California Oak Mortality Task Force Report
MARCH 2014

Monitoring

Sudden Oak Death (SOD) has been confirmed in Trinity County according to the California Department of Food and Agriculture (CDFA). The pathogen was first found there by UC Cooperative Extension, Humboldt and Del Norte County personnel less than 600 yards over the Humboldt County line into Trinity County on an 80-acre Bureau of Land Management parcel adjacent to the Six Rivers National Forest. The nearest known infestation is 0.4 miles west in Humboldt County.

Infected California bay laurel and tanoak trees, spanning approximately a 5-acre area, were identified; however, ground surveys to delineate the actual extent of the infestation will be conducted this spring, when symptoms will be most advantageous for surveying. Symptoms found include dead and symptomatic tanoaks as well as heavily symptomatic bay trees.

Trinity County is now the 15th California county known to have SOD. CDFA has submitted and finalized an emergency regulation change adding Trinity County to California Code of Regulations 3700, Oak Mortality Disease Control. As a regulated county, Trinity will be required to follow state and federal quarantine guidelines for the disease. For more information, contact Erin Lovig at (916) 654-0312 or erin.lovig@cdfa.ca.gov.

Washington Department of Natural Resources *Phytophthora ramorum* update - *Phytophthora ramorum* waterway monitoring as well as forest and nursery perimeter surveys have been conducted in Washington since 2003, with efforts since 2006 focusing on aquatic areas near previously positive nurseries. In 2013, 11 *P. ramorum* stream baiting sites were established in western Washington waterways, of which two were identified as positive - one in Clallam County and one in Thurston County. Eleven additional sites were repeatedly sampled in Clallam County as the source of the inoculum there is unknown; however, results to date have been negative or inconclusive.

In 2013, the water monitoring sampling methodology was changed from stream baiting with mesh bags to the Bottle-of-Bait method in the interest of increasing efficiency. Since waterway sampling began in 2005, *P. ramorum* has been detected in seven waterways in western Washington: two in King County and one each in Clallam, Clark, Lewis, Pierce, and Thurston Counties. Diseased plants were found associated with one of the waterways in 2010 (Pierce County) and were destroyed.

Five new positive waterways were identified during the 2013 National *P. ramorum* Early Detection Survey of Forests conducted by US Forest Service, Forest Health Monitoring and cooperating states. Assays were conducted at 104 stream sites in 12 states nationwide. The survey focused on high-risk waterways near infested forest areas in CA and OR; positive waterways already detected in AL, FL, GA, MS, NC, TX, and WA; and high-risk waterways outside nurseries that may have received infected ornamental plants in these states, plus NY and PA. *P. ramorum* was confirmed at two new sites in CA, two new sites in WA, and one new site in TX. Sites previously positive for *P. ramorum* were confirmed in AL, MS, NC, and TX. For more information, contact Borys Tkacz at btkacz@fs.fed.us.

Submissions of 2013 California *P. ramorum* survey results that have been laboratory validated are now being accepted for inclusion in the 2014 SODmap (www.sodmap.org). Both positive and negative plant, soil, and water findings are requested. Instructions for Submission of Data to SODmap can be found at http://nature.berkeley.edu/garbelotto/english/sodmapsubmit.php. All submissions are due via email by March 15th to dschmidt@berkeley.edu. SODmap is the most complete distribution map available for *Phytophthora ramorum*/Sudden Oak Death. It is the database accessed by SODmap mobile (app available for free for iPhone and Android), which allows users to identify known infected trees in the field as well as calculate risk for oak infection at the time and location of the user. For questions regarding SODmap or the submission process, contact Doug Schmidt at dschmidt@berkeley.edu.

RESEARCH

Beh, M.M.; Metz, M.R.; Seybold, S.J.; Rizzo, D.M. 2014. The novel interaction between *Phytophthora ramorum* and wildfire elicits elevated ambrosia beetle landing rates on tanoak, *Notholithocarpus densiflorus*. Forest Ecology and Management 318: 21-33.

