

Phytophthoras in Native Habitats Work Group – June 2022 update

New position at UC-Davis. Publication summaries.

***Phytophthora pluvialis* in the UK. Upcoming Events.**

Job posting. The UC Davis, Plant Pathology Department is advertising for a new position, an Assistant Professor of Cooperative Extension – Plant Pathology to focus on diseases of nursery and greenhouse plants including native plants for ecological restoration. For more information or to apply, see <https://recruit.ucdavis.edu/JPF05013>. The announcement opened June 8th with an August 31st deadline to ensure full consideration.



Figures 1 & 2. Toyon infested with *P. cactorum* and the pear bait used to isolate the pathogen. Photographs courtesy of Phytosphere Research.

Research - citations and summary excerpts

Bourret, T.B.; Fajardo, S.N.; Engert, C.P. and Rizzo, D.M. 2022. A barcode-based phylogenetic characterization of *Phytophthora cactorum* identifies two cosmopolitan lineages with distinct host affinities and the first report of *Phytophthora pseudotsugae* in California. *Journal of Fungi*. 8(3): 303. <https://doi.org/10.3390/jof8030303>.

A collection of 30 *Phytophthora cactorum* and 12 *P. pseudotsugae* strains isolated from several recent surveys across California was phylogenetically compared to a worldwide collection of 112 conspecific strains using sequences from three barcoding loci.

“According to our results, there are lineages within both *Phytophthora* species [*P. cactorum* and *P. pseudotsugae*] that are not currently present in California and, therefore, theoretically pose risks to native plants if they were to be introduced. Our evidence also suggests that at least one

genotype of *P. cactorum* is being locally spread via restoration activities. ...It appears that the *P. cactorum* California restoration lineage is, at the moment, only moving locally through restoration nurseries, while [an] apple–oak lineage is moving locally and worldwide through horticulture.”

Dale, A.L.; Feau, N.; Berube, J.A.; Ponchart, J.; Bilodeau, G.J. and Hamelin, R.C. 2022. Urban environments harbor greater oomycete and *Phytophthora* diversity, creating a bridgehead for potential new pathogens to natural ecosystems. Environmental DNA. DOI: 10.1002/edn3.300. <https://onlinelibrary.wiley.com/doi/pdf/10.1002/edn3.300>.

We conducted an eDNA metabarcoding study to compare communities of oomycetes, a group of eukaryotic microorganisms that comprises important crop and tree pathogens, in urban, natural, and interface environments. Oomycete diversity and abundance were highest in human impacted urban environments and lowest in natural environments, while the interface environments were intermediate.

“Our study serves as a warning that some *Phytophthora* species introduced from nurseries or spread by human movement could pose a threat to natural ecosystems. Shifting patterns in oomycete communities could interfere with natural ecosystem processes and result in increases in disease and ecosystem declines.”

Gomes Marques, I.; Solla, A.; David, T.S.; Rodríguez-Gonzalez, P.M. and Garbelotto, M. 2022. Response of two riparian woody plants to *Phytophthora* species and drought. Forest Ecology and Management 518: 120281. <https://doi.org/10.1016/j.foreco.2022.120281>.

The purpose of this study was to understand how two plant species, often used together in restoration of riparian ecosystems but with different ecological preferences, would respond to infection by each of two *Phytophthora* species in Mediterranean-climate regions, in the absence or presence of a simulated drought. Saplings of the drought resistant species *Frangula californica* [coffeeberry], and of the riparian species *Alnus rhombifolia* [white alder] were each inoculated in a greenhouse experiment with one of two *Phytophthora* species and exposed to two watering regimes.

“Results showed that both *P. cactorum* and *P. crassamura* are important pathogens of *A. rhombifolia* and *F. californica*. As expected, drought conditions were the main cause of decline and mortality in *A. rhombifolia* saplings, while water availability was a facilitator of *P. cactorum* infection in *F. californica* saplings.”

“We also emphasize the importance of ensuring that plant stock used in revegetation projects is not infected by *Phytophthora* species, and that biotic and abiotic risks are assessed prior to restoration actions.”

