Phytophthora Threats to Native Vegetation: Fighting Back!

Sudden oak death, Ft. Ross, Sonoma Co., Spring 2018

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Phytophthora Threats to Native Vegetation: Fighting back!

1) Overview. *Phytophthora* problems with a focus on native plant nurseries and restoration areas.

2) How organizations are addressing the problem.

Key Points…

*Phytophthora* introductions are causing irreversible degradation of forests & wildlands.

- Prevention is key.
What are Phytophthorases?

Photos: Rizzo, UC Davis & Garbelotto, UC Berkeley
**BROWN ALGAE and DIATOMS**

Phytophthora tree & plant-killers - worldwide

Phytophthora cinnamomi on oak in Southern Spain

Alder Phytophthora, Sweden
Sudden Oak Death, Big Sur, Monterey County, Spring 2018

Credit: Kerry Frangioso, UC-Davis
Phytophthora ramorum on tanoak near Brookings, OR
Manzanita – 9 species as *P. ramorum* hosts

Rainbow manzanita, *Arctostaphylos rainbowensis*

Credits: Latham, CDFA
Phytophthora ramorum

Mt Tamalpais, Marin Co.

Arctostaphylos glandulosa and Arctostaphylos virgata

Eastwood’s manzanita & Marin manzanita (rare plant)
Pathways for *Phytophthora* movement.
1. From Santa Cruz nursery. 2. Big Sur hotel 3. LPNF
Finding Phytophthora ramorum in the natural environment of north Vietnam

Origin of the sudden oak death pathogen
New Invasive Plant Disease in Placer County
By: Trish Grenfell

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

Phytophthora: New Strains Breaking the Mold

Deadly disease plagues plants high above Silicon Valley
Can local land managers, nurseries stop the spread of fungus-like water mold?
Large-scale plantings

Stubborn problems
Phytophthora tentaculata

Santolina

mugwort

Monkeyflower

Restoration plantings & hitchhiking *Phytophthora*

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

Suzanne Rooney-Latham
Cheryl L. Blomquist
Kathleen L Kosta
Phytophthora parvispora

First detection in North America - *Phytophthora parvispora*

Mexican orange blossom (*Choisya ternata*)
- non-native, ornamental

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
Are Phytophthoras surviving in restoration sites on the ANF?

• Tested 71 samples at 15 sites, scattered over various veg types
• Sites planted 6 months to 6 years previously
• Live and dead containers
• Sampled 14 different plant species
Nursery #1 = 3 species
Nursery #2 = 3 species
Nursery #3 = 5 species
Nursery #4 = 1 species

<table>
<thead>
<tr>
<th>Phytophthoras detected</th>
<th>Nsy ID #</th>
<th>Host species</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Phytophthora cactorum</em></td>
<td>1</td>
<td><em>Cercocarpus betuloides</em>, <em>Heteromeles arbutifolia</em>, <em>Salvia mellifera</em></td>
</tr>
<tr>
<td><em>Phytophthora cactorum</em></td>
<td>2</td>
<td><em>Quercus agrifolia</em></td>
</tr>
<tr>
<td><em>Phytophthora cambivora</em></td>
<td>3</td>
<td><em>Quercus chrysolepis</em></td>
</tr>
<tr>
<td><em>Phytophthora citrophthora/colocasiae</em></td>
<td>3</td>
<td><em>Adenostoma fasciculatum</em></td>
</tr>
<tr>
<td><em>Phytophthora cryptogea complex</em></td>
<td>2</td>
<td><em>Eriogonum fasciculatum</em>, <em>Salvia mellifera</em></td>
</tr>
<tr>
<td><em>Phytophthora hedraiandra</em></td>
<td>3</td>
<td><em>Cercocarpus betuloides</em></td>
</tr>
<tr>
<td><em>Phytophthora nicotianae</em></td>
<td>4</td>
<td><em>Acmispon glaber</em>, <em>Arctostaphylos glandulosa gabrielenis</em>, <em>Artemisia californica</em>, <em>Eriodictyon crassifolia</em>, <em>Eriogonum elongatum Quercus agrifolia</em>, <em>Salvia mellifera</em></td>
</tr>
<tr>
<td><em>Phytophthora nicotianae</em></td>
<td>1</td>
<td><em>Baccharis salicifolia</em>, <em>Populus fremontii</em>, <em>Salix lasiolepis</em></td>
</tr>
<tr>
<td><em>Phytophthora nicotianae</em></td>
<td>3</td>
<td><em>Quercus john-tuckeri</em>, <em>Q. wislezenii</em>, <em>Rhamnus illicifolia</em></td>
</tr>
<tr>
<td><em>Phytophthora nicotianae</em></td>
<td>2</td>
<td><em>Salvia mellifera</em></td>
</tr>
<tr>
<td><em>Phytophthora niederhauserii</em></td>
<td>1</td>
<td><em>Eriogonum fasciculatum</em>, <em>Heteromeles arbutifolia</em>, <em>Salvia mellifera</em></td>
</tr>
<tr>
<td><em>Phytophthora pini</em></td>
<td>3</td>
<td><em>Cercocarpus betuloides</em></td>
</tr>
</tbody>
</table>

Infested *Artemisia californica* (California sagebrush)
The widespread planting of exotic plant species ... 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.
Response to *Phytophthora* detections in restoration sites

Solarization, augers, ovens

Photos: Janell Hillman, SCVWD
Response to Phytophthora detections in restoration sites

Solar soil ovens, June 2018, above San Jose

Photos: Janell Hillman, SCVWD, Phytosphere Research
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)

Photos: McKee & Company Electric, East Bay Times
Phytophthora BMPs for Natural Resource Field Staff
Daily Refresher Checklist and Training Log

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.

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.

- Remove ground plant parts.
- Wiping Phytophthora BMPs
- Sanitizing agents; allow workers the time to

Presidio Phytophthora Management Recommendations

2016
Our California landscapes are facing threats from new diseases that we are not prepared to control once they are introduced. The greatest threat is from a disease-causing agent...
Pointing out the need for change – is difficult.

- Consider disease prevention in restoration design.


www.calphytos.org
Prevention! Don’t let nursery plants sit in water!
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 wildlans 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:

- [Background document] (February 2017)
- [Frequently Asked Questions] (February 2017)
- [Briefing paper] (May 2015)

For more information on Phytophthora species around the world:

www.calphytos.org or www.suddenoakdeath.org
Mark your calendar…

7th Sudden Oak Death Science & Management Symposium
Acknowledgements
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