



CALIFORNIA OAK MORTALITY TASK FORCE REPORT JUNE 2005

NURSERIES

***P. ramorum*-positive mountain laurel (*Kalmia latifolia*) has been confirmed at a** Gwinnett County, GA wholesale nursery. The positive plant was identified during the USDA Animal and Plant Health Inspection Service (APHIS) National Nursery Survey. A camellia plant was also found positive during the delimiting survey. The nursery had a previous camellia *P. ramorum* confirmation in 2004. The positive samples have been linked to several suppliers in two states. Inspections at those nurseries are underway, though no *P. ramorum*-positive plants have been found so far.

A second GA retail nursery has been found positive for *P. ramorum*. The facility was a positive trace-forward in 2004.

Two LA nurseries were found to have *P. ramorum*-positive camellias during the USDA APHIS National Nursery Survey. One of the nurseries was also found to have the pathogen in 2004; the other was an initial find.

The California Department of Food and Agriculture identified sixteen new nurseries in May with *P. ramorum*-positive plants; four of the nurseries ship interstate. Eight of the nurseries with new identifications are within the 14-county quarantined area, and eight are outside of the quarantined zone. Confirmations came from trace-forward investigations, trace-back investigations, and compliance agreement inspections. Two of the new confirmations came from previously positive nurseries, and were identified both times during trace-forward investigations.

***P. ramorum* federal order compliance agreements, trace-forward and –back** investigations, the USDA APHIS National Nursery Survey, and other investigations are ongoing. For 2005, USDA APHIS reports 57 sites in 4 states have had *P. ramorum* detections. Positive findings by state are: CA(45), GA(2), LA(2), OR(8).

RESEARCH

Establishment of an emerging generalist pathogen in redwood forest communities. Maloney, P. E., S. C. Lynch, S. F. Kane, C. E. Jensen, and D. M. Rizzo. Journal of Ecology (in press).

Summary:

Phytophthora ramorum (causal agent of sudden oak death) is an emerging generalist pathogen in coastal forests of California and Oregon, USA that causes lethal stem infections on oaks (*Quercus* spp.) and tanoak (*Lithocarpus densiflorus*) as well as non-lethal foliar infections on a broad range of trees and shrubs. We present the first study on this emerging pathogen over its known range in coastal redwood forests. The objectives of this study were to determine forest compositional variables that are important to the epidemiology of *P. ramorum* in redwood forest communities within the geographic area



already invaded by this pathogen. The redwood forest type is dominated by coast redwood (*Sequoia sempervirens*), tanoak, and California bay laurel (*Umbellularia californica*). A total of 120 permanent plots (500 m² each) were established in redwood forests at 12 sites within the main epidemic area in California. Over 5,000 trees were mapped and examined for the presence of *P. ramorum* during spring 2002 and resampled in spring 2003. Mean incidence of *P. ramorum* across all plots was 0.17 ± 0.01 in 2002 and 0.24 ± 0.02 in 2003. The highest infection levels by *P. ramorum* were found on California bay laurel (range 0.42-0.69) and tanoak (0.32-0.45). The highest levels of mortality were associated with tanoak and ranged from 0 to 66%, with 62.5% of that mortality associated with *P. ramorum* infection. Disease incidence above 30% was most often associated with bay laurel importance value. In plots with few bay laurel stems, high disease levels were associated with the presence of understory tanoaks. Experimental evidence has found these two host plants represent the main source of inoculum for further spread of *P. ramorum*.

Evaluating the survival of *Phytophthora ramorum* in Firewood. Singh, Ramnik, J. Shelly, C. Langford. Progress Report 1 to the USDA Forest Service, Pacific Southwest Research Station. April 2005.

Many of the larger, dead and dying oak and tanoak trees with Sudden Oak Death (*Phytophthora ramorum*) are known to be processed into firewood, yet the extent to which this pathogen survives in firewood is not well understood. A project, funded by the USDA Forest Service, PSW Research Station, was initiated at the University of California Richmond Field Station (UCRFS) to study the survival of *P. ramorum* spores during the air-drying (seasoning) process of *P. ramorum*-infested firewood. Two piles of firewood, each consisting of about 1,400 firewood pieces, are currently being monitored as they dry. One pile is being seasoned at ambient conditions in Marin County and the other at the UCRFS under simulated rainfall similar to the relatively wet 1994/95 winter season. Firewood pieces with bark and without bark are tested for the presence of active *P. ramorum* on a monthly basis using both pear and rhododendron leaves as bait.

