



CALIFORNIA OAK MORTALITY TASK FORCE REPORT MAY 2018

RESEARCH

Origin of *Phytophthora ramorum* may be East Asia – Detection in a Vietnam forest.

UK Forest Research reported that a survey in the Fansipan/Sapa area (Lào Cai Province) in Northwest Vietnam in March 2017 found samples that contained *P. ramorum* from natural vegetation and that the *P. ramorum* found in the area is not likely to be from a currently known lineage. The surveys led by Thomas Jung (*Phytophthora* Research Centre, Czech Republic) and Joan Webber and Clive Brasier (UK Forest Research) were conducted in collaboration with the Vietnamese Academy of Forest Sciences, Hanoi. The expedition focused on an ecologically diverse region of Vietnam with over 1,600 plant species, including many in the Ericaceae, Fagaceae, Magnoliaceae and Lauraceae, all known to contain species susceptible to *P. ramorum* infection. Isolations of the pathogen were made from plant material, and based on morphology, some cultures appear likely to be *P. ramorum*. Further analysis is needed to determine if they are genetically identical to the known clonal lineages of *P. ramorum* detected in Europe and North America. The finding of *P. ramorum* in northwest Vietnam has confirmed speculation that the pathogen might originate from East Asia, but the pathways which may have allowed the pathogen to move out of this geographical area and be transported to America and Europe remain unknown.

MONITORING

New waves of *P. ramorum*-caused mortality are being reported in near-coastal locations from Big Sur to northern Sonoma Co. Intensified mortality, with a 1-3 year lag time, was anticipated after extended and wet winters in 2015-2016 and 2016-2017. In Monterey Co. (Big Sur), the Vaciente Creek watershed in UC's Big Creek Preserve is currently displaying high tanoak mortality levels reminiscent of levels seen in Big Sur Valley in 2002. In Marin Co., heightened tanoak and manzanita mortality have been reported from parts of Mt Tamalpais; notable here is the absence of bay laurel from many of the mortality patches, indicating that tanoak (and perhaps manzanita) is primarily responsible for disease spread. In coastal Sonoma Co., mortality began even earlier: twig and branch dieback symptoms that yielded *P. ramorum* were collected on California black oak, madrone, and Douglas-fir (probably indicative of high inoculum) in 2016 from Ft Ross Road just above Ft Ross State Park, and extensive mortality is visible from Salt Point State Park south to Cazadero and inland along the Russian River to Guerneville and Occidental. Mortality is expected to intensify over the next few years in many infested locations.



P. ramorum-caused tanoak mortality in UC Big creek preserve, Monterey County.

Photo: Kerri Frangioso, UC Davis.



Sudden oak death mortality at Ft Ross, Sonoma Co. Photo: Chris Lee, Cal Fire.

NURSERIES

A Sacramento County nursery undergoing the Confirmed Nursery Protocol (since May 10, 2017) continues to have foliar and soil samples test positive for *P. ramorum*. Twenty-one soil samples tested positive for *P. ramorum* at the nursery in April. The nursery began destroying entire blocks of *Camellia* plants in beds where soil samples were determined positive along with *P. ramorum* host landscaping plants near the affected beds. Trace-forward inspections from this nursery are underway in 40 counties and 3 states, with 7 retail nurseries confirmed positive as a result of these inspections.

