CALIFORNIA OAK MORTALITY TASK FORCE REPORT
MAY 2015

NURSERIES

***Phytophthora ramorum* has been detected in four of the 10 Oregon nursery locations** participating in the Federal *P. ramorum* Certification Program during this year's spring survey. One remaining opt-in nursery will be inspected in May. Infected plants found at the four positive nurseries include *Rhododendron* (9), *Photinia*, *Pieris*, and *Osmanthus*. The USDA Confirmed Nursery Protocol (CNP) has been enacted at all four locations.

Three of the five nurseries that opted out of the Federal Certification Program in 2014 have also been surveyed so far this year. The pathogen was detected in two of the nurseries inspected, with infected *Rhododendron* and potting media found at one facility and infected *Rhododendron* 'Purple Splendor' found at the other. Both positive opt-out nurseries are under the USDA CNP. Test results from the third nursery are pending. The fourth nursery will be inspected in May and the fifth nursery (found positive in 2014**)** has been operating under the USDA CNP since before 1/1/15. Delimitation and destruction activities are ongoing at the fifth nursery.

***Rhododendron* and *Kalmia* samples were collected from two Puget Sound, WA** residential landscapes in April as part of a *P. ramorum* trace-forward investigation from an out-of-state nursery. All samples were negative.

A mature *Pieris* plant at a Kitsap County, WA botanical garden was found *P. ramorum* positive. The sample had been submitted to the Washington State University Plant Clinic in Puyallup. Under the direction of the USDA, regulatory sampling was conducted on the suspect *Pieris* plant, as well as other plants around the botanical garden. Mitigation and management procedures are being identified and put in place to help prevent spread and future introductions of the pathogen into the garden.

California has completed inspecting six of the seven nurseries participating in the Federal *P. ramorum* Certification Program this spring, all sampled nurseries have been negative for the pathogen. The seventh nursery (Sacramento County) will be inspected in May. Forty-seven nurseries in the quarantined counties have also completed their annual inspection. To date, all have been negative for the pathogen. A total of 2,464 plant, water, and soil samples have been analyzed from CA nurseries this spring.

MONITORING

Two Washington waterways in Kitsap and Thurston Counties have been found positive for *P. ramorum* in 2015. Both waterways have been positive in previous years and are downstream from previously positive nurseries. Ten waterways in six counties (Clallam, King, Kitsap, Lewis, Mason, and Thurston) are being monitored this year for the pathogen; no other confirmations have been made.

RESEARCH

Bowcutt, F. 2015. The Tanoak Tree: An Environmental History of a Pacific Coast Hardwood. University of Washington Press. 240 pp.

Summary: Tanoak (*Notholithocarpus densiflorus*) is a resilient and common hardwood tree native to California and southwestern Oregon. People's radically different perceptions of it have ranged from treasured food plant to cash crop to trash tree. Having studied the patterns of tanoak use and abuse for nearly twenty years, botanist Frederica Bowcutt uncovers a complex history of cultural, sociopolitical, and economic factors affecting the tree's fate.

Still valued by indigenous communities for its nutritious acorn nut, the tree has also been a source of raw resources for a variety of industries since white settlement of western North America. Despite ongoing protests, tanoaks are now commonly killed with herbicides in industrial forests in favor of more commercially valuable coast redwood and Douglas-fir. As one nontoxic alternative, many foresters and communities promote locally controlled, third-party certified sustainable hardwood production using tanoak, which doesn't depend on clearcutting and herbicide use.

Today tanoaks are experiencing massive die-offs due to sudden oak death, an introduced disease. Bowcutt examines the complex set of factors that set the stage for the tree's current ecological crisis. The end of the book focuses on hopeful changes including reintroduction of low-intensity burning to reduce conifer competition for tanoaks, emerging disease resistance in some trees, and new partnerships among tanoak defenders, including botanists, foresters, Native Americans, and plant pathologists.

Forrestel, A.B.; Ramage, B.S.; Moody, T.; Moritz, M.A.; and Stephens, S.L. 2015. Disease, Fuels and Potential Fire Behavior: Impacts of Sudden Oak Death in Two Coastal California Forest Types. Forest Ecology and Management. 348: 23–30.