La Spada, F.; Cock, P.J.; Randall, E.; Pane, A.; Cooke, D.E. and Cacciola, S.O. 2022. DNA metabarcoding and isolation by baiting complement each other in revealing *Phytophthora* diversity in anthropized and natural ecosystems. *Journal of Fungi*. 8(4): 330.
<https://doi.org/10.3390/jof8040330>

Isolation techniques supplemented by sequencing of DNA from axenic cultures have provided a robust methodology for the study of *Phytophthora* communities in agricultural and natural ecosystems. Recently, metabarcoding approaches have emerged as new paradigms for the detection of *Phytophthora* species in environmental samples. In this study, Illumina DNA metabarcoding and a conventional leaf baiting isolation technique were compared to unravel the variability of *Phytophthora* communities in different environments.

“Both techniques complemented each other in describing the variability of *Phytophthora* communities from natural and managed ecosystems and revealing the presence of rare or undescribed *Phytophthora* taxa.”

Vettraino, A.M.; Zikeli, F.; Scarascia Mugnozza, G.; Vinciguerra, V.; Tabet, D. and Romagnoli, M. 2022. Lignin nanoparticles containing essential oils for controlling *Phytophthora cactorum* diseases. *Forest Pathology*. 52(2): e12739.

Current plant protection strategies are often inadequate to control *Phytophthora* diseases. Hence, an attempt was made to evaluate the potential of a novel control method using lignin nanoparticles loaded with essential oil of *Thymus serpyllum* (EO-LNPs) for controlling *P. cactorum* infections on *Pinus nigra* in vitro and greenhouse conditions.

“... in vivo tests revealed that thyme EOs [essential oils] and EO-LNPs were very effective in reducing the mortality of inoculated pine seedlings, with an inhibition rate of 93% and 100%, respectively. Results reported in this study open the possibility of using EO-LNPs for improving plant health in greenhouse settings.”

Phytophthoras get around: *Phytophthora pluvialis* – first detection in the UK on new hosts.

P. pluvialis was first recognized in Cornwall, England in 2021 affecting mature western hemlock (Fig. 3) and Douglas-fir trees. The UK has imposed a quarantine and established “Demarcated Areas” to prohibit the movement of any wood, isolated bark, and trees (including live trees, felled or fallen trees, fruit, seeds, leaves, or foliage) of the genus *Tsuga* (hemlock), Douglas-fir, the genus *Pinus*, and tanoak from known infested areas.

Figure 3. *P. pluvialis* lesion on western hemlock growing in England. Photo: UK Forestry Commission.



This pathogen was first discovered in Oregon in 2013 on tanoak and Douglas-fir causing a needle cast and was subsequently identified in New Zealand causing 'red needle cast' of Monterey pine (*Pinus radiata*).

More information on [Phytophthora pluvialis](#) is available from the UK Forestry Commission. For a video on symptom identification, see [Phytophthora pluvialis / symptoms in western hemlock – YouTube](#) and Pérez-Sierra, A.; Chitty, R.; Eacock, A.; Jones, B.; Biddle, M. and others. 2022. First report of *Phytophthora pluvialis* in Europe causing resinous cankers on western hemlock. New Disease Reports. 45(1). <https://bsppjournals.onlinelibrary.wiley.com/doi/full/10.1002/ndr2.12064>.

Events

The 2022 California Native Plant Society Conference, October 18 – 22, 2022, San Jose will feature several restoration health programs:

- 1) workshop - How to detect *Phytophthora* and other plant pathogens in container nurseries,
- 2) field trip - Coyote ceanothus (*Ceanothus ferrisiae*) population creation site on Coyote Ridge:
Assisted colonization of an endangered chaparral shrub,
- 3) talks, posters, a discussion session and more.

For details see <https://conference.cnps.org/>.

The 2022 virtual meeting of the Phytophthoras in Native Habitats Work Group will be held Thursday, November 10, 1 pm to 3 pm PST. Also that week, the California Oak Mortality Task Force, www.suddenoakdeath.org, will meet virtually on November 8 & 9, 1 to 3 pm PST. More details will be available shortly.