Since the inception of this study in November 2004, 20 pieces of firewood from each of the two piles have been tested every month. After 5 months of testing, positive *P. ramorum* cultures continue to be obtained from both piles and also from the runoff water collected at the wetter UCRFS site. Thirteen of 100 firewood pieces from UCRFS were positive and 10 of the 100 pieces from the Marin County site tested positive. Also, during the first two months of testing, positive cultures were obtained from pieces both with and without bark; 8 of the 14 positives were on pieces without bark. Additionally, some of the pieces of firewood that initially tested positive remained positive upon retesting after 4 months of air-drying.

It is too early in the study to draw any conclusions, but the results suggest that *P. ramorum* is surviving longer in processed firewood than initially expected. Another noteworthy finding has been the positive results found on wood without bark. Because this organism seems to prefer to grow in the tree's cambium layer (zone between bark



and wood), it has not been thought to exist or survive in wood without bark. A more detailed study is planned to examine whether this result is from casual contact with other infested pieces or if it is an indication that *P. ramorum* can survive in the wood beneath the bark surface.

For more information, go to:

http://groups.ucanr.org/sodbusters/Sudden_Oak_Death_Firewood_Project/.

Sudden oak death in California: Disease progression in oaks and tanoaks. Brice A. McPherson, Sylvia R. Mori, David L. Wood, Andrew J. Storer, Pavel Svihra, N. Maggi Kelly, and Richard B. Standiford. *Forest Ecology and Management*. 2005. (in press).

Abstract: Sudden oak death (SOD), caused by *Phytophthora ramorum*, is killing oaks and tanoaks in the Coast Ranges of California, from Monterey County to Humboldt County. In March 2000, 20 disease progression plots were established in Marin County, California, to characterize the progress of disease symptoms, and to determine the fidelity of the association of three or more bark and ambrosia beetle species (Coleoptera: Scolytidae) with diseased oaks and tanoaks. Symptoms of sudden oak death and signs of associated organisms were recorded from coast live oaks (*Quercus agrifolia*), California black oaks (*Q. kelloggii*), valley oaks (*Q. lobata*), and tanoaks (*Lithocarpus densiflorus*), four times per year, from March 2000 through March 2003. Symptoms and signs in *Q. agrifolia* progressed from bleeding, to infestation by scolytid beetles, to the development of fruiting structures of the fungus *Hypoxylon thouarsianum*. Mortality of symptomatic trees increased from 2000 to 2003 as follows: *Q. agrifolia* (n = 668), 5.8-17.4%; *Q. kelloggii* (n = 53), 3.8-9.4%; and *L. densiflorus* (n = 164), 8.3-22.2%. All 31 *Q. lobata* remained asymptomatic. From 2000 to 2003, bleeding trees were 25.0-23.6% of living *Q. agrifolia*, 15.5-25.0% of *Q. kelloggii*, and 39.0-62.4% of *L. densiflorus*. Scolytid beetles colonized more than 95% of the living symptomatic *Q. agrifolia* that subsequently died. Same-symptom cohorts were followed from March 2000 through March 2003. In the asymptomatic *Q. agrifolia* cohort, 12.0% developed bleeding by 2003. For the bleeding only cohort, 22.7% of *Q. agrifolia* died, but 73.5% of the beetle-colonized bleeding cohort died. Bleeding developed in 40.9% of the initially asymptomatic *L. densiflorus* cohort. By 2003, 24.6% of the initially bleeding *L. densiflorus* cohort had died. Both Weibull and Cox Proportional Hazards regression were used to model cohort survival. The median survival time estimated by Weibull regression models declined rapidly by disease category (asymptomatic, bleeding only, bleeding with beetles), from 29 to 2.7 years for *Q. agrifolia*, and from 12.6 to 2.9 years for *L. densiflorus*. By 2003, structural bole failure had occurred in 21.5% of the *Q. agrifolia* that were bleeding in 2000, 93% of which had ambrosia beetle tunnels at the breakage point. For both *Q. agrifolia* and *L. densiflorus*, health failure analysis modeled by Weibull regression found a greater probability of developing sudden oak death for trees with larger stem diameters. Beetles were also positively correlated with larger diameter bleeding *Q. agrifolia*.



