CALIFORNIA OAK MORTALITY TASK FORCE REPORT
MAY 2011

MONITORING

The Washington *P. ramorum*-positive soil confirmation in December 2010 (reported on in Dec. COMTF newsletter) in a Gig Harbor, Pierce County landscape (adjacent to a previously positive repeat nursery) has been identified as the NA2 lineage. This is the first time this strain has been found outside of a nursery in soil. The confirmed site is along a drainage that had been found positive with infected salal plants in the summer of 2009.

NURSERIES

California had four confirmed nurseries in April 2011. Three of the finds were at production facilities and one was at a retail nursery. On April 15th, a production nursery in Santa Clara County was found to have *P. ramorum*-positive *Camellia sasanqua* 'Jean May,' *Camellia sasanqua* 'Showa No Sakae,' *Camellia japonica* 'Red,' and *Camellia japonica* (mixed) during an annual compliance agreement inspection. This nursery was previously positive in 2010 and does ship interstate; however, the only interstate shipments in the past six months have been to Nevada. Implementation of the confirmed nursery protocol (CNP) is underway. The second confirmation was made on April 19th, at a production facility in Stanislaus County during an annual compliance agreement inspection. Positive samples included *Rhododendron sp., Camellia sasanqua* 'Chansonette,' *Prunus laurocerasus*, and *Osmanthus heterophyllus*. The nursery was also positive for the pathogen in 2010. No interstate shipments have been made in the past six months. All known positive plants have been put on hold. Once all sample results are available, implementation of the CNP will be underway. The third positive production nursery confirmation was made on April 22nd, in Orange County in the retail section of the nursery during an annual compliance inspection. Positive samples were collected from *Pieris japonica* 'Forest Flame' and *Camellia japonica* (no variety specified). All known positive plants have been put on hold. Once all sample results are available, CNP will be implemented. The nursery has not previously been found positive for the pathogen, nor has it made any interstate shipments within the past six months. The fourth confirmation was made at a retail nursery in Sacramento County on April 22nd. The positive sample, *Cinnamonum camphora,* was collected during the two-year follow-up inspection of a previous positive in 2008. The Retail Confirmed Nursery Protocol is underway. No interstate shipments have been made in the past six months.

The Oregon Department of Agriculture has completed testing for the 2011 *P.* *ramorum* Federal Order Survey on 2,364 samples collected from 62 nursery grower locations. On April 22nd, *P. ramorum* was confirmed infecting a *Rhododendron* plant in a Washington County retail nursery and six *Viburnum* plants in a Polk County retail nursery. Neither nursery ships interstate. The Washington County nursery was also found positive for the pathogen in 2010. The USDA Retail Confirmed Nursery Protocol has been enacted at both nurseries.

RESEARCH

Davidson, J.M.; Patterson, H.A.; Wickland, A.C.; Fichtner, E.J.; and Rizzo, D.M. 2011. Forest Type Influences Transmission of *Phytophthora ramorum* in California Oak Woodlands. Phytopathology, Vol. 101, Number 4. pp. 492-501. DOI: 10.1094/PHYTO-03-10-0064.

Abstract: The transmission ecology of *Phytophthora ramorum* from bay laurel (*Umbellularia californica*) leaves was compared between mixed-evergreen and redwood forest types throughout winter and summer disease cycles in central, coastal California. In a preliminary multisite study, we found that abscission rates of infected leaves were higher at mixed-evergreen sites. In addition, final infection counts were slightly higher at mixed-evergreen sites or not significantly different than at redwood sites, in part due to competition from other foliar pathogens at redwood sites. In a subsequent, detailed study of paired sites where *P. ramorum* was the main foliar pathogen, summer survival of *P. ramorum* in bay laurel leaves was lower in mixed-evergreen forest due to lower recovery from infected attached leaves and higher abscission rates of infected leaves. Onset of inoculum production and new infections of bay laurel leaves occurred later in mixed-evergreen forest. Mean inoculum levels in rainwater and final infection counts on leaves were higher in redwood forest. Based on these two studies, lower summer survival of reservoir inoculum in bay laurel leaves in mixed-evergreen forest may result in delayed onset of both inoculum production and new infections, leading to slower disease progress in the early rainy season compared with redwood forest. Although final infection counts also will depend on other foliar pathogens and disease history, in sites where *P. ramorum* is the main foliar pathogen, these transmission patterns suggest higher rates of disease spread in redwood forests during rainy seasons of short or average length.