Abstract: The 2008 wildfires in the Big Sur region of California's central coast—the first to occur in forests impacted by *Phytophthora ramorum*, the non-native, invasive pathogen that causes sudden oak death—provided the rare opportunity to study the response of scolytid and other subcortical beetles to this novel disturbance interaction. We used sticky card traps attached to the main stem of tanoak, *Notholithocarpus densiflorus*, the tree species most susceptible to *P. ramorum*, to determine which subcortical beetle species may be using tanoak as a host and to compare insect landing rates on these trees in forest plots impacted by neither disturbance, either wildfire or *P. ramorum* disturbance alone, or both disturbances combined. *Xyleborinus saxesenii* and *Gnathotrichus pilosus*, two species of ambrosia beetles (Coleoptera: Scolytidae), composed the majority (48% and 40%, respectively) of subcortical beetles landing on tanoaks during both years of the study. Adults of two species of a small, branch-feeding flatheaded borer (*Anthaxia* sp.; Coleoptera: Buprestidae) were also captured in relative abundance landing on tanoaks in the combined disturbance plots during the second year of the study. All but two of the 2779 scolytid beetles collected in this study were trapped on tanoaks in forest plots disturbed by *P. ramorum* and/or fire, and 75% of these scolytids were trapped during the fall 2009 season. The majority of scolytids were trapped on tanoaks in plots containing both disturbances (81% in 2009 and 79% in 2010), and, of the two disturbances, more scolytids were trapped on tanoaks in burned plots than in *P. ramorum*-infested plots (92% more in 2009 and 476% more in 2010). Semiochemicals emanating from the tanoaks upon which the sticky cards were attached—either in the form of host volatile compounds or scolytid aggregation

pheromones—presumably affected ambrosia beetle landing rates, and greater quantities of moribund and recently-killed trees in the plots disturbed both by *P. ramorum* and fire may have led to greater population densities of ambrosia beetles in these areas. Our findings of elevated ambrosia beetle landing rates in Big Sur forests with mixed disturbances suggest a heightened threat to tanoak in these areas, but additional research is needed to determine the actual frequency of ambrosia beetle gallery initiation in living tanoaks and whether colonization hastens or leads to tree mortality.

Dillon, W.W.; Haas, S.E.; Rizzo, D.M.; Meentemeyer, R.K. 2014. Perspectives of Spatial Scale in a Wildland Forest Epidemic. European Journal of Plant Pathology. 138:449–465.

Abstract: The challenge of observing interactions between plant pathogens, their hosts, and environmental heterogeneity across multiple spatial scales commonly limits our ability to understand and manage wildland forest epidemics. Using the forest pathogen *Phytophthora ramorum* as a case study, we established 20 multiscale field sites to analyze how host-pathogen-environment relationships vary across spatial scales of observation in a wildland pathosystem. We developed statistical models of disease intensity across five nested levels of spatial aggregation, from an individual host through four broader spatial extents of observation. Analyses were conducted from two spatial perspectives: a focal view, where disease intensity at one scale was examined as a function of broader-scale landscape conditions, and an aggregate view, where disease intensity and landscape conditions was observed at the same scale of spatial aggregation. For each perspective, separate models were developed to compare direct field measurements of host density versus less expensive remotely sensed estimates of host habitat as predictors of disease in landscape-scale studies. From both perspectives, models using direct measurements of host density performed better than models using remotely sensed estimates of host habitat across all four spatial extents. We found no significant difference in model performance at the individual level. From the focal view, the performance of host density models declined with increasing spatial extent, whereas the performance of host habitat models improved with spatial extent. These results illustrate how the scale of observation – both spatial extent and measurement detail – can influence conclusions drawn from epidemiological models of wildland pathosystems.

Ginetti, B.; Carmignani, S.; Ragazzi, A.; Werres, S.; Moricca, S. 2014. Foliar Blight and Shoot Dieback Caused by *Phytophthora ramorum* on *Viburnum tinus* in the Pistoia Area, Tuscany, Central Italy. Plant Disease. 98(3): 423-423.