***Phytophthora ramorum*: one pathogen and many diseases, an emerging threat to forest ecosystems and ornamental plant life.** Alex A. Appiah, Phil Jennings, and Judith A. Turner. *Mycologist*, Volume 18, Part 4 November 2004. ©The British Mycological Society. Printed in the United Kingdom. DOI: 10:1017/S0269915XO4004136.

Phytophthora ramorum is a recently described species responsible for sudden oak death syndrome and also causes symptoms such as twig wilt and dieback, stem lesions, necrosis of leaf midrib from the petiole and leaf tip necrosis on a range of ornamental plant species. In the USA, a reported epidemic of *P. ramorum* infections on trees belonging to several families including Fagaceae, Lauraceae, and Ericaceae seems to be increasing and there are fears of similar epidemics occurring in woodlands in the UK and mainland Europe. This paper reviews the current state of knowledge and the research efforts being made to understand the biology, manage the disease, and prevent widespread outbreaks of *P. ramorum* infections across Europe and the USA.

RESOURCES

An updated “Nursery Guide for Diseases Caused by *Phytophthora ramorum* on Ornamentals: Diagnosis and Management” is available online and free of charge at the University of California Agriculture and Natural Resources website. The guide offers basic information on the pathogen as well as disease biology and symptoms on numerous ornamental host plants. It also provides useful information regarding Christmas tree plantations, regulations, nursery inspections, record keeping, sampling and diagnosis, and disease management strategies. To download the guide, go to:
<http://anrcatalog.ucdavis.edu/InOrder/Shop/ItemDetails.asp?ItemNo=8156>.

The *P. ramorum* 2005 National Nursery Survey Manual has been finalized and can be accessed through the National Agricultural Pest Information System website at:
<http://ceris.purdue.edu/napis/pests/sod/natplan/fy05/index.html>. Biological information, host information, the 2005 survey protocol, sampling protocol, and reporting results are included in the manual, as well as other information.

The *P. ramorum* 2004 National Nursery Survey Annual Report is now available on the USDA Animal and Plant Health Inspection Service (APHIS) website at:
http://www.aphis.usda.gov/ppq/ispm/pramorom/pdf_files/2004pramsurveyreport.pdf. The report includes information on the national nursery survey program, the 2004 survey method, and results of the survey.

A new *P. ramorum* information sheet has been posted to the United Kingdom (UK) Department for Environment, Food, and Rural Affairs (DEFRA) website:
<http://www.defra.gov.uk/plant/pestnote/newram.pdf>. Information on international *P. ramorum*-confirmed locations, hosts, symptom descriptions and photos, pathogen spread, and UK efforts are included in the fact sheet.



EDUCATION

The COMTF outreach survey results have been posted to the Task Force website in an online report at www.suddenoakdeath.org. The survey was active for one month and was completed by 302 respondents from 43 California counties, 12 states, and 4 countries. Overall, results indicate that Task Force outreach efforts, including training sessions and the website, have been well-received. More than 90 percent of respondents did consider themselves to be well-informed about *P. ramorum*, and felt that access to further information was readily available. Eighty percent of those that consider themselves to be highly informed about *P. ramorum* continue to attend COMTF training sessions and access the website. Additionally, 80 percent of respondents have incorporated *P. ramorum* information into their business or private practices.

Reported areas for improvement included posting more signs and supplying more site-specific information to individual parks and areas of infestation. Survey results also suggest that more information is needed to reduce misdiagnosis of *P. ramorum* through increased training on differentiating between *P. ramorum* and other common diseases.

PERSONNEL

James Writer, formerly the USDA APHIS Science and Technical Liaison, has officially received the new USDA APHIS Assistant National *Phytophthora ramorum* Program Manager position, located at the USDA Headquarters in Riverdale, MD. Under his new title, Writer will continue to work closely with Jonathan Jones, USDA APHIS National *P. ramorum* Program Manager on national and international *P. ramorum* issues. Writer may be contacted at: James.V.Writer@aphis.usda.gov.