Hayden, K.J.; Nettel, A.; Dodd, R.S.; Garbelotto, M. 2011. Will all the trees fall? Variable resistance to an introduced forest disease in a highly susceptible host. Forest Ecology and Management, Vol. 261, Issue 11. pp. 1781-1791.
DOI: 10.1016/j.foreco.2011.01.042.

Abstract: Although tanoak (*Notholithocarpus densiflorus* syn. *Lithocarpus densiflorus*) is the species most affected by the introduced pathogen *Phytophthora ramorum*, with demonstrable risk of extirpation, little is known about the origin, range or structuring of the tree's susceptibility. We examined variation in resistance to *P. ramorum* using a wound inoculation assay of detached leaves from trees at five geographically separated sites, and a non-wound inoculation assay on twigs from trees at two sites. The structure of variation in resistance was compared to the structure at nine nuclear microsatellite markers.

Resistance varied quantitatively, with 23% and 12% of the variation among individuals and populations, respectively. There was a significant correlation between resistance in detached leaves and lesion size in non-wounding twig inoculations. Among-population genetic diversity at nine microsatellite loci was weakly structured but significantly non-zero, with 9.5% of variation among populations. Within-population neutral genetic

diversity was a poor predictor of resistance, and estimates of phenotypic distances for resistance were no greater than neutral genetic distances.

The limited phenotypic and genetic structure we found indicates that tanoaks at all study sites are susceptible, and there is no evidence of prior selection for disease resistance. We conclude that tanoak populations across the species' range are at risk, but local disease dynamics will depend on both host genetics and environmental conditions.

Metz, M.R.; Frangioso, K.M.; Meentemeyer, R.K.; and Rizzo, D.M. 2011. Interacting disturbances: wildfire severity affected by stage of forest disease invasion. Ecological Applications, 21(2). pp. 313–320.

Abstract: Sudden oak death (SOD) is an emerging forest disease causing extensive tree mortality in coastal California forests. Recent California wildfires provided an opportunity to test a major assumption underlying discussions of SOD and land management: SOD mortality will increase fire severity. We examined pre-fire fuels from host species in a forest monitoring plot network in Big Sur, California (USA), to understand the interactions between disease-caused mortality and wildfire severity during the 2008 Basin Complex wildfire. Detailed measurements of standing dead woody stems and downed woody debris 1–2 years prior to the Basin fire provided a rare picture of the increased fuels attributable to SOD mortality. Despite great differences in host fuel abundance, we found no significant difference in burn severity between infested and uninfested plots. Instead, the relationship between SOD and fire reflected the changing nature of the disease impacts over time. Increased SOD mortality contributed to overstory burn severity only in areas where the pathogen had recently invaded. Where longer term disease establishment allowed dead material to fall and accumulate, increasing log volumes led to increased substrate burn severity. These patterns help inform forest management decisions regarding fire, both in Big Sur and in other areas of California as the pathogen continues to expand throughout coastal forests.

Ramage, B.S.; O'Hara, K.L; and Forrestel, A.B. 2011 Forest transformation resulting from an exotic pathogen: regeneration and tanoak mortality in coast redwood stands affected by sudden oak death. Canadian Journal of Forest Research, 41, 763-772.