Abstract: In the Douglas-fir (*Pseudotsuga menziesii* Mirb. Franco) and redwood (*Sequoia sempervirens* (D. Don) Endl.) forests of the central California coast, Sudden Oak Death (SOD) has led to landscape-scale mortality of tanoak (*Notholithocarpus densiflorus* (Hook. and Arn.) Manos, Cannon and S.H. Oh). As tanoak mortality progresses, fuel loads and potential fire behavior in these forests are changing. We documented increases in fuel loads over time in long-term monitoring plots in infested forests at Point Reyes National Seashore. Throughout the study, we observed a significant positive relationship between dead tanoak basal area and surface fuels. We used the fire behavior modeling program BehavePlus to compare potential fire behavior between diseased and healthy stands. Model outputs indicated the potential for longer flame lengths, higher rates of spread and more intense surface fire in diseased stands. The potential for increased fire intensity in diseased redwood and Douglas-fir forests may create additional challenges for fire and natural resources managers and may affect the ecology of these forests into the future.

Magarey, R.D.; Borchert, D.M.; Fowler, G.A.; Hong, S.C. 2015. Pest Risk Modelling and Mapping for Invasive Alien Species. The NCSU/APHIS Plant Pest Forecasting System (NAPPFAST). CABI Invasives Series No. 7. pp. 82-96. DOI: 10.1079/9781780643946.0082. Online at http://www.cabi.org/cabebooks/ebook/20153099614.

Abstract: This chapter describes the North-Carolina-State-University/Animal-and-Plant-Health-Inspection-Service Plant Pest Forecasting System (NAPPFAST). NAPPFAST, developed for pest risk modelling and mapping, was formerly used to support pest detection, emergency response and risk analysis for the US Department of Agriculture. NAPPFAST employs an internet-based graphical user interface to link weather databases with interactive biological model templates. The weather databases include historical daily weather databases for North America and the world. The templates include degree-days, generic empirical models, infection periods and the Generic Pest Forecast System (GPFS). The GPFS, currently in development, is a model that uses hourly inputs and includes modules for development rate, hot and cold mortality, population and potential damage. In this chapter, three examples illustrate the capabilities of NAPPFAST: (i) pathway analysis for *Lymantria dispar asiatica* (Asian gypsy moth); (ii) epidemiological modelling for *Phytophthora ramorum* (the cause of sudden oak death and other plant diseases); and (iii) simple population modelling for *Bactrocera dorsalis* (oriental fruit fly). One advanced feature of NAPPFAST is cyber-infrastructure that supports the sharing of products and data between modellers and end users. The infrastructure includes tools for managing user access, uploading and correcting geographic coordinates for pest observations, and an interactive geographic information system environment for viewing input data and model products. NAPPFAST was used by the US Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, although access has been granted to government and university cooperators working on risk analysis of invasive alien species.

Meentemeyer, R.K.; Dorning, M.A.; Vogler, J.B.; Schmidt, D.; and Garbelotto, M. 2015. Citizen Science Helps Predict Risk of Emerging Infectious Disease. Frontiers in Ecology and the Environment. 13: 189–194.

Abstract: Engaging citizen scientists is becoming an increasingly popular technique for collecting large amounts of ecological data while also creating an avenue for outreach and public support for research. Here we describe a unique study, in which citizen scientists played a key role in the spatial prediction of an emerging infectious disease. The yearly citizen-science program called “Sudden Oak Death (SOD) Blitz” engages and educates volunteers in detecting the causal pathogen during peak windows of seasonal disease expression. We used these data – many of which were collected from under-sampled urban ecosystems – to develop predictive maps of disease risk and to inform stakeholders on where they should prioritize management efforts. We found that continuing the SOD Blitz program over 6 consecutive years improved our understanding of disease dynamics and increased the accuracy of our predictive models. We also found that self-identified non-professionals were just as capable of detecting the disease as were

professionals. Our results indicate that using long-term citizen-science data to predict the risk of emerging infectious plant diseases in urban ecosystems holds substantial promise.