FUNDING

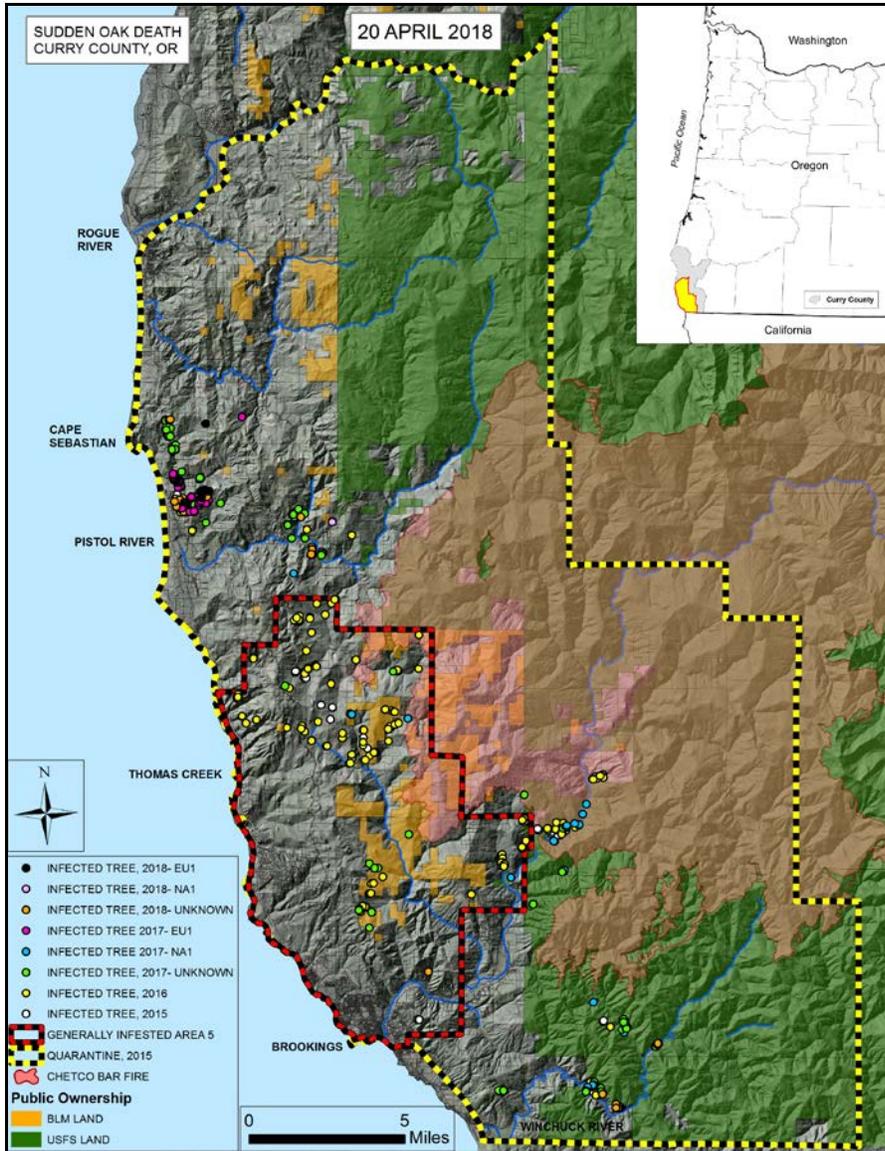
Under the USDA Farm Bill, Section 10007, \$1,772,429 is being awarded in 2018 for *P. ramorum* and related species projects in 16 states. This section of the Farm Bill focuses on preventing the introduction or spread of plant pests and diseases that threaten U.S. agriculture and the environment. Funds support survey, diagnostics, mitigation, probability modeling, genetic analysis, and outreach. In California, \$740,000 will be provided to develop best management practices for pest and disease mitigation at ornamental nurseries. A complete list of 2018 Section 10007 Farm Bill awards is available at www.aphis.usda.gov/farmbill.

OREGON

Update on Oregon's *P. ramorum* Program- To date in 2018, 6 new infestations have been detected at or beyond the Generally Infested Area (GIA), including one new EU1 infestation; all are well within the quarantine boundary (see map). Using a 300 ft treatment buffer, 2018 treatment areas to date total approximately 229 acres of private land and 10 USFS acres. The Oregon Department of Forestry has prioritized all EU1 infestations within the SOD quarantine



for treatment this year. NA1 sites from 2017 may not receive eradication treatments in 2018. Since the last update, the Oregon State Legislature established a reservation within the state Emergency Fund of \$1 million for ODF’s EU1 eradication efforts. This brings Oregon’s total eradication treatment funding to \$2.3 million in FY 2017-2019.



Phytophthora ramorum detections in Oregon as of April 20, 2018. Map courtesy of Oregon Department of Forestry.

RESEARCH

Bily, D.S.; Diehl, S.V.; Cook, M.; Wallace, L.E.; Sims, L.L.; Watson, C.; Baird, R. E. 2018. Temporal and locational variations of a *Phytophthora* spp. community in an urban forested water drainage and stream-runoff system. *Southeastern Naturalist*. 17(1): 176-201.

