



CALIFORNIA OAK MORTALITY TASK FORCE REPORT DECEMBER 2019

NURSERIES

NA2 *Phytophthora ramorum* clonal lineage inadvertently shipped to numerous states. In July 2019, USDA-APHIS reported shipments of potentially *P. ramorum* infected plants, originating from nurseries in Washington State and Canada, were delivered to several Eastern and Midwestern states. Lab analyses indicate that many of the shipped plants were infected with the NA2 *P. ramorum* lineage. This is the first report of the NA2 clonal lineage outside of British Columbia, Washington, and California. Niklaus Grünwald's laboratory, USDA-Agricultural Research Service, Corvallis, OR determined that all 26 of the isolates that they analyzed, from positive rhododendrons intercepted in several Indiana counties, were classified as belonging to the NA2 clonal lineage.

Additionally, in collaboration with USDA APHIS and Washington State Department of Agriculture, Gary Chastagner's laboratory at Washington State University, Puyallup has been analyzing isolates from plants at the source Washington nursery. To date, only the *P. ramorum*, NA2 lineage has been detected at that nursery. The researchers are also conducting steam mitigation treatments in contaminated areas of the nursery.

P. ramorum has four known clonal lineages: NA1, NA2, EU1 and EU2. In California, forest vegetation infestations are only known to be the NA1 clonal lineage, whereas in U.S. nurseries, the EU1, NA1, and NA2 clonal lineages have all been detected. Oregon's wildland vegetation infestations are also predominately the NA1 clonal lineage but the EU1 lineage was first identified there in 2015 killing tanoak (*Notholithocarpus densiflorus*), likely associated with a nearby nursery that contained NA1 and EU1 infected plants. The threat these shipments with the NA2 lineage pose to Midwestern and Eastern oaks is not fully understood. The incident, called "*P. ramorum* in Commerce", is still being investigated with trace-backs and trace-forwards being conducted by APHIS in cooperation with state agriculture departments.

MONITORING

The 2019 SOD Blitz survey reports an increase in *P. ramorum* infection rate in coastal California. Driven by warm, abundant rains in 2016-2017, the current *P. ramorum* infection rate, at 5.9%, has almost doubled as compared to 3.5% in 2018. The estimate reflects higher rates of infection on susceptible tree hosts, mostly California bay laurel (*Umbellularia californica*) and tanoak in the 15 known infested California counties. Based on a citizen scientist survey, the 2019 SOD Blitz was led by Matteo Garbelotto, UC Berkeley, Forest Pathology and Mycology Laboratory and conducted by a network of collaborators and volunteers. All isolates of the pathogen belong to the NA1 lineage, similar to all other analyzed *P. ramorum* wildland vegetation samples in California.

Key findings from the survey include the first detection of *P. ramorum* in Del Norte County (see COMTF news October issue) where two tanoaks tested positive in a state park east of Crescent City. Del Norte County is the only gap between the vast California *P. ramorum* infestation and the Southern Oregon outbreak. The find remains "unofficial" since it was not sampled and analyzed by regulatory personnel under the direction of the CA Department of Food and



Agriculture (CDFA). The tanoaks and surroundings are being resampled but fall is typically a difficult time of year to recover the pathogen; repeat collections have not yielded the pathogen.

For the 2019 SOD Blitz, UC Berkeley worked with over 30 local organizers to assemble 25 surveys conducted by trained volunteers. More than 400 people surveyed 16,227 trees across 16 California counties, collecting approximately 9,000 leaves from 1,732 symptomatic trees. Samples were sent to the Garbelotto laboratory for processing and analysis. More results are posted at https://nature.berkeley.edu/matteolab/?page_id=4956.