Abstract: In spring 2013, pot-grown *Viburnum tinus* plants shipped to an ornamental nursery in Pescia (Pistoia, central Italy, 287 m a.s.l., 43°54′0″ N, 10°41′0″ E) from another local nursery were found to bear disease symptoms. Symptoms included brown to black foliar lesions, later expanding into larger blotches; necrosis of the petioles; shoot wilting and folding; browning of the stems; and necrosis of the cambium. Infected leaves, shoots, and entire plants eventually died. Tissue samples (2 mm^2) were cut at the edge of active lesions from tissue of the phloem, the xylem, and the leaves and plated on selective

PARPNH V8 agar (V8A) (1). Rose-shaped and finely lobed cottony colonies arose in 2 to 3 days. Mono-hyphal colonies were isolated and transferred to V8A. Square colony pieces (1 cm^2) from isolates SB05a and SB05b were placed in filtered pond water after 5 to 7 days. Semipapillate, caducous sporangia with a rounded or conical base were produced within 24 h, individually or in pairs, on each sporangiophore. Sporangia (n = 30 per isolate) were examined: they were 56.2 ± 9.5 × 29.3 ± 4.3 µm (l:b ratio 1.9 ± 0.3). Exit pores averaged 7.0 ± 1.0 µm. Sporangia were ellipsoid (30%), lemon-shaped (28.3%), ovoid (20%), obovoid (16.7%), ampulliform (3.3%), or "peanut-like" (1.7%). Globose chlamydospores, borne intercalarly or terminally, were abundant on both V8A and carrot agar (CA), and were on average 54.7 ± 8.5 µm. Mono-hyphal isolates incubated for 7 days at 23°C were also transferred to CA, corn meal agar (CMA), malt extract agar (MEA), potato dextrose agar (PDA), and V8A. Colonies on these media were identical in shape and appearance to those described in previous reports (2,4). Isolates were identified as *Phytophthora ramorum* Werres, De Cock & Man in't Veld (4) on the basis of colony type; size, the average l:b ratio and shape of sporangia; and the type and size of the chlamydospores. Isolates were found to be the A1 mating type by pairing them with *P. cryptogea* BBA 63651 (mating type A2). PCR-amplification of the rDNA ITS region with specific primers Ph1/Ph4 (3) gave fragments of the expected size (GenBank Accession Nos. KF181162 and KF181163). A BLAST search of these ITS sequences in the database found that isolates of *P. ramorum* were the closest phylogenetically with 100% homology (YQ653034 and HM004221). Pathogenicity tests were conducted on 16 detached *V. tinus* leaves. A small cut was made aseptically on each of the leaf surfaces and a V8A disc (0.5 cm Ø) with mycelium was placed over the wounds. Control leaves received only sterile V8A discs. Inoculated and control leaves were incubated at 23°C in the dark. Necrotic areas (average 3.5 ± 1.3 cm^2) arose on inoculated leaves after 6 days. Control leaves had no symptoms. Re-isolations on PARPNH V8A confirmed *P. ramorum* as the causal agent. *P. ramorum* was reported in Italy in 2003 on the exotic *Rhododendron yakushimanum* (2). This is the first report of the pathogen on a native species (*V. tinus*) in this country. The Pistoia area is important for nursery gardens and flowers. *P. ramorum*, which probably arrived on infected plant material, could compromise the export/import trade in stock plants. For this reason, the plant protection services were promptly alerted and the infected plants were destroyed.

References: (1) Y. Balci et al. Plant Dis. 91:705, 2007. (2) C. Gullino et al. Inf. Agrar. 19:87, 2003. (3) K. J. Hayden et al. Phytopathology 94:1075, 2004. (4) S. Werres et al. Mycol. Res. 105:1155, 2001.

Osterbauer, N.K.; Lane, S.; and Trippe, A. 2014. *Phytophthora ramorum* Identified Infecting Eastern Teaberry (*Gaultheria procumbens*) Plants Shipped to Oregon. Plant Health Progress. 15(1):9. DOI: 10.1094/PHP-BR-13-0109.

These results confirm the pathogenicity of *P. ramorum* on eastern teaberry and complete Koch's Postulates for this new host. Eastern teaberry is an understory species native to eastern North America, with its range extending from Alabama and Georgia (United

States) in the south to Manitoba and Quebec (Canada) in the north. Infected nursery plants represent a potential pathway for *P. ramorum* introduction to this region.

