CALIFORNIA OAK MORTALITY TASK FORCE REPORT
OCTOBER 2023

Editors' note: Please join us for a California Oak Mortality Task Force meeting, online, on November 7th (see Meetings below). Also note that this report is the last issue for 2023. The next report will be published in February 2024, and it will be published three times in 2024 - February, June, and October.

MANAGEMENT - CALIFORNIA

After a wet winter, *Phytophthora ramorum* is on the move in Del Norte County. Prior to 2022, two main *P. ramorum* infestations were known to exist in Del Norte County: an NA1 infestation in Jedediah Smith State Park, just to the south of the main stem Smith River, and an EU1 infestation along North Bank Road, just to the northeast of the same river. Management actions were taken in late 2020 to try to slow or contain the EU1 infestation (see the October 2019, December 2020, February 2022 and April 2023 issues of this newsletter for background). Surveys since December 2022 have now established that both these infestations continue to spread.

After the NA1 infestation was discovered in 2019, surveyors were unable to find additional infected vegetation at the infested site for over three more sampling seasons. In 2022, an area of concentrated tanoak dieback and mortality was detected less than a mile downstream along Mill Creek, a tributary that feeds the Smith River from the south (see map, Figure 1). This infestation is established under a canopy of very tall old-growth redwood and spans both sides of a trail through the state park.

Although the originally detected (2020) EU1-infected trees along North Bank Road were cut down and a zone of surrounding tanoaks killed (almost no bay laurel exists on the site), a satellite infestation was found just a few hundred meters to the south, high on the banks of Little Mill Creek (another tributary of the Smith River), and intensively surveyed in late 2022. Only one small tree was found infected outside the core of this satellite infestation, but it was relatively remote from that core of infected trees (~380 m away). Further surveying in 2023 has detected additional infected tanoaks on the other side of the original EU1 infestation, to the north, stretching along Hutsinpillar Creek.

Additionally, stream sampling in the greater surrounding area in 2023 detected *P. ramorum* in three additional creeks: Rowdy Creek and Morrison Creek to the north of the EU1 area, and Myrtle Creek along Highway 199 east of both infestations. The Rowdy Creek infestation is the farthest north and is located 6 km from the original EU1 site; the Myrtle Creek infestation is located approximately 10 km southeast of that site. The site is approximately 7.5 km from the Oregon border. Two of these detections were the EU1 strain. It was impossible to isolate the Morrison Creek sample, so the lineage of this detection is still unknown.

