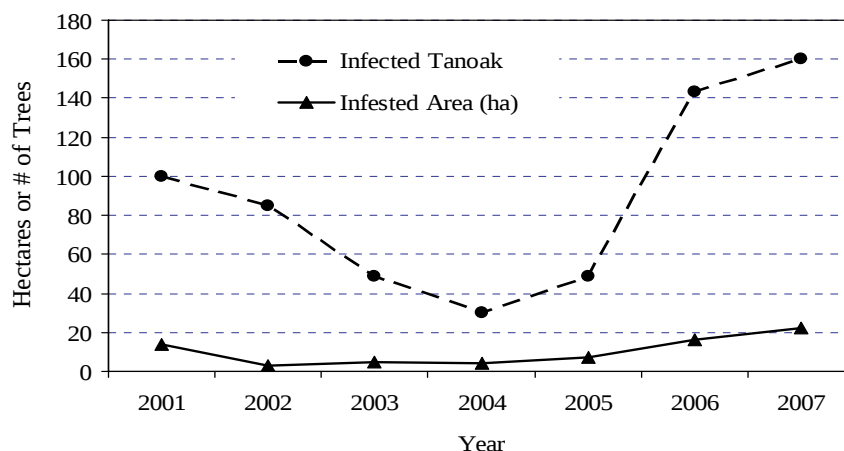


Figure 2—Number of new infected tanoaks and the area of new infestations each year in southern Curry County, Oregon.

Each year most new infested sites occurred very close to previously discovered infested sites. Post-treatment surveys indicate that disease is absent on most sites and that the pathogen, when it is present, can be recovered only at extremely low frequencies from soil and host plants. It is unlikely that new infestations in the adjacent forest occur because the pathogen survived the eradication treatments. It is more likely that the new infestations occur because the pathogen has already spread to these areas but was not detectable in our surveys. Future success of the program will require earlier detection of infected plants, reduction in the time between detection and treatment, and larger treatment areas.

The net effect of the eradication program thus far has been to eliminate the pathogen from some sites and greatly slow spread of *P. ramorum* in Oregon forests. When comparing expansion of the Oregon infestation (aggressive eradication program) to a similar area in Humboldt county California (no comprehensive control program), it is clear that the disease can expand rapidly in the absence of control measures (fig. 3). It is equally clear that containment and eradication of *P. ramorum* from Oregon forests will require a much more substantial and aggressive program of early detection and treatment.

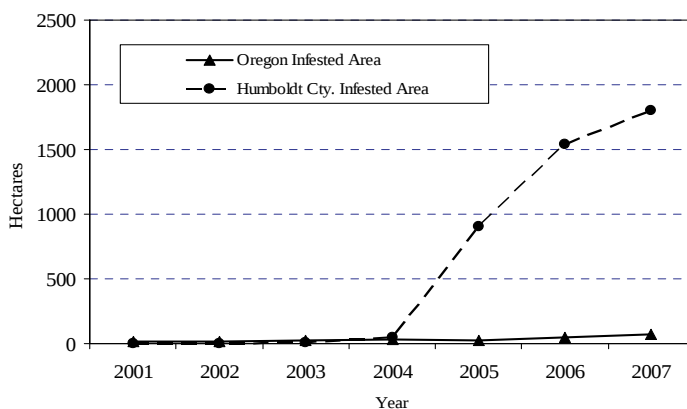


Figure 3—Comparison of the expansion of sudden oak death infestations in Curry County OR and Humboldt County, CA.