



## CALIFORNIA OAK MORTALITY TASK FORCE REPORT JUNE 2009

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### MONITORING

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**A Forsyth County, GA nursery was found by the GA Department of Agriculture to have a *P. ramorum*-positive plant in 12/08.** Follow-up surveys conducted from 12/08 to 3/09 detected the pathogen from multiple sample types collected inside the nursery, as well as an off-site positive obtained by filtration of water draining from the nursery. As part of the National *P. ramorum* Early Detection Survey of Forests effort in GA, rhododendron leaf baiting was initiated by GA Forestry Commission personnel in 1/09. *P. ramorum*-positive findings were obtained in 2/09 from a nearby lake. The lake is used to irrigate the positive nursery as well as an adjacent woody ornamental nursery (not known to be *P. ramorum*-positive) and an adjacent subdivision (not known to be *P. ramorum*-positive). A stream draining the lake, nurseries, and subdivision was also found positive just downstream from the nurseries in March, April, and May. Additional positives were obtained in April from one of two streams feeding the lake. Results for some diagnostics are still pending for baits collected in April and May from the stream draining the lake, the lake itself, and its feeder streams. March survey efforts of the vegetation along the stream draining the lake were all negative. A follow-up survey of the streamside vegetation, including that along the lake feeder streams, is being scheduled for early June.

**To date, the 2009 National Survey has identified six stream baiting positives in water outside of nurseries in five states: WA (1), MS (1), AL (2), GA (1), and FL (1).** All confirmed locations have had more than one positive survey this year. All vegetation samples collected so far in 2009 from an environs survey outside the MS nursery have been negative for the pathogen after multiple positives in 2008.

### MANAGEMENT

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**The Marin County Department of Public Works, Road Maintenance Division is currently dedicating a substantial amount of resources toward hazard tree removals, particularly in West Marin.** Currently the department commits one day a week to SOD tree removals. It is estimated that approximately \$90,000 has been spent by the county to remove nearly 100 trees so far this calendar year. While some removals were contracted out, most were conducted by county crews. Target areas for SOD hazard tree removals have been major arterial and corridor roads; however, with the summer fire season approaching, calls are also being received from neighborhood areas. For more information, contact Pete Maendle at (415) 446-4421 or [PMaendle@co.marlin.ca.us](mailto:PMaendle@co.marlin.ca.us).



## NURSERIES

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**Three Washington (WA) nurseries were found to have *P. ramorum*-positive plants** in May. On May 1<sup>st</sup>, a Snohomish County small rhododendron production nursery was found infested with *P. ramorum* during an annual nursery compliance and certification survey. Identified infected species included: *Rhododendron* spp. 'Wojrar's Purple,' 'Peppermint Twist,' 'Purple Jack,' 'Tamarindos,' 'Jumping Jeff,' 'Star Trek,' 'Crystal Springs,' 'Chapeau,' 'Dexter's Pink,' and *Kalmia* sp. 'Sarah.' The nursery ships rhododendrons interstate and internationally, primarily via mail order sales. Delimitation and trace-back and trace-forward investigations are underway. A second nursery in Pierce County was found to have *P. ramorum*-positive *Rhododendron* sp. 'Marie Forte' during a nursery stock cleanliness inspection on May 6<sup>th</sup>. This retail nursery was also found positive for the pathogen in 2004. It does not ship interstate. Delimitation and trace-back and trace-forward investigations are underway. The third infested nursery was a production facility in Clark County. The *P. ramorum*-positive *Rhododendron* sp. was found during an annual nursery compliance and certification inspection on May 6<sup>th</sup>. The nursery was also positive for *P. ramorum* in 2008. The nursery does ship interstate. Delimitation and trace-back and trace-forward investigations have been conducted.

**A Fulton County, GA retail nursery was confirmed to have *P. ramorum*-positive *Rhododendron* sp. 'Roseum elegans' on May 14<sup>th</sup>.** This is the first time this nursery has been found positive for the pathogen.

**A Mecklenburg County, NC retail nursery was confirmed to have *P. ramorum*-positive *Pieris japonica* 'Mountain Fire' and *Kalmia latifolia* 'Pink Charm' on May 22<sup>nd</sup>.** The nursery was found positive in 2008.

**A Greenville County, SC retail nursery was confirmed to have *P. ramorum*-positive *Pieris floribunda* (Mountain Peris) and *Pieris japonica* 'Dorothy Wycoff' on May 15<sup>th</sup>** as part of a routine state nursery inspection. The nursery was found positive in 2008 as part of a trace-forward investigation from the Mecklenburg County, NC 2008 nursery confirmation.

