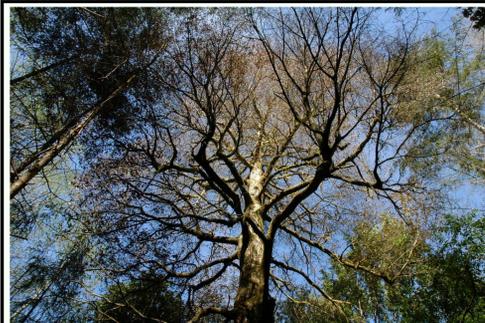


Sudden Oak Death (SOD) in Oregon Forests, 2001-2009

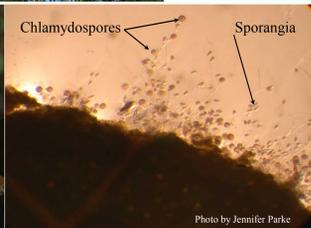
Alan Kanaskie¹, Michael McWilliams¹, Jon Laine¹, Michael Thompson¹, Harvey Times¹, Stacy Savona¹, Bill Woosley¹, Ellen Goheen², Bob Schroeter², Everett Hansen³, Wendy Sutton³, Paul Reeser³, and Nancy Osterbauer⁴
 1 = Oregon Department of Forestry, 2 = U.S. Forest Service, 3 = Oregon State University, 4 = Oregon Department of Agriculture



THE DISEASE

Sudden Oak Death (SOD), caused by *Phytophthora ramorum*, was first discovered in Curry county, Oregon in July 2001. The disease occurs in forests and in forest-urban interface areas.

P. ramorum can infect more than 100 plant species. The primary hosts in Oregon forests are tanoak, rhododendron, and evergreen huckleberry. **Tanoak** is the most important species in terms of damage and disease spread.



Initial infection of tanoak occurs on leaves and stems. Microscopic spores produced from these lesions are spread by rain-splash and wind.

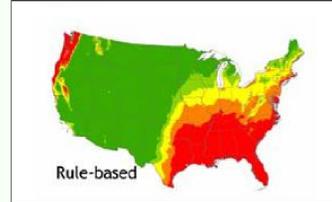
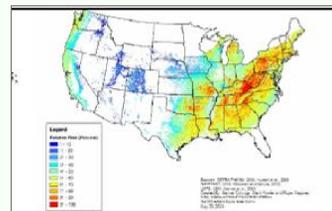
P. Ramorum kills tanoak when the pathogen destroys the inner bark and sapwood

WHAT IS AT RISK?

Tanoak forests in Oregon and California – The pathogen already has killed millions of trees in California, altering ecosystems and increasing wild-fire risk.

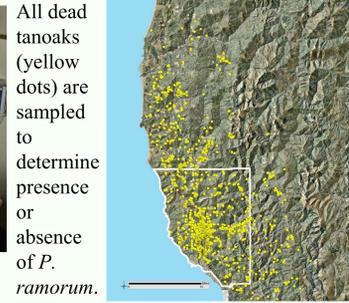
Hardwood forests of the eastern US, Europe, and other parts of the world – Many tree and shrub species are highly susceptible to this disease.

Economic impacts to nursery and forest industries – Regulations increase production costs and affect domestic and international markets.



Rule-based Risk of *P. Ramorum* establishment (red = high)

AERIAL AND GROUND SURVEYS (4 per year)



Aerial view of a patches of dead tanoaks

Mike McWilliams sketch-mapping from Partenavia Observer aircraft (ODF)

All dead tanoaks (yellow dots) are sampled to determine presence or absence of *P. ramorum*.

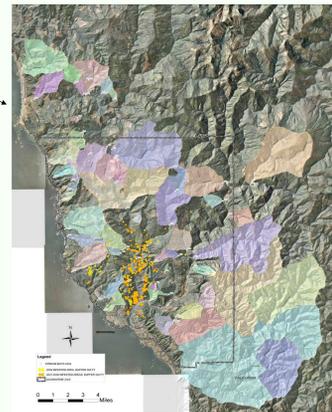
EARLY DETECTION BY BAITING STREAMS

Tanoak or rhododendron leaves are suspended in stream water in 57 drainages in SW Oregon.

Zoospores of *P. ramorum* attack and colonize the leaf.

Bait leaves are collected every two weeks and analyzed for *P. ramorum* in the OSU lab.

If the test is positive, we conduct ground surveys to located the infected plants upstream of the baits.



ERADICATION

- Since 2001 we have been attempting to eradicate the pathogen by cutting and burning all infected host plants and adjacent apparently uninfected plants (2,800 acres treated to date).
- Direct costs of the eradication have been funded by the USDA Forest Service, ODF, BLM, and USDA-APHIS, with little or no direct cost to landowners.
- The eradication program has substantially slowed spread of the pathogen, but it has not stopped it. Cost of eradication program to date = \$4 million.



Figure 4. Area of Eradication Treatments 2001-2009
 Acres
 800
700
600
500
400
300
200
100
0
 2001 2002 2003 2004 2005 2006 2007 2008 2009
 Figure 4. Area identified for treatment each year, includes back & squirt, cut, and burn. Many 2009 sites untreated as of 12-31-09 due to funding delays.