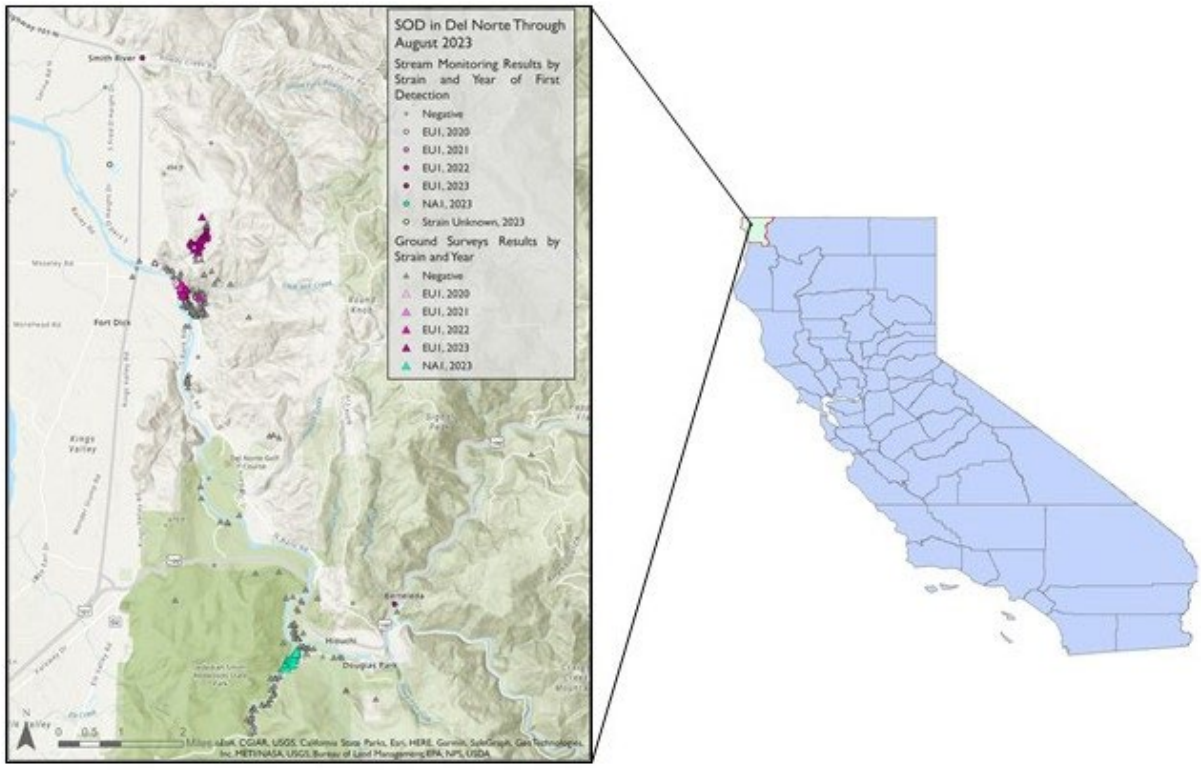

Figure 1. *P. ramorum* detections in Del Norte County. August 2023. For a larger view see here.

Discussions about potential management actions, objectives related to disease and overall forest health, and resources necessary to address the problem have been taking place between the affected land managers, which represent a variety of public and private entities and individuals. These discussions have been complicated and delayed for some participants by several very large wildfires in Del Norte and northern Humboldt Counties, some of which are still burning. Meanwhile, monitoring to track continued spread and detect cryptic infections on the rugged Del Norte County landscape continues. For more information contact Wallis Robinson, wlrobinson@ucanr.edu, or Chris Lee, christopher.lee@fire.ca.gov.

RESEARCH

Bourret, T.B.; Mehl, H.K.; Aram, K. and Rizzo, D.M. 2023. Rhododendron leaf baiting of coastal California watersheds for *Phytophthora* and *Nothophytophthora*. Mycological Progress. 22(8): 62.

For nearly two decades, stream baiting of northern and central California coastal streams has been an important tool in the management of sudden oak death, a devastating forest disease caused by the oomycete *Phytophthora ramorum*. *Phytophthora* species are baited with floating rhododendron leaves, serving as an early detection tool for the presence of *P. ramorum* in watersheds across more than 800 km of California coastline. While this long-standing management tool is focused on a single species of *Phytophthora*, other species of *Phytophthora*

have been baited alongside *P. ramorum*, and this study documents the presence and distribution of 22 *Phytophthora* and *Nothophytophthora* species across the northern and central coasts of California. Although *P. ramorum* was isolated at the greatest number of sites, several species in subgeneric clade 6 were also abundant and widespread, a common feature of *Phytophthora* stream baiting studies. Clade 3 species *P. nemorosa, P. pluvialis*, and *P. pseudosyringae* were also frequently isolated in northern coastal streams. The species *Nothophytophthora caduca* and the genus *Nothophytophthora* are reported for the first time in North America along with the first report of *P .pluvialis* in California. Two novel species, *Nothophytophthora* sp. *californica* and *P.* sp. *aureomontensis* (a member of the *P. citricola* species complex) are provisionally named. Mitochondrial sequences revealed multiple hybridization events between *P. lacustris* and *P. riparia*. Stream monitoring can serve as an important tool for monitoring ongoing *Phytophthora* invasions as well as establishing baseline pathogen communities, critical data for preventing future invasions.