**As of May 15, 2009, the Oregon Department of Agriculture has surveyed** 212 nursery grower sites for *Phytophthora ramorum*. So far, the pathogen has been detected at four sites, two in Washington County, one in Clackamas County, and one in Lane County. At the first Washington County nursery, the pathogen was initially detected twice on *Pieris japonica* and, during delimitation, in a third block of *P. japonica* and in the potting media associated with an infected plant. At the second Washington County nursery, *P. ramorum* was initially detected on *Pieris* 'Mountain Fire' and, during delimitation, in the soil. This was the fourth consecutive year *P. ramorum* was detected at this site. In response, the State enacted an emergency quarantine that strictly regulates the movement of plants on and off the site and requires specific actions by the nursery to clean up the site. Samples are still being processed from the delimitation surveys at the final two sites. Initially, *P. ramorum* was detected on *P. japonica* at the Clackamas County site and twice on *Camellia* at the Lane County site. So far, additional positives



have been detected in *Rhododendron* at the Lane County site. To date, cultures have been recovered from every *P. ramorum*-positive sample found.

## RESEARCH

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**Hall, K.M. and Albers, H.J. 2009. [Economic Analysis for the Impact of \*Phytophthora ramorum\* on Oregon Forest Industries.](#)**

The objective of the study is to inform in-state decision makers of some of the economic implications of three different *P. ramorum* policy scenarios identified by the Oregon Department of Forestry in order to assist with the creation of a *P. ramorum* control strategy in Curry County. The three policy options being considered are 1) to continue the current control program, 2) to increase control efforts in an attempt to eradicate *P. ramorum* from Oregon wildlands, and 3) to eliminate the *P. ramorum* control program all together. The assessment looks specifically at the impact of the three policy options on the forest products industry in Oregon and includes estimated costs and benefits to forest industries in at-risk counties. This analysis does not attempt to quantify any ecological losses as a result of the spread of the pathogen nor the ecological costs of the control policies, which should also be considered in control policy analysis.

**Prospero, S.; Grünwald, N.J.; Winton, L.M.; and Hansen, E.M. 2009. Migration patterns of the emerging plant pathogen *Phytophthora ramorum* on the West Coast of the United States of America. *Phytopathology* 99:739-749.**

Abstract: *Phytophthora ramorum* (oomycetes) is the causal agent of sudden oak death and ramorum blight on trees, shrubs, and woody ornamentals in the forests of coastal California and southwestern Oregon and in nurseries of California, Oregon, and Washington. In this study, we investigated the genetic structure of *P. ramorum* on the West Coast of the United States, focusing particularly on population differentiation potentially indicative of gene flow. In total, 576 isolates recovered from 2001 to 2005 were genotyped at 10 microsatellite loci. Our analyses of genetic diversity and inferences of reproductive mode confirm previous results for the Oregon and California populations, with the strong majority of the genotypes belonging to the NA1 clonal lineage and showing no evidence for sexual reproduction. The high incidence of genotypes shared among populations and the lack of genetic structure among populations show that important large-scale, interpopulation genetic exchanges have occurred. This emphasizes the importance of human activity in shaping the current structure of the *P. ramorum* population on the West Coast of the United States.

**Riedel, Marko; Calmin, Gautier; Belbahri, Lassaad; Lefort, Francois; Gotz, Monika; Wagner, Stefan; and Werres, Sabine. 2009. Green Fluorescent Protein (GFP) as a Reporter Gene for the Plant Pathogenic Oomycete *Phytophthora ramorum*. *J. Eukaryot. Microbiol.*, 56(2). pp. 130–135. DOI: 10.1111/j.1550-7408.2008.00376.x.**

Abstract: Transgenic *Phytophthora ramorum* strains that produce green fluorescent protein (GFP) constitutively were obtained after stable DNA integration using a



polyethylene glycol and CaCl<sub>2</sub>-based transformation protocol. Green fluorescent protein production was studied in developing colonies and in different propagules of the pathogen to evaluate its use in molecular and physiological studies. About 12% of the GFP transformants produced GFP to a level detectable by a confocal laser scanning microscope. Green fluorescent protein could be visualized in structures with vital protoplasm, such as hyphal tips and germinating cysts. In infection studies with *Rhododendron*, one of the GFP expressing strains showed aggressiveness equal to that of the corresponding non-labeled isolate. Thus, GFP could be used as a reporter gene in *P. ramorum*. Limitations of the technology are discussed.