Species richness and diversity of *Phytophthora* spp. (water molds) in urban riparian-forest ecosystems, which serve as primary drainage passageways for surface-water runoff, may be



attributed to surrounding landscape management, associated vegetation, and environmental conditions. These riparian areas, although generally small, are always flooded during wet seasons and almost completely dry during the hottest parts of each year when there is limited precipitation. Little is known about *Phytophthora* spp. diversity within these heavily impacted sites. We sampled water, soil, and vegetation (phenology dependent) across 14 dates, over ~2 y at a site containing a drainage ditch that enters Hog Creek, in Rankin County, MS. We cultured all *Phytophthora* spp. using 4 published protocols to ensure maximum isolation potential. Across all sampling dates, 65 isolations were positive for *Phytophthora* spp., 12 of which were recovered from vegetation. We employed morphological and internal transcribed sequence (ITS) data to confirm taxa. We determined a total of 11 taxa on the basis of their phylogenetic clustering with known species of *Phytophthora* in a Bayesian analysis. The most common taxa were *P. chlamydospora*, *P. mississippiiae*, and *P. cinnamomi* at frequencies of 12.5%, 11.0%, and 10%, respectively. We verified morphologically and by sequence similarity an undescribed species, *Phytophthora* oaksoil taxon, which has been reported previously in the Western US, as well as other countries, such as Australia. Overall, the bottle-of-bait (BOB) intact-leaf and water-filtration methods had numerically greater frequencies ($P \leq 0.05$) than BOB leaf disks, soil-baiting leaf disks, or vegetation sampling protocols. Overall frequency (14%) of *Phytophthora* spp. was significantly greater ($P \leq 0.05$) for the 17 December 2014 sampling date. Even though several taxa identified in this study are reported to be pathogenic to riparian forest trees and vegetation at the Hog Creek site, symptoms on surrounding trees and vegetation was generally limited to foliar lesions, and we observed no visible damage or decline during the study period. It would be judicious to visit different, similar urban habitats to determine if common *Phytophthora* in this study are present in other central and southern Mississippi riparian habitats. [Note: *P. ramorum* was detected in this survey.]

Widmer, T.L.; Tooley, P.W.; Camp, M.J. 2018. Recovery of *Phytophthora ramorum* in plant tissue with mixed infections. European Journal of Plant Pathology, 150(1): 253-258.

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**

Bourret, T.B.; Choudhury, R.A.; Mehl, H.K.; Blomquist, C.L.; McRoberts, N.; and Rizzo, D.M. 2018. Multiple origins of downy mildews and mito-nuclear discordance within the genus *Phytophthora*. PLOS One. 13(3): e0192502. <https://doi.org/10.1371/journal.pone.0192502>.

Panda, A.; Sen, D.; Ghosh, A.; Gupta, A.; Prakash Mishra, G.; Singh, D.; ... and Tripathy, S. 2018. EuMicrobedbLite: A lightweight genomic resource and analytic platform for draft oomycete genomes. Molecular Plant Pathology. 19(1): 227-237.

Sandino, J.; Pegg, G.; Gonzalez, F.; Smith, G. 2018. Aerial mapping of forests affected by pathogens using UAVs, hyperspectral sensors, and artificial intelligence. Sensors. 18(4): 944. doi:[10.3390/s18040944](https://doi.org/10.3390/s18040944).

EDUCATION AND OUTREACH

Spring 2018 SOD Blitzes. Community members living near areas known to be impacted by SOD are encouraged to attend a Blitz and learn how to look for the disease so that they can monitor for it in their community, facilitating early detection of new outbreaks. Participants will be trained to identify and collect symptomatic bay and tanoak samples as well as how to record sample locations. Those who have attended a training before should still attend this year to receive necessary supplies. Blitz participants are encouraged to bring their smartphones to the training so they can learn how to use their mobile devices as GPS units to mark sample locations using the free SODMAP app. Samples will be analyzed at the Garbelotto lab at UC Berkeley to determine pathogen presence or absence. Results will be published in the fall at www.sodblitz.org. For more details on Blitz dates and locations, see the “Calendar of Events” below.