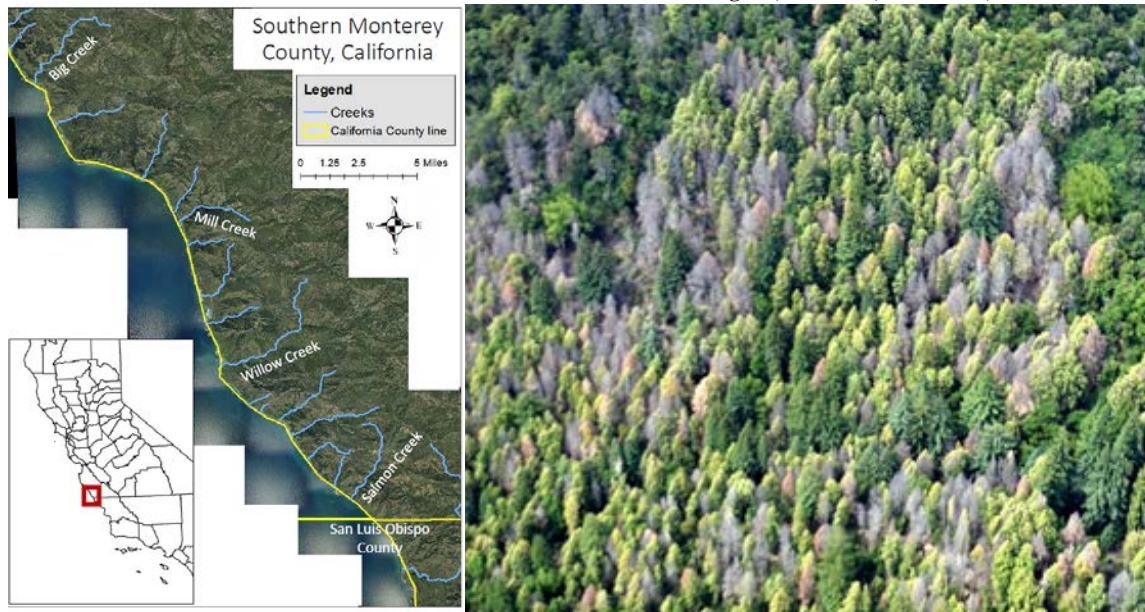
Wave of sudden oak death mortality hits Big Sur region (Monterey County). *Phytophthora ramorum* has been present in Big Sur for over two decades, but there is new expansion of tanoak mortality in Big Creek, Mill Creek, Plaskett Creek, and Willow Creek. Researcher Kerri Frangioso, UC-Davis and Big Sur resident, reports that these watersheds look similar to how the Big Sur valley looked during the early 2000s, with numerous standing dead tanoaks. Additionally, in 2018, UC-Davis detected the pathogen in the Salmon Creek watershed for the first time, which moved the boundary for the known *P. ramorum* infestation southward towards the border with San Luis Obispo County.

The wave of mortality is associated with warm rains during the very wet winter of 2016/17, since it takes a few years following infection for tanoak mortality to occur. Coast live oak (*Quercus agrifolia*) die more slowly than tanoak, so mortality is just starting to appear on oaks, especially those in close proximity to California bay laurel (*Umbellularia californica*). For more information, contact Kerri Frangioso, kfrangioso@ucdavis.edu.

Figure 1. Map of southern Monterey County showing watershed locations.

Figure 2. Sudden oak death mortality in Big Sur as observed in the US Forest Service 2019 Aerial Survey.

Credits: K. Frangioso, UC Davis; Jeff Moore, USFS PSW FHP.





NURSERIES

Oregon Department of Agriculture *P. ramorum* program update. During the “*P. ramorum* in Commerce” trace investigations that were conducted over the summer, one nursery in Multnomah County was confirmed positive with a single *Rhododendron* ‘Holden’ plant. The ODA has since monitored this property, finding no additional suspect plant material. However, this nursery has a sister location in the same county and at this second location, another *Rhododendron* ‘Holden’ plant was confirmed positive for *P. ramorum*. The retail USDA Confirmed Nursery Protocol is underway (See figure 1).



Figure 1. Delimitation of retail nursery: The nursery has been compliant with requirements, fully marking off area and posting clearly to customers that the plants are not for sale. Affected beds are separated from the gravel sale floor with 2-inch wooden trim. Credit: Colin Park, USDA APHIS PPQ.

All plants within the quarantine area have been destroyed and additional plants were sampled with results pending. ODA staff returned to sample soil and continue the delimitation process in late November. Previously, it was verified that material is not moving between these two locations. The Multnomah County nursery purchased the plants from a local nursery in Marion County. The trace-back investigation is in progress.

The Oregon Department of Agriculture (ODA) commenced compliance surveys for the fall 2019 season on October 7th. To date, six of seven interstate shippers have been surveyed. Three had negative results for *P. ramorum* and three are pending results. As to the five intrastate shippers under compliance agreements, two have been surveyed and tested negative for *P. ramorum*. The remaining three nurseries are scheduled to be surveyed by early December.

After nine years, one nursery in Marion County was released from the program in November upon successfully fulfilling the program requirements. This is the third nursery in Oregon to have completed the program. For more information, contact Chris Benemann, sbenemann@oda.state.or.us.

Washington State Department of Agriculture *P. ramorum* program update. In October, a Critical Control Points assessment was conducted and a Federal compliance agreement signed at a wholesale shipping nursery found positive in May. Under the new compliance agreement, a certification survey was also conducted in October with 1,240 samples collected over four days.



A single *P. ramorum* positive sample was detected on a *Kalmia latifolia* ‘Firecracker’. The delimitation survey was negative. In addition to the required destruction of the positive *Kalmia*, the nursery voluntarily destroyed many nearby host plants. Trace-forward information will be given to the USDA.