**The following abstracts on *P. ramorum* and related topics are being presented at the 2009 APS Annual Meeting** in Portland, OR August 1 – 5, 2009.

**Botts, M.;** Hansen, E.; and Kitin, P. 2009. [Interactions between tanoak and \*Phytophthora ramorum\* studied on a microscopic and molecular scale.](#) Phytopathology 99:S15.

**Britt, J.** and Hansen, E. 2009. [Phenotypic plasticity, fitness and multilocus genotypes of \*Phytophthora ramorum\* populations in southern Oregon tanoak forests.](#) Phytopathology 99:S16.

**Britt, J.** and Hansen, E. 2009. [Trees, soils, streams and rain traps: Intensive sampling leads to recovery of multiple genotypes from hosts of \*Phytophthora ramorum\* in Oregon forests.](#) Phytopathology 99:S16.

**Chastagner, G.A.;** DeBauw, A.; Riley, K.; and Dart, N.L. 2009. [Residual effectiveness of fungicides in protecting rhododendron leaves from \*Phytophthora ramorum\*.](#) Phytopathology 99:S180.

**Dart, N.L.;** Chastagner, G.A.; and Coats, K. 2009. [Initial assessment of genotypic diversity of \*Phytophthora ramorum\* associated with Washington state ornamental nurseries.](#) Phytopathology 99:S181.

**Elliott, M.;** Holmes, T.; Sumampong, G.; Shamoun, S.F.; De Boer, S.H.; Li, S.; Varga, A.; Masri, S.; and James, D. 2009. [Bacterial soft rot in \*Daphne laureola\* \(Thymelaceae\): A histopathological investigation.](#) Phytopathology 99:S32.

**Elliott, C.R.;** McDonald, V.; and Grunwald, N.J. 2009. [\*Phytophthora ramorum\* - pathogenic fitness of the three clonal lineages.](#) Phytopathology 99:S32.

**Elliott, C.R.;** McDonald, V.; Henslee, K.A.; and Grunwald, N.J. 2009. [Comparative epidemiology of \*Phytophthora ramorum\* and other \*Phytophthora\* species.](#) Phytopathology 99:S32.



- Goss, E.M.;** Larsen, M.; Chastagner, G.A.; Givens, D.R.; and Grunwald, N.J. 2009. [Variation within the NA1 clonal lineage of \*Phytophthora ramorum\* from US nurseries reveals migration pathways.](#) *Phytopathology* 99:S45.
- Jinek, A.;** Simard, M.; Brière, S.; Watson, A.; Tweddell, R.J.; and Rioux, D. 2009. [In vitro inoculations with \*Phytophthora ramorum\*: Foliage susceptibility of six eastern Canadian forest species.](#) *Phytopathology* 99:S193.
- Kanaskie, A.;** Goheen, E.M.; Hansen, E.M.; Sutton, W.; Reeser, P.; and Osterbauer, N. 2009. [Monitoring the effectiveness of \*Phytophthora ramorum\* eradication treatments in southwest Oregon tanoak forests.](#) *Phytopathology* 99:S61.
- Kanaskie, A.;** Goheen, E.; Hansen, E.; Osterbauer, N.; McWilliams, M.; Schultz, R.; Savona, S.; Sutton, W.; and Reeser, P. 2009. [Early detection and eradication of \*Phytophthora ramorum\* \(sudden oak death\) in Oregon forests.](#) *Phytopathology* 99:S61.
- Manter, D.K.** 2009. [Pathogenicity of \*Phytophthora ramorum\*.](#) *Phytopathology* 99:S163.
- Meentemeyer, R.** 2009. [Landscape epidemiology of \*Phytophthora ramorum\*: Measuring, mapping, and modeling spread.](#) *Phytopathology* 99:S163.
- Nagle, A.M.;** McPherson, B.A.; Wood, D.L.; Bonello, P.; and Garbelotto, M. 2009. [Does phloem phenolic chemistry contribute to coast live oak resistance to \*Phytophthora ramorum\*?](#) *Phytopathology* 99:S92.
- Parke, J.L.;** Pscheidt, J.; Regan, R.; Hedberg, J.; and Grunwald, N. 2009. [Online outreach: \*Phytophthora\* training for nursery growers.](#) *Phytopathology* 99:S175.
- Rizzo, D.M.** 2009. [Phytophthora in forests: Feedbacks between pathogen and plant communities in forests.](#) *Phytopathology* 99:S163.
- Santamaria, L.;** MMBAGA, M.T.; Sauve, R.J.; and Mrema, F.A. 2009. [Plant pathogenic \*Phytophthora\* species found in Tennessee commercial nurseries.](#) *Phytopathology* 99:S114.
- Sechler, K.E.;** Carras, M.M.; Shishkoff, N.; and Tooley, P.W. 2009. [Detection limit of \*Phytophthora ramorum\*-infected \*Rhododendron\* leaves using the Cepheid SmartCycler.](#) *Phytopathology* 99:S205.
- Tooley, P.W.** and Browning, M. 2009. [Sporulation capacity of \*Phytophthora ramorum\* on northern red oak and chestnut oak.](#) *Phytopathology* 99:S205.
- Widmer, T.L.** and Dodge, S.C. 2009. [Susceptibility of sprouted oak acorns to \*Phytophthora ramorum\* zoospores.](#) *Phytopathology* 99:S205.

