

An Update on *Phytophthora* species in Native Plant Nurseries and Outplanted Material in Restoration Areas



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**APS Annual Meeting of the California Forest Pest Council
November 5, 2015**



Phytophthora tentaculata

- **November 2014 Forest Pest Council Meeting –**

“*Phytophthora tentaculata*- A New *Phytophthora* Species causing root and crown rot of Ornamentals and Native Plant Species in California Nurseries”

- * Prior to 2012, it was not known to occur in the US
- * A 2009 USDA PERAL listed it among top 5 exotic *Phytophthora* sp. of concern to the US





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Exotic Phytophthora Species in Native Plant Nurseries, Restoration Plantings, and Wildlands

by CATE MOORE on OCTOBER 16, 2014

WHEN: December 2,
2014 @ 8:30
am – 4:30 pm

WHERE: Log Cabin
1299 Storey
Avenue
Golden Gate
National
Recreation Area,
San Francisco, CA
94129
USA



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Increased interest in plant health of restoration nursery stock and preventing the introduction of potentially damaging pathogens to our wildlands

- Significant number of native plant nurseries contacted CDFA with interest in joining the Best Management Practices (BMP) Program.
- 2014 Grant: “*Phytophthora tentaculata* survey in CA native plant nurseries and reforestation sites.”

Frankel, S.J., Blomquist, C., Latham, S., Swiecki, T., Kosta, K., and Weber, K.
- Between Dec. 2014 and Oct. 2015 the CDFA lab received over 1000 samples to be tested for *Phytophthora*.
 - Root, soil and bait samples - 941
 - *Phytophthora* cultures – 155
- Lab procedure for testing:
 - Culture, ELISA, baiting, ITS PCR, *Phytophthora*-specific PCR (genes), sequencing

Survey Results:



P. tentaculata detections in new native plant nurseries



P. tentaculata detections in new outplanted sites



New host detections of *P. tentaculata*

Prior to this survey, all CA detections natives

- *Diplacus aurantiacus* - Sticky monkey flower plant
- *Frangula californica* (= *Rhamnus californica*) – Coffeeberry
- *Heteromeles arbutifolia* – Toyon
- *Salvia* spp. – Sage

This survey revealed 4 additional hosts:



Artemisia douglasiana
California Mugwort



Artemisia dranunculoides
Tarragon



Artemisia californica
California sagebrush



Ceanothus cuneatus
Buck brush

- In one intensively surveyed native plant nursery, 11 different *Phytophthora* species were detected in among 21 different native plant species.

P. tentaculata, P. plurivora, P. cactorum, P. multivora, P. nicotianae, P. cambivora, P. hedraiandra, P. cryptogea, P. pini, P. niederhauserii, P. kelmania-like

- One lot of container grown chamise (*Adenostoma fasciculatum*) was tested and 4 different *Phytophthora* spp. were found in 2 symptomatic plants

P. niederhauserii, P. pini, P. cactorum and P. cambivora



Phytophthora species on *Diplacus aurantiacus*

- Prior to 2012, no known *Phytophthora* species on Sticky Monkey Flower
- Since 2012, 10 species have been associated:

P. tentaculata
P. cactorum
P. citricola
P. cryptogea
P. dreschleri
P. megasperma
P. multivora
P. nicotianae
P. niederhauserii
P. pini



One or more *Phytophthora* sp. were detected from
~ 19% of the samples submitted to our lab





Scrophularia californica infected with *Phytophthora nicotianae*

Phytophthora cactorum



Ceanothus rigidus



Arctostaphylos montereyensis

Two lots of nursery grown *Arctostaphylos* spp. had 4 different *Phytophthora* species on the roots and stems