Peterson, E.; Hansen, E.; and Kanaskie, A. 2015. Temporal Epidemiology of Sudden Oak Death in Oregon. Phytopathology. Early View. http://dx.doi.org/10.1094/PHYTO-12-14-0348-FI.

Abstract: An effort to eradicate *Phytophthora ramorum*, causal agent of sudden oak death, has been underway since its discovery in Oregon forests. Using an information-theoretical approach we sought to model yearly variation in the size of newly infested areas and dispersal distance. Maximum dispersal distances were best modeled by spring and winter precipitation two years before detection, and infestation size the year prior. Infestation size was best modeled by infestation size and spring precipitation the year prior. In our interpretation, there is a two year delay between the introduction of inoculum and onset of mortality for a majority of sites. The year-long gap in between allows ample time for the production of inoculum contributing to the spread of *P. ramorum*. This is supported by epidemic development following changes in eradication protocols precipitated by an outbreak in 2011, attributable to a 2009 treatment delay and an uncharacteristically wet spring in 2010. Post-eradication, we have observed an increase in the total area of new outbreaks and increased frequency in dispersal distances greater than 4 km. While the eradication program has not eliminated *P. ramorum* from Oregon forests it has likely moderated this epidemic, emphasizing the need for prompt treatment of future invasive forest pathogens.

Tooley, P.W. and Browning, M. 2015. Temperature Effects on the Onset of Sporulation by *Phytophthora ramorum* on *Rhododendron* 'Cunningham's White.' Phytopathology. Early View. DOI: 10.1111/jph.12390.

Abstract: The effect of temperature and moist period on the onset of sporangia production by *Phytophthora ramorum* on *Rhododendron* 'Cunningham's White' was examined with misted detached leaves held in humid chambers. Following wound inoculation with sporangia, leaves were pre-incubated at 20°C for either 24 or 72 h prior to placement at six different temperatures (4, 10, 15, 20, 25 and 30°C). The overall mean moist period required for first occurrence of sporulation over all six temperatures was 3.24 days with the 24-h pre-incubation time, compared with 1.49 days for the 72-h pre-incubation time. Following 24 h pre-incubation at 20°C and at an incubation temperature of 15°C, sporangia were first collected from leaves following a 24 h incubation. At 10 and 20°C, sporangia were first collected after 48 h, whereas at 4, 25 and 30°C, sporangia were first collected after 3 days. Following 72 h pre-incubation at 20°C, sporulation generally occurred within 1 day, even at temperatures such at 4 and 30°C that are suboptimal for sporulation. The highest levels of *P. ramorum* sporulation were observed at 20°C. *P. ramorum* formed sporangia on host tissue under moist conditions within the same time frame reported for *P. phaseoli*, *P. palmivora* and *P. nicotianae*, but substantially more slowly than certain other species such as *P. infestans*. Quantifying moisture and temperature conditions for initiation of sporangia production provides

knowledge which leads to a greater understanding of the epidemic potential of *P. ramorum*.

MANAGEMENT

The 10th Annual North Coast Sudden Oak Death Coordination Meeting in Fortuna was held by UC Cooperative Extension and partners on April 23rd. The day-long meeting, attended by about 65 people, featured updates on the status of *P. ramorum* in Humboldt, Sonoma, and Mendocino Counties and Curry, Co., Oregon. Presentations covered tanoak genetics and resistance research and the challenges and strategies of managing non-native pathogens. To view the presentations, go to http://ucanr.edu/northcoastsod.

REGULATIONS

The USDA Animal and Plant Health Inspection Service (APHIS) issued a Federal Order on 4/3/15, expanding the area federally quarantined for *P. ramorum* in California to include Trinity County. Under the Federal Order, USDA APHIS formally recognizes Trinity County as the 15th California county with *P. ramorum* in wildlands. APHIS is taking this action as a result of the 2/13/14 confirmation of *P. ramorum* on Trinity County tanoaks (*Notholithocarpus densiflorus*). Consequently, effective as of 4/3/15, all interstate movement of *P. ramorum* regulated articles from Trinity County must be done in accordance with any applicable provisions of the Federal Order and the regulations promulgated pursuant to the Plant Protection Act found at 7 CFR 301.92 *et seq*.