**RELATED RESEARCH**

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**Ghimire, S.R.; Richardson, P.A.; Moorman, G.W.; Lea-Cox, J.D.; Ross, D.S.; and Hong, C.X. 2009.** An *in-situ* baiting bioassay for detecting *Phytophthora* species in irrigation runoff containment basins. *Plant Pathology* 58:577–583. DOI: 10.1111/j.1365-3059.2008.02016.x.

**McCarren, K.L.; McComb, J.A.; Shearer, B.L.; and St. J. Hardy, G.E. 2009.** Phosphite impact on the *in vitro* production and viability of selfed oospores by *Phytophthora cinnamomi*. *Forest Pathology* 39:124–132. DOI: 10.1111/j.1439-0329.2008.00571.x.

**Williams, N.; St. J. Hardy, G.E.; and O'Brien, P.A. 2009.** Analysis of the distribution of *Phytophthora cinnamomi* in soil at a disease site in Western Australia using nested PCR. *Forest Pathology* 39:95–109. DOI: 10.1111/j.1439-0329.2008.00567.x.

**SOD SYMPOSIUM 4 WORKSHOPS**

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**Two new meetings have been added to the Fourth Sudden Oak Death Science Symposium:**

**USDA APHIS PPQ and CPHST are holding a *P. ramorum* Program Technical Review** on Monday, June 15 from 8:00 a.m. to 12:00 p.m. The objective of the meeting is to initiate discussions about the scientific integrity of current nursery regulations based on the best available science. Areas which will be emphasized include identifying or improving mitigation measures that impact industry confidence of the current system; identifying possible knowledge gaps; determining levels of protection and programmatic success; and the practicality of implementing mitigation measures. It is anticipated that finalized considerations and/or conclusions may be not be achieved during this meeting, and that additional work may be required following the meeting to fully evaluate the identified areas for review. The meeting is open to anyone interested in participating.

**USDA APHIS National Quality Assurance and Program and Planning will hold a *P. ramorum* Quality Assurance Program Review: Industry Focus Discussion** on Wednesday, June 17 from 5:15 – 6:45 p.m. The objective of the meeting is to provide a brief overview of the federal *P. ramorum* program quality assurance review. Discussions will also explore how the regulatory program works for the various impacted industries and user groups, how it affects those parties, and how some processes might be improved.

**REGULATIONS**

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**Israel has included *P. ramorum* in its 2009 “Plant Import Regulations.”** To access the regulations, go to the Ministry of Agriculture and Rural Development Plant Protection and Inspection Services website at <http://www.ppis.moag.gov.il/NR/rdonlyres/BFAAC1EB-EBBC-430D-BD31-D92401EA691B/0/PlantImportRegulations2009UnofficialTranslation.pdf> or click [here](#).



**CALENDAR OF EVENTS**

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**6/15 – 6/18 – Fourth Sudden Oak Death Science Symposium; Hilton, Scotts Valley** (near Santa Cruz). For Symposium registration information, go to <http://nature.berkeley.edu/comtf/sodsymposium4/> or contact Janice Alexander at [JAlexander@ucdavis.edu](mailto:JAlexander@ucdavis.edu). For conference logistics and facilities information, contact Katie Palmieri at [Palmieri@nature.berkeley.edu](mailto:Palmieri@nature.berkeley.edu). For hotel room reservations, go to <http://www.hilton.com/en/hi/groups/personalized/SJCSVHF-SODS-20090612/index.jhtml>.

**3/7/10 – 3/12/10 - 5th IUFRO *Phytophthora* in Forest Trees and Natural Ecosystems** Conference; Rotorua, New Zealand; For more information, contact Pam Taylor at [pam.taylor@scionresearch.com](mailto:pam.taylor@scionresearch.com).

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