needles, crown dieback, and tree mortality. There are no rhododendrons near the infected larch. *Vaccinium* plants were found near the outbreak, but they were symptom free. DNA analysis is underway to identify the pathogen mating type and lineage present at the site. Previously *P. ramorum* had only been detected in understory vegetation in the natural environment, primarily on rhododendron in Brittany, Normandy, and Pays de la Loire.

Nine eastern states are participating in the 2017 National *P. ramorum* Early Detection Survey of Forests (AL, FL, GA, MS, NC, PA, SC, TN, and TX). Of the 373 samples collected this spring, 161 have been analyzed. To date, two samples from one NC stream (first detection in 2010) have been *P. ramorum* positive. The positive stream is associated with a previously positive nursery.

A quarterly *P. ramorum* survey of the Washington Kitsap County Botanical Garden (first found positive in 2015) was conducted in April. The 274 samples collected were from previously positive areas of the garden as well as a buffer area of the adjacent woodland. All samples were negative for the pathogen.

SODMAP 2017 Call for Submissions – Laboratory-validated California SOD survey results from 2016 and 2017 are now being accepted for inclusion in the 2017 SODMAP update (www.sodmap.org). Positive and negative plant, soil, and water findings will be accepted. SODMAP is the most complete distribution map for *P. ramorum*/SOD on the West Coast. It is the database accessed by the SODMAP mobile app (www.sodmapmobile.org; available free for iPhone and Android), which allows users to identify known infected trees in the field and to calculate risk for oak infection at a given time and location. For questions regarding SODMAP or the submission process, contact Doug Schmidt at dschmidt@berkeley.edu.

REGULATIONS

The California Department of Food and Agriculture (CDFA) is in the process of completing new pest risk assessments on pests and pathogens reported in California for the purpose of updating pest ratings. Currently, the genus *Phytophthora* is under review. With increased focus on potential risks presented by Phytophthoras, new information has resulted in rating changes previously assigned to some *Phytophthora* species. New ratings are posted on the CDFA website at http://blogs.cdfa.ca.gov/Section3162/?p=1969. *P. cambivora* is currently under review and open for public comment at http://blogs.cdfa.ca.gov/Section3162/?p=3779 until August 13th.

RESEARCH

Chen, G.; He, Y.; De Santis, A.; Li, G.; Cobb, R.; and Meentemeyer, R.K. 2017. Assessing the Impact of Emerging Forest Disease on Wildfire Using Landsat and KOMPSAT-2 Data. Remote Sensing of Environment. 195: 218-229.

Abstract: Environmental disturbance regimes are more frequently being altered by historically novel events and disturbance interactions, which may trigger reorganizations of new ecosystem states and processes. Here we examine synergies between emerging forest disease and wildfire to determine whether disease outbreak changes environmental drivers of burn severity using sudden oak death and the basin complex fire in California as a case study of novel disturbance

interaction. We mapped the spatial distribution of sudden oak death tree mortality using a new object-based filter with 1.0 m resolution KOMPSAT-2 images. We integrated these data with a physical simulation model of burn severity informed by post-fire Landsat data. Model performance varied across stages of disease establishment (early, middle and late) with stronger relationships occurring during later stages of disease progression. Multiscale statistical analysis of environmental drivers of burn severity in diseased compared to healthy forests showed that sudden oak death tree mortality altered relationships between burn severity and the biophysical environment. Specifically, compared to the healthy forests, those affected by disease exhibited higher landscape heterogeneity at smaller spatial scales (e.g., 25 and 50 m), which has been associated with decreased burn severity in the literature. Our results showed the opposite pattern. That is, a disease-affected landscape comprising less connected patches and higher patch shape complexity was more likely to experience greater burn severity. This suggests that disease-caused increases in surface fuels may have reduced the landscape's resistance to fire and in turn increased burn severity in forest patches neighboring disease-impacted forests.

Garbelotto, M.; Schmidt, D.; Swain, S.; Hayden, K.; and Lione, G. 2017. The Ecology of Infection between a Transmissive and a Dead-End Host Provides Clues for the Treatment of a Plant Disease. Ecosphere. 8(5).

Abstract: In plant pathosystems in which some hosts are transmissive and some are dead-ends, infection is mediated by multiple factors including the susceptibility of both hosts, the sporulation potential of transmissive hosts, the mobility of infectious propagules, the presence of environmental factors conducive to infection, and the variability in distribution of both host types. The factors above were studied for the California forest disease sudden oak death caused by the pathogen *Phytophthora ramorum*. This pathogen is exotic to California, and while it sporulates at significant levels on the leaves of California bay laurels, four susceptible oak species appear to be non-infectious dead-end hosts. Here, we report, for the first time, on inoculum levels necessary to successfully infect adult oaks and on the distribution of such inoculum levels through time and space thanks to a seven-year-long monitoring effort across a network of 128 monitoring points. Through a series of geostatistical and statistical analyses, we show that the presence of high inoculum loads is positively correlated with close proximity to bay laurels, with high rainfall levels, and with warmer temperatures. Data are consistent with splash dispersal of the pathogen and show that increased presence of tanoak corresponds to a reduced presence of bay laurels and to a lower frequency of high inoculum events. Removal of bay laurels resulted in a substantial decrease of number of events in which spore loads were high enough to infect oaks. This effect was significant when bays were removed 10 m around sampling points, thus indicating that removal of bays 10 m around oaks is a valid approach to reduce infections of oaks.

Miles, T.D.; Martin, F.N.; Robideau, G.P.; Bilodeau, G.J.; and Coffey, M.D. 2017. Systematic Development of *Phytophthora* Species-Specific Mitochondrial Diagnostic Markers for Economically Important Members of the Genus. Plant Disease. 101(7): 1162-1170.