REGULATIONS

Turkey amended their plant quarantine regulation, which included an update to their *P.* *ramorum* regulations. As of March 29, 2014, isolated bark of bigleaf maple (*Acer macrophyllum* Pursh), California buckeye (*Aesculus californica* [Spach] Nutt.), tanoak (*Notholithocarpus densiflorus* (Hook. & Arn.) Manos, Cannon & S.H. Oh, and Pacific yew (*Taxus brevifolia* Nutt.), originating in countries where *P. ramorum* is known to exist, are forbidden entry into Turkey.

RELATED RESEARCH

Dreaden, T.J.; Davis, J.M.; Harmon, C.L.; Ploetz, R.C.; Palmateer, A.J.; Soltis, P.S.; Smith, J.A. 2014. Development of Multilocus PCR Assays for *Raffaelea lauricola*, Causal Agent of Laurel Wilt Disease. 98(3): 379-383.

Lebeda, A.; Burdon, J.J.; Thrall, P.; Jeger, M.J. (eds.). 2014. Wild Plant Pathosystems. European Journal of Plant Pathology Special Issue 138(3):415-677. 15 Articles. http://link.springer.com/journal/10658/138/3/page/1.

McConnell, M.E. and Balci, Y. 2014. *Phytophthora cinnamomi* as a Contributor to White Oak Decline in Mid-Atlantic United States Forests. Plant Disease. 98(3):319-327.

RESOURCES

The 2013 California Forest Pest Conditions Report is now available online at http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046704. Assembled by the California Forest Pest Council (http://caforestpestcouncil.org/), the report covers forest health and pest issues impacting California's forests, woodlands, and urban trees throughout the 2013 year, and is intended to be a resource for forest managers, pest management specialists, landowners, and other interested parties.

MEETINGS

Thank you to everyone who participated in the "Visualizing Sudden Oak Death" E-conference, held February 10 – 21, 2014. We welcome all attendees to please take a quick online survey of your experience so that we can use the feedback we receive to help drive future meetings and e-conferences. While the conference has come to a close, the discussion forum, webinar, Hangout, art gallery, videos, posters, handouts, and Art of Saving Oaks exhibit will remain online indefinitely as a resource.

CALENDAR OF EVENTS

3/11 – 3/13 - 60th Annual Conference on Soilborne Plant Pathogens, Dominican University of California, San Rafael; For more information, or to register, go to http://soilfungus.ars.usda.gov/index.htm. The field trip on 3/11 will feature sudden oak death at Mt. Tamalpais and Muir Woods.

3/22 – SOD Management Meeting hosted by the University of California Cooperative Extension, Sonoma, and the Gold Ridge Regional Conservation District; Salmon Creek School; 1935 Bohemian Highway, Occidental; 9:00 a.m. – 2:00 p.m.; The presentations and afternoon on-site field trip will focus on various goals of forest management in a SOD-infested forest. To register, go to http://ucanr.edu/sodmanagement. For more information, contact Lisa Bell at (707) 565-2050.

4/5 – Santa Lucia SOD Blitz Training; Santa Lucia Preserve; 10:00 – 10:45 a.m.; For residents only.

4/11 - Santa Cruz SOD Blitz Training; UCSC Arboretum; 1156 High St, Santa Cruz; Map Link; 7:00 – 7:45 p.m.; For more information, contact Brett Hall at brett@ucsc.edu.

4/12 - South Skyline SOD Blitz Training; Saratoga Summit (Cal Fire) Fire Station; 12900 Skyline Blvd, Los Gatos; 10:00 – 10:45 a.m.; For more information, contact Jane Manning at skyline_sod@yahoo.com.

4/18 – Mendocino SOD Blitz Training, Option 1; Fort Brag location to be determined; 7:00 – 7:45 p.m.; For more information, contact Lori Hubbart at lorih@mcn.org.

4/19 – Mendocino SOD Blitz Training, Option 2; Gualala location to be determined; 10:00 – 10:45 a.m.; For more information, contact Lori Hubbart at lorih@mcn.org.

