

Monitoring *Phytophthora ramorum* in Oregon-2003

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Aerial and Ground Surveys for *P. ramorum* in Oregon

Sudden Oak Death (SOD), caused by *Phytophthora ramorum*, was first discovered in Oregon in July 2001. Since then we have been attempting to eradicate the pathogen by cutting and burning all infected host plants and adjacent apparently uninfected plants.

Each year we conduct at least two fixed-wing aerial surveys (July and October) searching for recently killed tanoaks (*Lithocarpus densiflora*) in the forests of southwest Oregon. These are followed with a helicopter survey to obtain accurate latitude and longitude of dead trees for ground-based assessments. All dead tanoaks identified from the air are visited on the ground to determine cause of death and to attempt isolation of *P. ramorum*.

In 2003 we conducted two fixed-wing and four helicopter aerial surveys for SOD on 1,316,000 acres. We detected a total of 292 new dead tanoaks from the air and ground checks for field assessment.

We also conducted ground-based surveys to look for early indicators of infection on tanoak, rhododendron (*Rhododendron macrophyllum*), Oregon myrtle (*Umbellularia californica*), and evergreen huckleberry (*Vaccinium ovatum*) in the vicinity of all known infestations of *P. ramorum*.



Aerial view of a patch of dead tanoaks

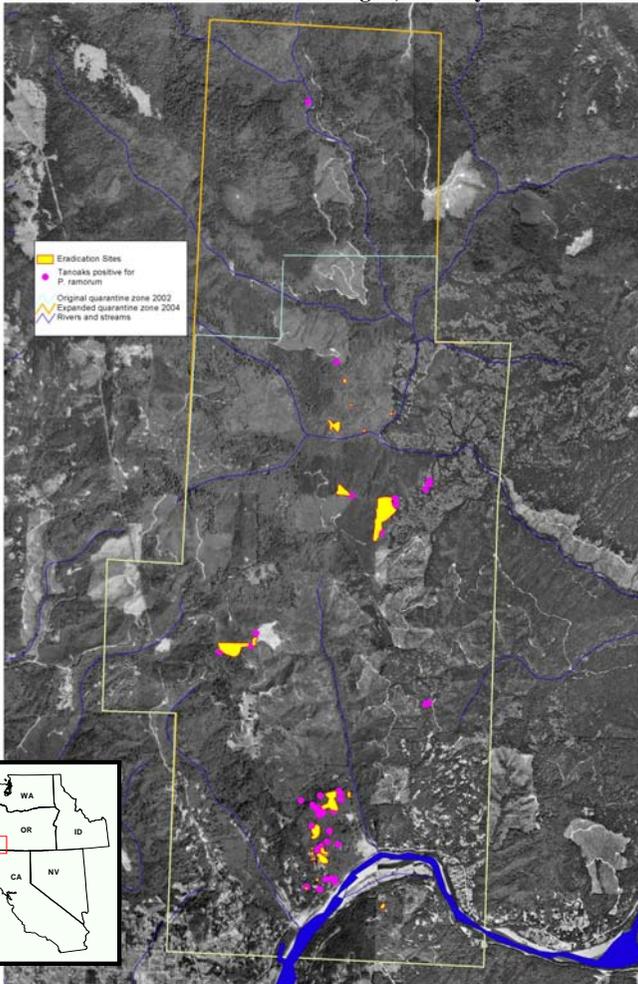


P. ramorum-caused lesions on bole of tanoak



Rhododendron leaves infected by *P. ramorum*

Sudden Oak Death in Oregon, January 2004



Detections during 2001, 2002, and 2003

- Number of infected trees has decreased each year
- Most infected trees discovered in 2003 were within 200 meters of eradication sites, with the exception of three trees discovered 0.25, 0.8, and 1.8 miles from the nearest site
- Each year, new sites occur close to or in a northerly direction from other sites, following prevailing rainy season wind, and suggesting aerial or vector-mediated spread

Year	Number of tanoaks infected with <i>P. ramorum</i>	Number of new disease patches	Total acres in new disease patches each year
2001	91	9	40
2002	85	12	8
2003	48	12	12

Monitoring within Eradication Sites

- Host species sprouted prolifically following cutting and burning
- Infected sprouts were found on half of infested sites one year after treatment
- Tanoak is species most commonly infected, but rhododendron and huckleberry infected also
- Symptom expression and recovery of *P. ramorum* from sprouts was greatest during rainy season, rare in summer
- *P. ramorum* recovered from soil rarely, and usually from soil associated with an infected stump
- Infected sprouts usually were associated with the stump of a tree known to be infected before cutting
- Chemical and mechanical destruction of sprouts ongoing, and essential to curtail future spread of the pathogen



Eradication site immediately following burning



Eradication site one year later



Herbicide treated tanoak sprouts in background

Stream Water Monitoring



Rhododendron leaves suspended in stream water

We baited streams with rhododendron leaves at 27 stations in the vicinity of known *P. ramorum* infestations. We recovered *P. ramorum* at least once from nine of these sites in 2003. *P. ramorum* was recovered from most streams draining infested sites and almost never from streams not associated with infested sites.

Soil Sampling



- Soil is collected from within infested sites
- Soils are flooded, and "baited" with pears, rhododendron leaves, or Port-Orford-cedar foliage
- If *P. ramorum* is present in soil zoospores swim up and infect baits
- Few soil samples are positive for *P. ramorum*

Rainfall Traps



- Rainwater is collected periodically at 6 sites, and assayed for presence of *P. ramorum*
- *P. ramorum* was recovered from rainwater collected beneath an infected tanoak in December, 2003. Prior to this, *P. ramorum* had not been recovered from rainwater collections within or near infested sites

Conclusions

- Despite several new occurrences of *P. ramorum* in 2003, distribution of the pathogen in forests remains limited to a very small area near Brookings.
- New isolated infestations as far as 1.8 miles from other infestations suggest aerial or vector transmission.
- *P. ramorum* survived cutting and burning on most eradication sites, and was present in stump sprouts and soils. It was found with high frequency in stumps of infected trees.
- *P. ramorum* has been detected in several streams associated with eradication sites, and rarely in streams not clearly associated with known infestations.
- Efforts to eradicate the pathogen from Oregon forests will continue.