- *P. cactorum*
- *P. cambivora*
- *P. hedraiandra*
- *P. multivora*





Restoration site #2 in Monterey County, CA





Phytophthora species detected from Monterey restoration site #2

P. tentaculata

P. cryptogea

P. drechsleri

P. cactorum

P. hedraiandra

* *Meloidogyne hapla*



Photo from Phytosphere Research



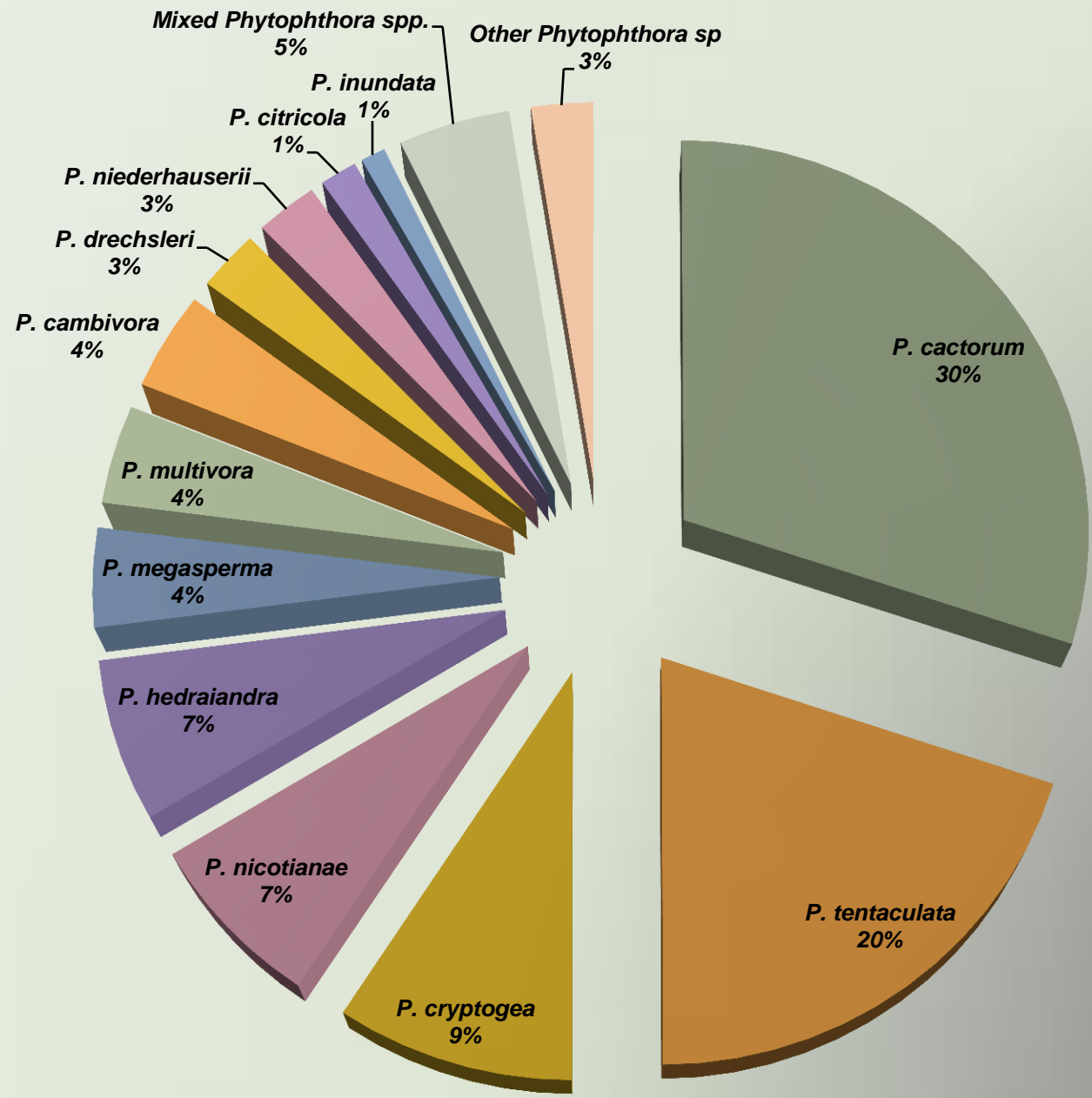
Photo from Phytosphere Research



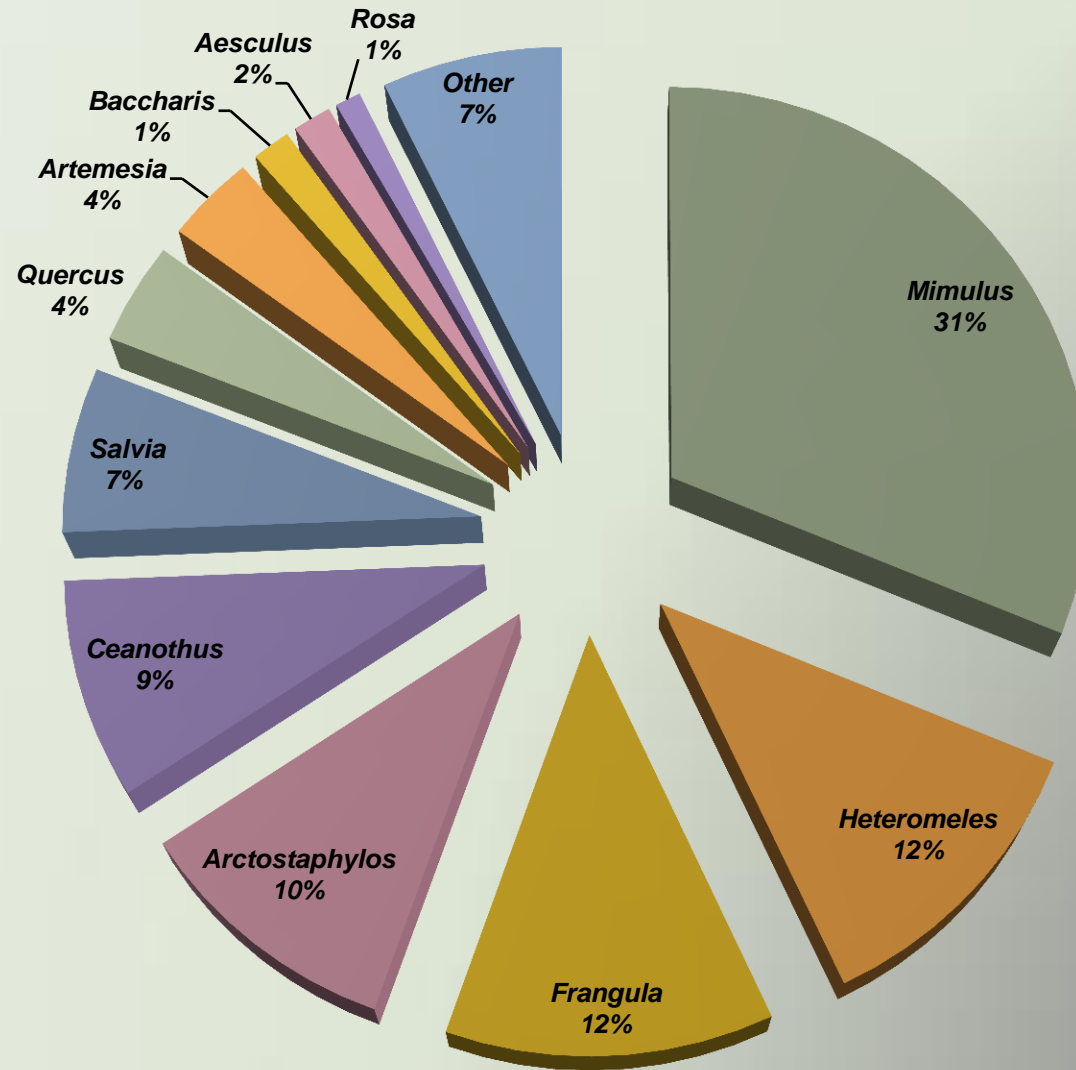
22 years after planting - Apparent infested area covers at least 2 ha



Photos from Phytosphere Research



Percentage of *Phytophthora* species detected by host



Conclusions:

- Many *Phytophthora* spp. are a chronic problem in nurseries.
- These *Phytophthora* spp. have likely been around for some time. Reuse of **infested pots** has likely facilitated the spread of these pathogens.
- So far, **18** species of *Phytophthora* have been found on **34** native plant host genera in nurseries.
- Spread of *P. tentaculata* and other *Phytophthora* sp. in nurseries and into wildlands may cause serious economic and everlasting environmental damages.
- Although small, our survey picked up a lot of infested plant material that was destined for the wildlands.
- Pathogenicity of these *Phytophthora* spp. on most of these hosts is unknown.
- This work has significantly changed the culture of native plant growers and land managers and has encouraged them to really look at their stock and work on a clean production system (BMP) .
- Future work:
 - More surveys
 - Pathogenicity experiments
 - Surveying infested restoration sites over time to track any spread and mortality

Acknowledgements

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