CALENDAR OF EVENTS

5/1 – Free Arborist, Tree Care Specialist, and Urban Forester Spring Sudden Oak Death Training Session; UC Santa Cruz Arboretum; 1156 High St, Large Conference Room, Santa Cruz; 9:00 am – 1:00 pm; To register, or for more information, contact Brett Hall at brett@ucsc.edu.

5/3 – Petaluma, Sonoma County SOD Blitz. Petaluma Community Center, 320 N McDowell Blvd, Petaluma; 5:30 PM. Registration required; For more information, contact Kerry Wininger at kwininger@ucanr.edu. Or see <http://cesonoma.ucanr.edu/SuddenOakDeath/>

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

5/5 – Sonoma County SOD Blitzes (four events); Registration required; For more information contact Kerry Wininger at kwininger@ucanr.edu, or see <http://cesonoma.ucanr.edu/SuddenOakDeath/>,
- Graton Community Club; 8996 Graton Rd, Graton; 9:30 - 11:00 am
- Spring Lake Park Environmental Discovery Center; 393 Violetti Drive, Santa Rosa. Use park entrance at Violetti Drive, upper parking lot; 9:30 - 11:00 am



- Galbreath Preserve; meet at Yorkville Post Office (25400 CA-128, Yorkville); 9:00 am - 1:00 pm; Samples will be collected on-site immediately following the training.
- Sonoma Valley Regional Library; 755 W Napa St, Sonoma; 10:30 am – 12:30 pm.

5/6 – Fairfield Osborn Preserve SOD Blitz; 9:30 am. Registration required; Samples will be collected on-site immediately following the training. For more information, contact Kerry Wininger at kwinger@ucanr.edu or see <http://cesonoma.ucanr.edu/SuddenOakDeath/>,

5/8 – San Francisco SOD Blitz; County Fair Building, Recreation Room, Golden Gate Park, San Francisco; 8:30 am. Contacts: Eric Andersen, eric.andersen@sfgov.org and Christa Conforti, CConforti@presidiotrust.gov.

5/9 – 11 “The Impact of *Phytophthora* on Restoring Native Habitats” is one of the technical session themes at the 25th Annual Conference of the California Society for Ecological Restoration; Marina Village, San Diego; Eight talks will be presented on *Phytophthora* concerns in restoration, including detections from the Bay Area and Southern California as well as guidance on best management practices to prevent introduction and spread. For more information, go to <http://www.sercal.org/links-conference-timeline/>

5/12 – Woodside, Portola Valley, Atherton, Redwood City, and Los Altos Hills SOD Blitz; Woodside Town Hall; 2955 Woodside Rd., Woodside; 10:00 - 11:00 am; For more information, contact Debbie Mendelson at naturemend@sbcglobal.net; Sue Welch, Los Altos Hills, at sodblitz09@earthlink.net; or Coty Sifuentes, Midpeninsula Regional Open Space, at csifuentes@openspace.org.

5/12 – SOD Blitz, Los Gatos; 23230 Summit Road, Los Gatos; 1 pm, Contact: Guillhamet brothers: peterguilhametjr@gmail.com.

5/16 – SOD Blitz, Orleans at the Karuk Tribe’s Council Chambers; 5:30 pm. Contact Heather Rickard; heather.d.rickard@gmail.com.

5/19 – Napa County SOD Blitz; Napa County UC Cooperative Extension office; 1710 Soscol Ave, Napa; 10:00 - 11:00 am; For more information, contact Bill Pramuk at info@billpramuk.com.

5/19 – Happy Camp SOD Blitz at the Karuk Tribe’s People’s Center, 10 am; Contact: Heather Rickard heather.d.rickard@gmail.com.

7/28 – 6th International Oomycetes Workshop: *Phytophthora*, *Pythium*, Downy Mildews and related genera. International Congress of Plant Pathology (ICPP 2018), Boston Convention Center; <https://apsnet.confex.com/apsnet/ICPP2018/meetingapp.cgi/Session/2089> [\(link\)](#).

11/13 - 14– 2018 California Forest Pest Council Annual Meeting at UC Davis. More information will be forthcoming soon.