Abstract: Sudden oak death is dramatically altering forests throughout coastal California, but little is known about the communities that are assembling in affected areas. This emerging disease, caused by the exotic pathogen *Phytophthora ramorum* (S. Werres, A.W.A.M. de Cock), has had especially severe effects on tanoak (*Notholithocarpus densiflorus* (Hook. & Arn.) Manos, Cannon & S.H. Oh), a broadleaf evergreen that is abundant in forests dominated by coast redwood (*Sequoia sempervirens* (D.Don) Endl.). Tanoak, a valuable food source to numerous wildlife species, is unlikely to successfully regenerate in diseased areas, and thus, affected redwood forests are transitioning to a novel state. In this study, to predict which species might replace tanoak, we investigated regeneration patterns in heavily impacted stands in Marin County, California. Our main findings were as follows: (i) despite reductions in canopy cover, there is no evidence that

any species other than tanoak has exhibited a regenerative response to tanoak mortality, (ii) the regeneration stratum was dominated by redwood and tanoak (other tree species were patchy and (or) scarce), and (iii) some severely affected areas lacked sufficient regeneration to fully re-occupy available growing space. Our results indicate that redwood is likely to initially re-occupy the majority of the ground relinquished by tanoak, but also provide evidence that longer-term trajectories are unresolved, and may be highly responsive to management interventions.

Riley, K.L.; Chastagner, G.A.; and Blomquist, C. 2011. First report of *Phytophthora ramorum* infecting grand fir in California. Online. Plant Health Progress. DOI: 10.1094/PHP-2011-0401-01-BR.

Brief: *Phytophthora ramorum* was detected on grand fir (*Abies grandis*) in 2003 and 2005 in a Christmas tree plantation near Los Gatos, CA, in association with infected California bay laurel. Isolates derived from stem lesions were used to inoculate grand fir seedlings in two tests. Isolations from lesions on inoculated plants were positive for *P. ramorum* in both tests. This work provides the completion of Koch's postulates to establish grand fir as a host of *P. ramorum*. The potential for grand fir to be infected within its native range is unknown.

Valachovic, Y.S.; Lee, C.A.; Scanlon, H.; Varner, J.M.; Glebocki, R.; Graham, B.D.; and Rizzo, D.M. 2011. Sudden oak death-caused changes to surface fuel loading and potential fire behavior in Douglas-fir-tanoak forests. Forest Ecology and Management, Vol. 261, Issue 11. pp. 1973-1986. DOI: 10.1016/j.foreco.2011.02.024.

Abstract: We compared stand structure and fuel loading in northwestern California forests invaded by *Phytophthora ramorum*, the cause of sudden oak death, to assess whether the continued presence of this pathogen alters surface fuel loading and potential fire behavior in ways that may encumber future firefighting response. To attempt to account for these kinds of changes over a longer term than *P. ramorum* has been present in California, we supplemented sampling of pathogen-killed stands with those killed by herbicides. Although fuel loadings were greater in diseased than in undiseased stands, great variability was observed and the differences did not rise to the level of significance. Fuel loading observed in herbicide-treated stands was significantly greater than that in control stands ($P < 0.001$); total weight of downed woody debris (1-, 10-, 100-, and 1000-h fuel loadings) approximately doubled with the herbicide treatment ($\bar{x} = 106.3 \ \mathrm{Mg \ ha^{-1}}$) over the control condition ($\bar{x} = 58.1 \ \mathrm{Mg \ ha^{-1}}$). The increasing trends in herbicided and diseased plots resembled each other, suggesting that fuel loadings in diseased plots will continue to increase relative to the controls over a longer time horizon than observed. Fuel models based on the observed surface fuel accumulations in herbicide-treated and diseased plots predict that for some early-to-mid-phase (2–8 years) herbicide-treated forests, and for late-phase (8 years plus) diseased forests, rates of spread, flame lengths, and fireline intensities could increase significantly over the baseline, challenging effective firefighter response. These results, together with the "background" surface fuels observed in the control stands, highlight the need for

fuels treatments and effective disease management strategies in infested stands and as sudden oak death expands throughout a broader region.

RELATED ISSUES

***Phytophthora lateralis* was confirmed in April on Lawson cypress (*Chamaecyparis lawsoniana*)** trees at two more Scottish sites in Greenock Cemetery, Inverclyde, west of Glasgow. The finding follows the first confirmation of *P. lateralis* in Britain in November 2010 when Lawson cypress trees at Balloch Castle were found positive for the pathogen. Staff at Greenock Cemetery noticed the unusual dieback and notified the Forestry Commission in March. The site has more than 100 Lawson cypress, of which 23 are showing clear signs of infection, and several more are showing early signs. The symptomatic trees at Greenock cemetery are being felled and burned on site to limit disease spread. Biosecurity measures are being put in place to minimize the risk of the pathogen being spread from the site by staff or visitors. (Note: In its native range, Lawson cypress is called Port Orford cedar.)