Abstract: The genus *Phytophthora* contains many invasive species to the U.S.A. that have the potential to cause significant damage to agriculture and native ecosystems. A genus and species-specific diagnostic assay was previously reported based on mitochondrial gene order differences

that allowed for the systematic development of 14 species-specific TaqMan probes for pathogen detection (†). In this study, an additional 32 species-specific TaqMan probes for detection of primarily invasive species have been validated against 145 *Phytophthora* taxa as well as a range of *Pythium* and plant DNA samples. All validated probes were found to be species-specific and could be multiplexed with a genus-specific probe. The lower limit of linear detection using purified genomic DNA ranged from 1 to 100 fg in all assays. In addition, 124 unique TaqMan probes for *Phytophthora* spp. developed in silico are presented, which, if testing confirms they are species-specific, will provide diagnostic capabilities for approximately 89% of the genus. To enhance sensitivity of detection for several species that contained a single nucleotide polymorphism (SNP) in the reverse primer, a second primer was developed that is added in a small amount to the master mix. Furthermore, a PCR-RFLP system was developed that could be used to identify individual species when multiple species are present in a sample, without requiring cloning or sequencing. Several experiments were also conducted to compare various qPCR thermal cyclers and independent validation experiments with another research laboratory to identify possible limitations when the assays are used on a range of equipment in different labs. This system represents a comprehensive, hierarchal approach to increase the detection capability and provide tools to help prevent the introduction of invasive *Phytophthora* species.

Sakoda, T.; Goto, H.; Kanno, T.; Hiyama, T.; Hirakawa, T.; Nakanishi, Y.; and Hirata, T. 2017. Ramorum Blight of *Rhododendron* sp. Caused by *Phytophthora ramorum* Intercepted in Plant Quarantine Inspection in Japan. Research Bulletin of the Plant Protection Service Japan. 53: 75-81.

Abstract: A new disease of *Rhododendron* sp. (cv. Loch Lomond) causing leaf blight was intercepted in a plant quarantine inspection at Tokyo International Post Office in Japan. The isolated fungus was pathogenic to the original host, and identified as *Phytophthora ramorum* Werres De Cock & Man in't Veld, based on the morphology and the phylogenetic analysis of the rDNA-ITS region.

Widmer, T.L.; Tooley, P.W.; and Camp, M.J. 2017. Recovery of *Phytophthora ramorum* in Plant Tissue with Mixed Infections. European Journal of Plant Pathology. DOI: 10.1007/s10658-017-1260-3.

Abstract: This study was performed to investigate the frequency with which *P. ramorum* would be isolated from host tissue co-infected with *P. ramorum* as well as an indigenous *Phytophthora* species or *P. kernoviae*. Three separate experiments were tested in a similar manner using different combinations of pathogens and hosts. Overall for any of the individual experiments, very few segments did not have any growth of *Phytophthora* spp. For mixed infections of *P. ramorum* and *P. kernoviae*, a difference was observed between isolating both of the species and *P. ramorum* only on rhododendron. The data showed that *P. ramorum* or *P. kernoviae* will not be detected 29 or 12% of the time, respectively, in infected *Rhododendron* sp. *Phytophthora kernoviae* was not detected alone in mixed infections with *P. ramorum* on *Pieris japonica*. When two different *P. ramorum* isolates were co-inoculated individually with one *P. citricola* isolate, there was a significant difference between isolating *P. ramorum* and isolating both species. These results confirm that choice of host species used for baiting can strongly influence detection results. For example, if *P. japonica* were used for baiting in mixed infections, there is a 55%

chance that *P. kernoviae* would not be detected. This study highlights the difficulty in being confident in isolating and identifying an individual *Phytophthora* sp. from host material when mixed infections are present, and emphasizes the importance of a large sample size in order to increase the chances to recover all possible different species in a mixed infection.

RELATED RESEARCH

Grünwald, N.J.; Everhart, S.; Knaus, B.J.; and Zhian N. Kamvar, Z.N. *In press*. Best Practices for Population Genetic Analyses. Phytopathology. https://doi.org/10.1094/PHYTO-12-16-0425-RVW.

Paap, T.; Croeser, L.; White, D.; Aghighi, S.; Barber, P.; Hardy, G.E.S.J.; Burgess, T.I. 2017. *Phytophthora versiformis* sp. nov., a New Species from Australia Related to *P. quercina*. Australasian Plant Pathology. 46(4): 369–378.

Sharpe, S.R. 2017. *Phytophthora* Species Associated with American, Chinese, and Backcross Hybrid Chestnut Seedlings in Field Sites in the Southeastern United States. All Theses. 2672. http://tigerprints.clemson.edu/all_theses/2672.

Steinrucken, T.V.; Aghighi, S.; Hardy, G.E.S.J.; Bissett, A.; Powell, J.R.; and van Klinken, R.D. 2017. First Report of Oomycetes Associated with the Invasive Tree *Parkinsonia aculeata* (Family: Fabaceae). Australasian Plant Pathology. 46(4): 313–321.

JOB OPPORTUNITY

A UC Cooperative Extension County Director for Mendocino and Lake Counties/ Cooperative Extension Forestry Advisor for Mendocino, Lake, and Sonoma Counties is now available. Applications are due by August 14, 2017. For more information, go to http://ucanr.edu/Jobs/Jobs_990/?jobnum=1221 or contact Kim Ingram at (530) 750-1282.

CALENDAR

2/1 – 2/3/18 – 2018 California Native Plant Society Conservation Conference; Los Angeles Airport Marriott; 5855 West Century Boulevard, Los Angeles; For more information, go to https://conference.cnps.org/.