Moralejo, E.; Garcia-Munoz Sr, J.A.; Gimenez Romero Sr, A.; Denman, S. 2023. Leaf susceptibility of Macaronesian laurel forest species to *Phytophthora ramorum*. BioRxiv, 2023-07. [Preprint. Not peer-reviewed.]

Phytophthora ramorum is an invasive oomycete in Europe and North America and the causal agent of sudden oak death (SOD), which occurs along the coastal fog belt of California and southwestern Oregon, and it also causes sudden larch death in the UK. The Macaronesian laurel forest, a relict subtropical evergreen forest of the North Atlantic islands, shares climatic and some taxonomic affinities with those areas affected by SOD. To assess the disease risk, we tested the foliage susceptibility of MLF species and their capacity to sustain *P. ramorum* sporulation and compared the climatic suitability with other areas where the pathogen is established. Detached leaves of 15 species were inoculated with zoospores and mycelium (through wounding) with five *Pr* isolates belonging to the EU1 and NA1 clonal lineages. Macaronesian laurel forest species showed diverse responses to *P. ramorum*, ranging from extensive necroses on *Viburnum tinus* to asymptomatic sporulation on *Picconia excelsa*. Eleven species developed necrotic lesions to different degrees through zoospore inoculation while this increased to 13 species through wound treatment. Overall, small necrotic lesions (i.e. tolerance) were predominant, but *P. ramorum* was rather aggressive to *V. tinus*, *Arbutus canariensis* and *Ilex canariensis*. Although the mean sporangial production was generally low (25-201 sporangia) in all species, the number of sporangia per leaf in five Macaronesian laurel forest species was similar to those reported for *Umbellularia californica*, a key host driving the SOD epidemics in California. Climatic suitability indexes in Macaronesian laurel forest areas were similar to those where SOD is found in California. Our results indicate a moderate to high risk of *P. ramorum* establishment if the pathogen is introduced in the Macaronesian laurel forest.

RELATED RESEARCH

Contreras-Cornejo, H.A.; Larsen, J.; Fernández-Pavía, S.P.; Oyama, K. 2023. Climate change, a booster of disease outbreaks by the plant pathogen *Phytophthora* in oak forests. Rhizosphere 27: 100719. DOI: https: 10.1016/j.rhisph.2023.100719.

Lanning, K.K.; Kline, N.; Elliott, M.; Stamm, E.; Warnick, T.; LeBoldus, J.M.; Garbelotto, M.; Chastagner, G.; Hulbert, J.M. 2023. Citizen science can add value to *Phytophthora* monitoring: five case studies from western North America. Frontiers in Environmental Science. 11: 1130210. DOI: 10.3389/fenvs.2023.1130210.

Raffa, K.F.; Brockerhoff, E.G.; Grégoire, J.C.; Hamelin, R.C.; Liebhold, A.M.; Santini A; Venette, R.C.; Wingfield, M.J. 2023. Approaches to forecasting damage by invasive forest insects and pathogens: A cross-assessment. Bioscience. 73(2): 85-111.

MEETINGS

November 7, 2023. **2023 California Oak Mortality Task Force Meeting**. Online. 10 am to noon. Status of *Phytophthora ramorum* and sudden oak death in wildlands and research updates will be presented. Free to attend but registration is required. For questions contact Janice Alexander, jalexander@ucanr.edu.

November 8, 2023. **2023 Phytophthoras in Native Habitats Work Group Meeting**. Online. 10 am to noon. A new diagnostic guide for Phytophthoras in restoration areas, updates on Accreditation to Improve Restoration (AIR), research and management of *Phytophthora* species in restoration and wildlands will be discussed. Free to attend but registration is required. For questions contact Janice Alexander, jalexander@ucanr.edu.

November 14-15, 2023. **2023 California Forest Pest Council meeting**, in-person, Putah Creek Lodge, UC Davis campus. Registration and more information will be posted at https://www.caforestpestcouncil.org/. For more questions contact Kim Corella, Kim.Corella@fire.ca.gov.