Why the concern over Phytophthoras in restoration plantings?



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Why the concern - Phytophthoras in restoration plantings?

- 1) Background. What is "Phytophthora"? Pathogen. Diseases.
- 2) CA restoration *Phytophthora* problems native plant nurseries
- 3) Phytophthoras in Native Habitats Work Group (www.calphytos.org)

Key points...

- *Phytophthora* introductions are causing irreversible degradation of forests & wildlands.
- Prevention is key.

How can AEP members help sustain habitat?



Sudden oak death – *Phytophthora ramorum* mortality on tanoak (*Notholithocarpus densiflorus*)

In 2018 - 1.6 million dead trees on 106,000 acres





Pathways for *Phytophthora* movement. SOD pathogen. 1. From Santa Cruz nursery. 2. Big Sur hotel 3. Los Padres NF



Any project that plants nursery stock presents a risk for pathogen introduction!



What are Phytophthoras?













BROWN ALGAE and DIATOMS



Sogin, Mitchell L. and Patterson, David J. 1995. Stramenopiles.









Port-Orford-Cedar Root Disease



Phytophthora lateralis



Photo: C. Delatour





Phytophthora ramorum on tanoak near Brookings, OR

Manzanita – 9 species as *P. ramorum* hosts

Rainbow manzanita, Arctostaphylos rainbowenis





Arctostaphylos glandulosa and Arctostaphylos virgata

Eastwood's manzanita & Marin manzanita (rare plant)

CA native plant nurseries & restoration areas - Pathogen pathways





Photos: CDFA, SFPUC

Intercepted *Phytophthora* infection in a nursery – on an endangered species



Oenothera deltoides ssp *howellii* Antioch Dunes Evening Primrose



California Rare Plant Rank: 1B.1 (Rare, threatened, or endangered in CA and elsewhere). Federal – Endangered.



San Francisco Bay National Wildlife Refuge Complex



San Pablo Bay National Wildlife Refuge is managed as part of the San Francisco Bay National Wildlife Refuge Complex.





Don Edwards San Francisco Bay







🖪 Visit

Wildlife & Habital Seasons of Wildlife



Phytophthora pseudocryptogea



Raven's Manzanita

(Arctostaphylos hookerii ssp. ravenii)

The parent plant and clones have suffered significant dieback in the last two years due to a fungal pathogen that apparently had flourished following several years of above average rainfall.



Status: Federal: Endangered State: Endangered California Native Plant Society List 1B, R-E-D Code 3-3-3



"The widespread planting ... for coastal dune protection and restoration over decades suggest infested nursery stock as the primary pathway of Phytophthora spp. to the National Park of La Maddalena."



Maquis Vegetation, including Two New Species, *Phytophthora* crassamura and *P. ornamentata* sp. nov.



Restoration plantings & hitchhiking Phytophthoras









Photos: Phytosphere Research

Auburn Journal

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San Francisco Chronicle

DATEBOOK

Parks officials in Bay Area work to keep out plant-killing

FOOD

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N-DEPTH

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2014



Photo by Ted Swiecki, Phytosphere Research

Phytophthora: New Strains **Breaking the Mold**

New Strains Breaking the Mold

by Alison Hawkes June 28, 2016

David Perlman Feb. 6, 2015 Updated: Feb. 7, 2015 10:59 a.m.

NEV

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molds



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Deadly disease plagues plants high above Silicon Valley

Can local land managers, nurseries stop the spread of fungus-like water mold?

by Sue Dremann / Palo Alto Weekly



Rooney-Latham, S., Blomquist, C. L., Swiecki, T., and Bernhardt, E. 2015. *Phytophthora tentaculata*. Forest Phytophthoras 5(1): doi: 10.5399/osu/fp.5.1.3727



Large-scale plantings

Stubborn problems

plant disease

Editor-in-Chief: Alison E. Robertson Published by The American Phytopathological Society

Home > Plant Disease > Table of Contents > Abstract Previous Article | Next Article

Accepted for publication https://doi.org/10.1094/PDIS-01-18-0167-RE *Phytophthora* species were detected from 77% of the CA native plant nurseries – on 22 host families.

Phytophthora species are common on nursery stock grown for restoration and revegetation purposes in California.

"These findings document the widespread occurrence of *Phytophthora* spp. in native plant nurseries and highlight the potential risks associated with outplanting infested nursery-grown stock into residential gardens and wildlands."