4/19 – Sonoma SOD Blitz Training, 3 Concurrent locations to be determined; 10:00 – 10:45 a.m.; For more information, contact Lisa Bell at lkbell@ucanr.edu.

4/26 - Marin, San Rafael SOD Blitz Training; Dominican University of California; Joseph R Fink Science Center, Rm 102; 10:00 – 10:45 a.m. For more information, contact Wolfgang Schweigkofler at wolfgang.schweigkofler@dominican.edu or Kristin Jacob at kristinjakob@att.net.

4/26 - San Mateo, Burlingame Hills SOD Blitz Training; 120 Tiptoe Lane (off Canyon Rd.), Burlingame; 1:00 – 1:45 p.m.; For more information, contact Steve Epstein at steve@burlingamehills.org.

5/3 - Monterey SOD Blitz Training; Garland Ranch Regional Park Museum Visitors Center, Carmel Valley; 10:00 – 10:45 a.m.; For more information, contact Kerri Frangioso at kfrangioso@ucdavis.edu or Brian LeNeve at bjleneve@att.net.

5/10 - Contra Costa SOD Blitz Training; Orinda Public Library; 26 Orinda Way, Orinda; 10:00 – 10:45 a.m.; For more information, contact William Hudson at wllhh@ymail.com.

5/10 – Alameda SOD Blitz Training; UC Berkeley Campus; 159 Mulford Hall, Berkeley; 1:00 -1:45 p.m.; For more information, contact Toni Mohr at toni.mohr@gmail.com.

5/16 - San Luis Obispo SOD Blitz Training; location to be determined; 7:00 – 7:45 p.m.; For more information, contact Lauren Brown at lbrown805@charter.net.

5/17 - San Mateo-Santa Clara, Woodside-Portola Valley/Emerald Hills/San Carlos/Atherton SOD Blitz Training; Woodside Town Hall; 2955 Woodside Road, Woodside; 10:00 – 10:45 a.m.; For more information, contact Debbie Mendelson at sodblitz@gmail.com.

5/18 - Santa Clara SOD Blitz Training; Montalvo-Saratoga-Los Gatos; Montalvo Arts Center; 15400 Montalvo Road, Saratoga; 10:00 – 10:45 a.m.; For more information, contact Kelly Sicat at KSicat@montalvoarts.org or president@cnps-scv.org.

5/22 - San Francisco SOD Blitz Training; Golden Gate Park Presidio and Golden Gate Park Rec. Room; San Francisco County Fair Building; Golden Gate Park near 9th Ave. & Lincoln Way, San Francisco; 10:00 – 10:45 a.m.; For more information, contact Eric Anderson at eric.anderson@sfgov.org.

5/24 - Santa Clara, Los Altos Hills SOD Blitz Training; Los Altos Hills Town Hall; 26379 Fremont Road, Los Altos Hills; 10:00 – 10:45 a.m.; For more information, contact Sue Welch at sodblitz09@earthlink.net.

5/31 – Napa SOD Blitz Training; UCCE Meeting Room; 1710 Soscol Avenue, Napa; 10:00 – 10:45 a.m.; For more information, contact Bill Pramuk at info@billpramuk.com.

11/3 – 11/6 - 7th California Oak Symposium; Visalia Convention Center, Visalia; For more information, go to http://ucanr.edu/sites/oaksymposium/?utm_source=Oak+Symposium+2014+Save+the+Date&utm_campaign=oak+symposium&utm_medium=email.

11/10 – 11/14 - Seventh meeting of the IUFRO Working Party 7.02.09 "*Phytophthora* in Forests and Natural Ecosystems;" Esquel, Argentina. For more information, registration, or abstract submission details, go to http://www.iufrophytophthora2012.org/.

11/12 – 11/13 - 2014 Annual Meeting of the California Forest Pest Council; USDA Forest Service, Wildland Fire Training & Conference Center; 3237 Peacekeeper Way; McClellan; More information will be forthcoming. For more information, contact Katie Palmieri at kpalmieri@berkeley.edu.