



CALIFORNIA OAK MORTALITY TASK FORCE REPORT TO THE BOARD OF FORESTRY JULY 2015

NURSERIES

Trace-forward investigations from a Washington nursery identified eight

Phytophthora ramorum positive plants at a Humboldt County nursery. Due to the poor condition of the plants upon arrival, the receiving nursery kept them isolated. All infested plants were destroyed. A follow-up inspection at the Humboldt County facility was negative for any additional *P. ramorum* findings.

A Critical Control Points (CCP) Assessment of the *P. ramorum*-positive Kitsap

County botanical garden was performed on June 30th. USDA, the Washington State Department of Agriculture, and Washington State University personnel participated in identifying key practices for botanical garden staff to mitigate the inadvertent spread of the pathogen. Worker sanitation, exclusion from positive areas, leaf debris collection for the creation of mulch, and worker training on *Phytophthora* management were topics discussed. Some of the revised practices will be required under the Federal Confirmed Nursery Protocol while others will be covered under a Washington state compliance agreement. After the detection of *P. ramorum* on a *Pieris* plant at the garden in April, the delimitation survey found 10 other plants in the same general area that were *P. ramorum* positive: rhododendron (3), viburnum (3), pieris (1) camellia (1), mahonia (1), and vinca (1). All positive plants and nearby host plants have been destroyed. Soil steaming at selected sites will commence in July. Water samples taken from the stream running through the botanical garden were negative for the pathogen. A perimeter survey of the botanical garden is scheduled for August.

MANAGEMENT

The Los Padres National Forest will be implementing a Sudden Oak Death

mitigation and management plan for three campgrounds on the Monterey Ranger District (Botchers Gap, Nacimiento, and Ponderosa). All dead and hazardous oak and tanoak trees will be removed and chipped. All California bay laurel and live tanoak trees will be removed, and the stumps will be treated with herbicide to prevent resprouting. By removing foliar host trees in the campgrounds, oak trees will be more resilient to Sudden Oak Death, maintaining high quality recreational value. Hazardous fuel reduction will enhance public, community, and firefighter safety. The project's public comment period has closed. The USDA Forest Service is now conducting the National Environmental Policy Act (NEPA) environmental review. Work is planned to begin this fall, with over 200 trees (most less than 2 ½ m tall) slated for removal. In all, 24 acres will be treated. For more information, contact Kerri Frangioso at kfrangioso@ucdavis.edu.

MONITORING

The British Forestry Commission's 2015 Japanese larch *P. ramorum* aerial survey continued in June. In Scotland, suspect trees were identified along the southwest edge of the *P. ramorum* management zone. Within the management zone, spread appeared to be



limited, even in areas that have had high infection levels over the past 2 years. Flights over northeastern England and the east Midlands found few symptoms, all of which were confined to individual trees near previously positive rhododendron and/or larch. A small number of isolated dead larch sites were also observed, although the symptoms were not consistent with *P. ramorum*. Some *P. ramorum* symptoms were observed along England's southern coast, with only two sites of concern identified. Follow-up ground surveys are underway at all locations to confirm the cause of die-off.

Other observations in June included ash crown deterioration and mortality in areas where Chalara infection has been confirmed; dieoff and dieback of sweet chestnut previously confirmed *P. cinnamomi* positive; juniper dieback; and spruce sites with *Dendroctonus micans* (great spruce bark beetle) symptoms.

RESEARCH

Blomquist, C.L.; Yakabe, L.E.; Rooney-Latham, S.; McRoberts, N.; and Thomas, C. 2015. Detection of *Phytophthora ramorum* in Nurseries and Forest Lands in California 2004-2009. <http://dx.doi.org/10.1094/PDIS-12-14-1302-RE>.

Abstract: From December 2004 through May 2009, samples were collected from California nurseries and wild lands to survey for *P. ramorum* and comply with federal regulations of nursery stock. Samples were prescreened by an ELISA that detects *Phytophthora* spp. and tested by culture, *P. ramorum* specific qPCR and nested PCR. Yearly percentages of infected samples ranged from 0.6% to 2.3%. *Camellia* spp., *Rhododendron* spp., *Magnolia* spp., *Pieris* spp., and *Laurus nobilis* tested positive the most frequently in the nurseries and *Lithocarpus densiflorus*, *Umbellularia californica* and *Quercus agrifolia* tested positive most often from wild lands. Of the 118,573 samples isolated onto PARP media, 0.8% was identified as *P. ramorum*. Of 115,056 samples tested by ELISA, 5.9% tested positive for *Phytophthora* spp. Of the 6,520 samples tested by PCR, 12.4% tested positive for *P. ramorum*. The false negative, positive and internal control failure rates of the assays are discussed. After removing the seasonal effect of sampling strategy, isolation of the pathogen into culture was found to be seasonally dependent whereas detectability by PCR and ELISA was not. To our knowledge, this is the first evaluation of a regulatory testing program for a plant disease on this scale using standardized assays.