RELATED RESEARCH

Qiao, Y.; Shi, J.; Zhai, Y.; Hou, Y.; and Ma, W. 2015. *Phytophthora* Effector Targets a Novel Component of Small RNA Pathway in Plants to Promote Infection. Proceedings of the National Academy of Sciences of the United States of America. DOI: 10.1073/pnas.1421475112.

Reeser, P.W.; Sutton, W.; Hansen, E.; Goheen, E.M.; Fieland, V.; and Grünwald, N.J. 2015. First Report of *Phytophthora occultans* Causing Root and Collar Rot on Ceanothus, Boxwood, Rhododendron, and Other Hosts in Horticultural Nurseries in Oregon, USA. Plant Disease. DOI: http://dx.doi.org/10.1094/PDIS-02-15-0156-PDN.

Rooney-Latham, S.; Blomquist, C.L.; Swiecki, T.; Bernhardt, E.; and Frankel, S.J. 2015. First Detection in the US: New Plant Pathogen, *Phytophthora tentaculata*, in Native Plant Nurseries and Restoration Sites in California. Native Plants Journal 16 (1): 23-27.

Vettraino, A.; Roques, A.; Yart, A.; Fan, J-t.; Sun, J-h.; and Vannini, A. 2015. Sentinel Trees as a Tool to Forecast Invasions of Alien Plant Pathogens. PLoS ONE 10(3): e0120571. DOI: 10.1371/journal.pone.0120571.

Widmer, T.L.; 2015. Differences in Virulence and Sporulation of *Phytophthora* *kernoviae* Isolates Originating from Two Distinct Geographical Regions. Plant Disease. 99(4): 460-466.

CALENDAR

5/8 – North Coast SOD Blitz Training (Fort Bragg); Location to be determined; 6:00 – 7:00 p.m. For more information, contact Nancy Ruth Morin at Nancy.Morin@nau.edu.

5/9 – North Coast SOD Blitz Training (Point Arena); Location to be determined; 10:00 – 11:00 a.m.; For more information, contact Nancy Ruth Morin at Nancy.Morin@nau.edu.

5/15 – San Luis Obispo SOD Blitz Training; San Luis Obispo UC Cooperative Extension classroom; 2156 Sierra Way, San Luis Obispo; 6:00 – 7:00 p.m.; For more information, contact Lauren Brown at lbrown805@charter.net.

5/16 – Woodside, **Portola Valley, Atherton, Emerald Hills, and Belmont SOD Blitz** Training; Woodside Town Hall; 2955 Woodside Rd.; Woodside; 10:00 – 11:00 a.m.; For more information, contact Debbie Mendelson at naturemend@sbcglobal.net.

5/23 – Carmel Valley SOD Blitz Training; Carmel Valley Garland Ranch Regional Park Museum Hall; 700 West Carmel Valley Road, Carmel; 10:00 – 11:00 a.m.; For more information, contact Kerri Frangioso at kfrangioso@ucdavis.edu.

5/30 – Marin SOD Blitz Training; Dominican University of California; Joseph R Fink Science Center, Rm 103, San Rafael; 10:00 – 11:00 a.m.; For more information, contact Wolfgang Schweigkofler at wolfgang.schweigkofler@dominican.edu.

5/30 – Sonoma SOD Blitz Training; 10:00 – 11:00 a.m.; 3 locations from which to choose:
Graton Community Club, Main & N. Edison, (8996 Graton Rd.) Graton
Spring Lake Park, Environmental Discovery Center, 393 Violetti Road, Santa Rosa
Cloverdale Historical Society, 215 North Cloverdale Blvd., Cloverdale
For more information on a Sonoma SOD Blitz training, contact Lisa Bell at lkbell@ucanr.edu.

6/6 – Tribal SOD Blitz; 11:00 a.m. – 3:00 p.m.; Kashia Band of Pomo Indians; Stewarts Point Rancheria - Community Center; 31455 Skaggs Springs Road; Stewarts Point; For more information, or to register, contact Nina Hapner at nina@stewartspoint.org.

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.