A retail nursery found positive for *P. ramorum* during a trace-forward investigation in June was released from the Confirmed Nursery Protocol. Samples collected at the 45- and 90-day marks were negative for *P. ramorum*. The nursery underwent soil steaming in areas with positive soil samples. Post-treatment soil samples were negative for *P. ramorum*. The nursery will be monitored and inspected for the next two years.

In October, a two-day survey was conducted at the botanical garden in Kitsap County, first found positive in 2015. A total of 325 samples were collected near previously positive sites and in a large buffer area around the garden. Results are still pending. For more information, contact Scott Brooks, SBrooks@agr.wa.gov.

California Department of Agriculture (CDFA) *P. ramorum* program update. Ten previously positive nurseries that ship regulated nursery stock out of the quarantined areas in California are currently undergoing bi-annual compliance surveys. Two of the ten nurseries are in non-quarantined counties. Sampling at these ten nurseries, also known as regulated establishments after the May 2019 update to the federal domestic quarantine for *Phytophthora ramorum*, is occurring throughout November into December. Eight of the ten nurseries to be surveyed are large production and wholesale nurseries where between 200-400 foliar samples will be collected. The bi-annual compliance survey at regulated establishments also requires samples be taken from puddles, potting media, cull piles and other symptomatic foliar tissue. For more information contact Carolyn Lambert, Carolyn.Lambert@cdfa.ca.gov.

REGULATIONS

The California Department of Food and Agriculture is proposing to change the California Pest Rating Proposal for *P. ramorum* from its current “Q” pest rating to a proposed “A” pest rating. A “Q” rating is a temporary designation, whereas an “A” rating is used for an “Organism of known economic importance subject to state (or ag commissioner) enforced action such as: Quarantine Regulation & Exclusion...” or other required actions. Comments on CDFA’s proposed change may be submitted through December 30, 2019. For more details or to comment see <https://blogs.cdfa.ca.gov/Section3162/?p=6608>. Definitions of CDFA’s pest ratings are posted at https://www.co.shasta.ca.us/index/ag_index/ag_programs/ag_prog_ratings.aspx. For more information, contact Heather Scheck, plant.health@cdfa.ca.gov.

RESEARCH

Rani, A.; Donovan, N.; Mantri, N. 2019. The future of plant pathogen diagnostics in a nursery production system. *Biosensors and Bioelectronics*. Volume 145: <https://doi.org/10.1016/j.bios.2019.111631>.

Plant diseases have a global economic impact through the loss of productivity and trade restrictions. Production of disease-free plants in nurseries is crucial for plant survival and productivity in the field environment. Accurate diagnosis of plant pathogens helps to identify appropriate management practices to reduce production losses. Current diagnostic methods for



plant pathogens include evaluation of disease symptoms, identification of culturable organisms or direct analysis of infected tissue by serological and molecular methods. Laboratory methods can be laborious, expensive and require specific technical expertise. There is a strong demand for the development of rapid, specific, sensitive and cost-effective tests that can be used at the point-of-care in nurseries. This review summarizes disease diagnostic methods that have been successfully applied in other fields and have the potential to transform production in the nursery industry. Emerging technologies include isothermal amplification, nanomaterial-based detection, biosensors, robotics, lab-on-chip, and paper-based analytical devices.

RELATED RESEARCH

Bradshaw, R.E.; Bellgard, S.E.; Black, A.; Burns, B.R.; Gerth, M.L. and others. *In press.* *Phytophthora agathidicida*: research progress, cultural perspectives and knowledge gaps in the control and management of kauri dieback in New Zealand. Plant Pathology. <https://doi.org/10.1111/ppa.13104>.

Li, D.W.; Schultes, N.; LaMondia, J. and Cowles, R.S. 2019. *Phytophthora abietivora*, a new species isolated from diseased Christmas trees in Connecticut, USA. *Plant Disease*. 103: 3057-3064.

FUNDING

A Request for Pre-Proposals for Sudden Oak Death/*Phytophthora ramorum* focused monitoring, extension, management and mitigation activities has been issued by the USDA Forest Service, Pacific Southwest Region, State and Private Forestry, Forest Health Protection. Funds are available for 2020-2021 and the proposal submission deadline is January 17, 2020. For more information, contact Phil Cannon, phil.cannon@usda.gov.

PERSONNEL

Congratulations and best wishes to Paul Tooley, upon his retirement from the USDA Agricultural Research Service, Foreign Disease-Weed Science Research, Fort Detrick, Maryland. Dr. Tooley worked for 34 years on the biology, epidemiology, and detection of emerging plant pathogenic oomycetes and contributed to over two dozen papers on *P. ramorum*.