All host plants within 300 feet of infected trees are cut, piled and burned

Work is done by hand crews or machinery, depending on site factors

SPREAD OF DISEASE, 2001 – 2009

(Sites enlarged by 1000 ft yellow halo for visibility)

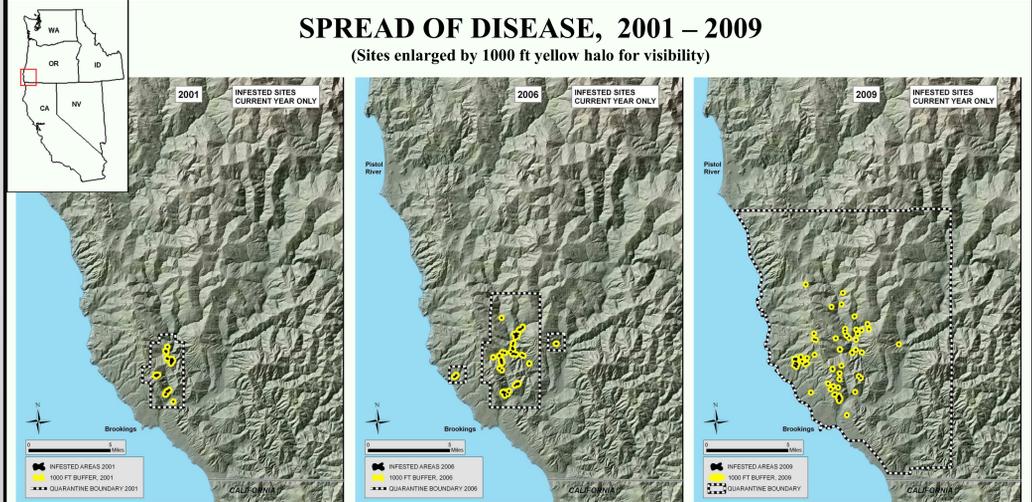


Figure 2. Number of Infected trees and Area Infested 2001-2009

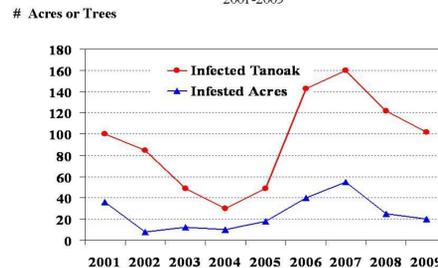


Figure 2. Trend in number of new infested trees and area of new infestations in southern Curry County, Oregon, 2001-2009.

Figure 3. Number of Infested Sites 2001-2009

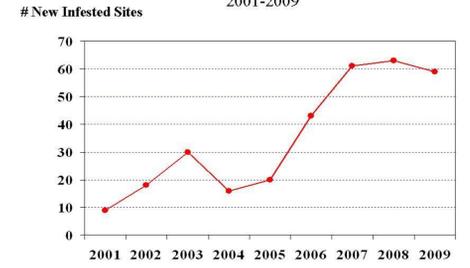


Figure 3. Trend in number of new infested sites detected each year.

Despite the eradication program, the disease continues to spread slowly in southwest Oregon.

Effectiveness of the program can be improved by earlier detection of the pathogen, more rapid treatment response, and elimination of administrative delays related to funding.

COSTS AND FUNDING

Estimated amount spent to date on SOD program in forests (research, surveys, monitoring, eradication) = **\$7 million**

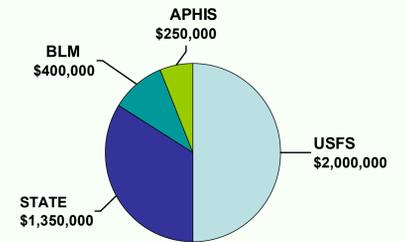
Current program costs (detection, monitoring, and eradication) = **\$2 million / year**

Results expected at this program level = continued slow spread

Estimated cost to stop spread and eradicate = **\$7 million / year** for 3 to 5 years

SOD ERADICATION COSTS (2001-2009)

Contractor and Landowner Payments only
 Total = \$4 Million



RESEARCH IN OREGON FORESTS



Aerial fungicide application

Effectiveness Monitoring – Following eradication treatments the pathogen was recoverable from soil on 38% of treated sites, and from plants in only 10% of treated sites (119 sites sampled).

Fungicides – aerial application of AgriFos™ (phosphonate) to slow spread of disease – in progress.

Epidemiology (OSU) – determining factors affecting disease establishment and spread

Risk Modeling (UNC Charlotte) – predicting risk of disease spread in Oregon and California.

STATUS AND OUTLOOK

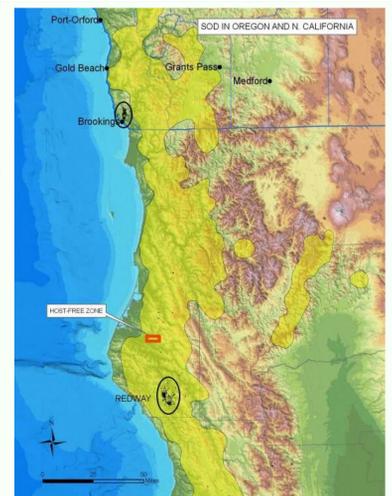
Distribution of the pathogen in Oregon forests has been limited to a relatively small (162 mi²) quarantine area near Brookings, thereby minimizing regulatory impacts to various industries.

P. Ramorum continues to spread slowly in Oregon, but at a much slower rate than in California.

\$2 million per year is necessary to continue current program and obtain results similar to those of previous years. Substantially more funding will be required to **stop** spread of the pathogen.

Delays in the process of early detection and eradication treatments must be eliminated to ensure a successful program.

Eradication operations temporarily are suspended due to lack of funds. Federal ARRA (Stimulus) funds recently have become available and will allow treatments to resume.



ACKNOWLEDGEMENTS

The USDA Forest Service Forest Health Monitoring Program and Forest Health Protection Program (Regions 6 and 5) have provided the majority of funds for detection, monitoring, research, and eradication efforts in Oregon. Thanks also to the USDI-Bureau of Land Management, USDA-APHIS, and the many cooperating landowners in Curry county.