Rooney-Latham, S., Blomquist, C.L., Kosta, K.L., and others. 2019. *Phytophthora* species are common on nursery stock grown for restoration and revegetation purposes in California. Plant Disease. https://doi.org/10.1094/PDIS-01-18-0167-RE





*P. cinnamomi on pallid manzanita, Arctostaphylos pallida*East Bay Regional Parks District



Photos: Phytosphere Research, CALFLORA

Endangered species – *Ceanothus ferrisiae* - Coyote ceanothus, California lilac







Endemic to Santa Clara County. 200,000 individuals in 3 occurrences.

Photos: J. Hillman, SCVWD; Phytosphere Research



Phytophthora Species in Restoration Plantings and Nursery Stock on the Angeles NF

Katie VinZant, U.S. Forest Service, ANF Susan Frankel, U.S. Forest Service, PSW Ted Swiecki, Phytosphere Research

Phytophthora in restoration sites – featured in California Agriculture



Fall 2018 issue



FEATURED

Coordinated response to inadvertent introduction of pathogens to California restoration areas

Susan J. Frankel, Janice M. Alexander, Diana Benner, Alisa Shor

Frankel, S., Alexander, J., Benner, D., & Shor, A. 2018. Coordinated response to inadvertent introduction of pathogens to California restoration areas. California Agriculture. 72(4): 205-207.



Response to Phytophthora detections in restoration sites

San Francisco Water Department (SFPUC)





SFPUC - SUNOL NURSERY

Sunol, CA (Started 2017 and scheduled to be completed 2018)

Working to Save Our Oaks

Baland this fance is one of many SEPUC perjectil designed to protect and inherical the rultural resources of the Peninaula Watersheds. The treas aurouarding this creek are in danget fron sudden calk destb (SOD), an introduced disease that kills several species of native California bake to 2000, the SEPUC logical a shady to protect these trees from SOD by tensoring relative California bay trees, which hurbor and transfer the disease to the sale.





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Photos: McKee & Company Electric, East Bay Times

Fighting back - Presidio Trust, Golden Gate NRA

Phytophthora BMPs for Natural Resource Field Staff

Daily Refresher Checklist and Training Log

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Phytophthora training and education: for all field staff, new hires, interns, contractors, etc.

Everyday Checklist

Phytophthora is Greek for "plant destroyer". It is a genus of "water molds" that are capable of causing massive die-off to plants.

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- Barry

Large scale Phytophthora infestations can wipe out natural plant communities which could cause erosion, habitat degradation, and have major economic impacts for our Park

Like other molds, Phytophthora spreads through spores that can live for long periods of time, even in dry soil.

nitizing agents; allow workers the time to

ove ground plant parts. wing Phytophthora BMPs

tions are	prime	conditions	for	Phytophthora

lothes, shoes, tools, vehicles, etc. We may

2016









CALIFORNIA OAK MORTALITY TASK FORCE

Home

Phytophthoras in Native Habitats Work Group

Other Phytophthora species in California's Native Habitats

Several first-in-the-USA detections and newly identified species of *Phytophthora* in both native plant nurseries and restoration areas have occurred in recent years. Many of these *Phytophthora* species appear to have wide host ranges, capable of causing disease on plants across many families and in many different habitats. The **Phytophthoras in Native Habitats Work Group** formed to determine steps needed to protect wildlands and assist the restoration industry. The Work Group is now part of the California Oak Mortality Task Force and serves as an "Other Phytophthoras" committee for that group.

More information can be found in the following:

- <u>Background document</u> ¹/₂ (February 2017)
- Frequently Asked Questions 2 (February 2017)
- Briefing paper 1 (May 2015)

For more information on Phytophthora species around the world,



Photo by Janell Hillman, Santa Clara Valley Water District

www.calphytos.org or www.suddenoakdeath.org



www.suddenoakdeath.org

Sudden Oak Death is a tree disease caused by the

First recognized in the mid 1990s, the disease kills some oak species (primarily coast live oak, Quercus agrifolia, and an oak relative, tanoak, Notholithocarpus densifiorus) and has had devastating effects on

constal forests in California and Oreson. The nother an also infects the dedendrone complian and other

Please join us... Healthy Plants in a World with *Phytophthora* 7th Sudden Oak Death Science & Management Symposium June 25 - 27, 2019. Golden Gate Club, The Presidio.



Acknowledgements



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For info on sudden oak death: www.suddenoakdeath.org. For Phytophthoras on native plants: www.calphytos.org.