RELATED RESEARCH

Coleman, T.W.; Grulke, N.E.; Daly, M.; Godinez, C.; Schilling, S.L., Riggan, P.J.; and Seybold, S.J. 2011. Coast live oak, *Quercus agrifolia*, susceptibility and response to goldspotted oak borer, *Agrilus auroguttatus*, injury in southern California. Forest Ecology and Management, Vol. 261, Issue 11. pp. 1852-1865.

Magarey, R.D.; Borchert, D.M.; Engle, J.S.; Colunga-Garcia, M.; Koch, F.H.; and Yemshanov, D. 2011. Risk maps for targeting exotic plant pest detection programs in the United States. OEPP/EPPO Bulletin, 41:46-56.

Marcais, B.; Cael, O.; and Delatour, C. 2011. Interaction between root rot basidiomycetes and *Phytophthora* species on pedunculate oak. Plant Pathology, 60:296–303. DOI: 10.1111/j.1365-3059.2010.02378.x.

Rea, J.; Burgess, T.I.; St J. Hardy, G.E.; Stukely, M.J.C.; and T. Jung, T. 2011. Two novel and potentially endemic species of *Phytophthora* associated with episodic dieback of Kwongan vegetation in the south-west of Western Australia. Plant Pathology. DOI: 10.1111/j.1365-3059.2011.02463.x.

Richter, B.S.; Benson, D.M.; and Ivors, K.L. 2011. Microbial profiling of cultural systems for suppression of Phytophthora root rot in Fraser fir. Plant Disease, 95. pp.537-546.

Scanu, B.; Linaldeddu, B. T.; and Franceschini, A. 2011. A New *Phytophthora* sp. Causing Root and Collar Rot on *Pistacia lentiscus* in Italy. Dipartimento di Protezione delle Piante, Sezione di Patologia Vegetale, Università degli Studi di Sassari, Via E. De Nicola 9, 07100 Sassari, Italy.

COMTF 2011 MEETING

Remember to register for the California Oak Mortality Task Force 2011 meeting, taking place online May 25, 2011 and June 1, 2011. Each one-hour session will focus on challenging *P. ramorum*-related topics. On May 25, attendees will participate in a virtual "field trip," as speakers discuss *P. ramorum* management-related issues in the field, and on June 1, presenters will focus on issues dealing with *P. ramorum*-related pathways. There is no charge to participate, but preregistration is required. Forest health specialists, land managers, regulators, nursery industry representatives, tribal members, arborists, researchers, Master Gardeners, and other interested parties are encouraged to participate. For more information, see the "Calendar of Events" below.

RESOURCES

The 2010 California Pest Conditions Report is now available at http://www.fs.fed.us/r5/spf/publications/pestconditions/conditions2010_110405_web.pdf. The California Forest Pest Council publication provides an update on insects, diseases, and abiotic conditions impacting California's forests.

CALENDAR OF EVENTS

5/11 - SOD Treatment Workshop; Meet at oak outside of Tolman Hall, UC Berkeley Campus; 1 – 3 p.m.; Pre-registration is required. This class is free and will be held rain or shine. To register, or for questions, email kpalmieri@berkeley.edu, and provide your name, phone number, affiliation and license number (if applicable), and the date for which you are registering. For more information, go to http://nature.berkeley.edu/garbelotto/english/sodtreatmenttraining.php.

5/16 – 5/18 - National Workshop on Climate and Forests; DuBois Conference Center; Northern Arizona University Campus, Flagstaff Arizona; For more information, go to http://www.safnet.org/natworkshop11/index.cfm.