Kamvar, Z.N.; Larsen, M.M.; Kanaskie, A.M.; Hansen, E.M.; and Grünwald, N.J. 2015. Spatial and Temporal Analysis of Populations of the Sudden Oak Death Pathogen in Oregon Forests. *Phytopathology*. <http://dx.doi.org/10.1094/PHYTO-12-14-0350-FI>.

Abstract: Sudden oak death caused by the oomycete *Phytophthora ramorum* was first discovered in California toward the end of the 20th century and subsequently emerged on tanoak forests in Oregon before its first detection in 2001 by aerial surveys. The Oregon Department of Forestry has since monitored the epidemic and sampled symptomatic tanoak trees from 2001 to the present. Populations sampled over this period were genotyped using microsatellites and studied to infer the population genetic history. To



date, only the NA1 clonal lineage is established in this region, although three lineages exist on the North American west coast. The original introduction into the Joe Hall area eventually spread to several regions: mostly north but also east and southwest. A new introduction into Hunter Creek appears to correspond to a second introduction not clustering with the early introduction. Our data are best explained by both introductions originating from nursery populations in California or Oregon and resulting from two distinct introduction events. Continued vigilance and eradication of nursery populations of *P. ramorum* are important to avoid further emergence and potential introduction of other clonal lineages.

Mulholland, V.; Elliot, M.; and Green, S. 2015. Diagnostics of Tree Diseases Caused by *Phytophthora austrocedri* Species. Plant Pathology: Techniques and Protocols. pages 59-74.

Abstract: We present methods for the detection and quantification of four *Phytophthora* species which are pathogenic on trees; *Phytophthora ramorum*, *Phytophthora kernoviae*, *Phytophthora lateralis*, and *Phytophthora austrocedri*. Nucleic acid extraction methods are presented for phloem tissue from trees, soil, and pure cultures on agar plates. Real-time PCR methods are presented and include primer and probe sets for each species, general advice on real-time PCR setup and data analysis. A method for sequence-based identification, useful for pure cultures, is also included.

Rollins, L.; Elliott, M.; and Chastagner, G. 2015. Applying *Phytophthora ramorum* Inoculum to Hosts: A New Method That Simulates Overhead Irrigation. Plant Management Network. DOI:10.1094/PHP-RS-15-0008.

Abstract: The inoculum threshold for *Phytophthora ramorum* in irrigation water required for infection of plant material was investigated using a novel pressurized device designed to deliver zoospore inoculum in a way that simulated certain aspects of overhead irrigation. The results of the current research may assist nursery managers, property owners, and regulatory agencies in assessing the risk of using *P. ramorum* infested water for irrigation within nurseries and private landscapes.

RELATED RESEARCH

Chandelier, A.; Husson, C.; Druart, P.; and Marçais, B. 2015. Assessment of inoculation methods for screening black alder resistance to *Phytophthora ×alni*. Plant Pathology. DOI: 10.1111/ppa.12418.

Hansen, E.M.; Reeser, P.; Sutton, W.; and Brasier, C.M. 2015. Redesignation of *Phytophthora* taxon Pgchlamydo as *Phytophthora chlamydo* sp. nov. North American Fungi. 1(10): 1-14. ISSN 1937-786X. Available at: <https://www.pnwfungi.org/index.php/pnwfungi/article/view/1414>.



Kamvar, Z.N.; Brooks, J.C.; and Grünwald, N.J. 2015. Novel R Tools for Analysis of Genome-Wide Population Genetic Data with Emphasis on Clonality. *Frontiers in Genetics*. 6(208). DOI: 10.3389/fgene.2015.00208.

Prigigallo, M.I.; Mosca, S.; Cacciola, S.O.; Cooke, D.E.L.; and Schena, L. 2015. Molecular Analysis of *Phytophthora* Diversity in Nursery-Grown Ornamental and Fruit Plants. *Plant Pathology*. DOI: 10.1111/ppa.12362.

Taylor, T. 2015. Phosphotransacetylase and Xylulose 5-Phosphate/Fructose 6-Phosphate Phosphoketolase: Two Eukaryotic Partners of Acetate Kinase. *All Dissertations*. Paper 1523. http://tigerprints.clemson.edu/all_dissertations/1523.

CALENDAR

8/23 – 8/28 - 5th International Workshop on the Genetics of Tree-Parasite

Interactions; Orléans, France; For more information, or to register, go to <https://colloque.inra.fr/tree-parasite-interactions2015>.

9/21 - 9/25 - 63rd Western International Forest Disease Work Conference; Newport,

Oregon; For more information, or to register, go to <http://www.fs.fed.us/foresthealth/technology/wif/>.

10/21 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC

Berkeley Campus; 1:00 – 3:00 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 name and date of the class.

11/4 – 11/5 - 2015 Annual Meeting of the California Forest Pest Council; USDA

Forest Service, Wildland Fire Training & Conference Center, Hamm and Loop rooms; 3237 Peacekeeper Way; McClellan; More information will be forthcoming. For more information, contact Katie Palmieri at kpalmieri@berkeley.edu.