5/25 - CA Oak Mortality Task Force 2011 Meeting: Sudden Oak Death/*Phytophthora ramorum*: A Global Perspective on Management and Movement Webinar, **Part 1**, "Virtual 'Field Trip' of *Phytophthora ramorum* Wildland Management;" 9:00 – 10:00 a.m.; Advanced registration is required. There is no cost to participate. For more information, or to register, go to COMTF 2011 Meeting. For question, contact Katie Palmieri at kpalmieri@berkeley.edu or Janice Alexander at jalexander@ucdavis.edu.

6/1 - CA Oak Mortality Task Force 2011 Meeting: Sudden Oak Death/*Phytophthora ramorum*: A Global Perspective on Management and Movement Webinar, **Part 2**, "Focus on *Phytophthora ramorum* Pathways;" 9:00 – 10:00 a.m.; Advanced registration is required. There is no cost to attend. For more information, or to register, go to COMTF 2011 Meeting. For question, contact Katie Palmieri at kpalmieri@berkeley.edu or Janice Alexander at jalexander@ucdavis.edu.

6/21 – 6/23 - Coast Redwood Forests in a Changing California: A Symposium for Scientists and Managers; University of California, Santa Cruz; For more information, go to http://ucanr.org/sites/redwood.

6/30 - Guidelines for Managing Oak Rangelands; webinar series field trip to Avenales Ranch, Pozo, San Luis Obispo County; 10:00 a.m. - 2:30 p.m.; This series is intended for oak woodland landowners, certified range managers, and registered professional foresters. It is designed to create an awareness of the importance of managing oak woodlands and to present alternative management strategies.; Registration is $25. To register, go to http://ucanr.org/oakwebinar. Registered participants will receive follow-up log-in instructions. For more information, contact Richard Standiford at (510) 643-5428 or standifo@berkeley.edu. Note: As the webinar series has already started, those who register now will get access to a recording of already completed sessions, and a link for the upcoming sessions.

7/13 – 7/14 - California Forest Pest Council Summer Weed Tour; Murphy's, Calaveras County; For more information, contact Tim Collins at tcollins@spi-ind.com or (530) 272-2297, or Patricia Raggio at praggio@parks.ca.gov or (209) 795-8270.

7/26 - California Forest Pest Council Summer Insect, Disease, and Animal Damage Tour; Fort Bragg, Mendocino County; For more information, contact Tom Smith at (916) 599-6882 or tom.smith@fire.ca.gov.

7/31 – 8/5 – Disease and Insect Resistance in Forest Trees: Fourth International Workshop on the Genetics of Host-Parasite Interactions in Forestry; Valley River Inn; 1000 Valley River Way; Eugene, OR 97401; To register, or for more information, go to http://ucanr.org/sites/tree_resistance_2011conference/. For questions, contact Richard Sniezko at rsniezko@fs.fed.us; Katie Palmieri at (510) 847-5482 or kpalmieri@berkeley.edu; or Janice Alexander at (415) 499-3041 or jalexander@ucdavis.edu.

9/15 – 9/17 - California Urban and Community Forests Conference; Crown Plaza Hotel in Palo Alto; For more information, go to http://www.caufc.org/Annual%20Conference.

10/5 – 10/6 – The Seventh Meeting of the Continental Dialogue on Non-Native Forest Insects and Diseases; Boulder, Colorado; For more information, contact Debbie Lee at dlee@resolv.org or (202) 965-6381 or Beth Weaver at bweaver@resolv.org or (202) 965-6211. For more information about the Dialogue go to: www.continentalforestdialogue.org.

10/10 – 10/14 - The 59th Western International Forest Disease Work Conference; Enzian Hotel, Leavenworth, WA. This meeting is intended for forest pathologists from western North America (and beyond); For more information, go to www.fs.fed.us/foresthealth/technology/wif/index.htm. For questions, contact Greg Filip at gmfilip@fs.fed.us or (503) 808-2997.

11/8 – 11/11 - 2011 IUFRO Forest Protection Joint Meeting, Research Groups 7.02 – 7.03; Colonia del Sacramento, Uruguay; More information will be forthcoming. For questions, contact Alina Greslebin at agreslebin@ciefap.org.ar.

6/18 – 6/22/12 – Sudden Oak Death Fifth Science Symposium; More information will be forthcoming.