

# ***Phytophthora ramorum:* cause of sudden oak death and other diseases**

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University of California Cooperative Extension  
Oregon State University  
USDA-Animal and Plant Health Inspection Service  
California Oak Mortality Task Force  
USDA-Forest Service



# Overview

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- History & description of *P. ramorum*
- *P. ramorum* in wildlands
- *P. ramorum* in nurseries & landscaping
- Regulations
- Best Management Practices: IPM
- Research update
- Communication & education
- Questions & answers



# Speakers

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- Janice Alexander, Sudden Oak Death Outreach Coordinator, University of California Cooperative Extension
- Jennifer Parke, Plant Pathologist, Oregon State University
- Jonathan Jones, National *Phytophthora ramorum* Program Manager, USDA APHIS PPQ

# History of *Phytophthora ramorum* in North America







**Marin County, CA (north of San Francisco)**

Photo: Marin County Fire Department





**Marin County, CA (north of San Francisco), 2000**

Photo: Marin County Fire Department



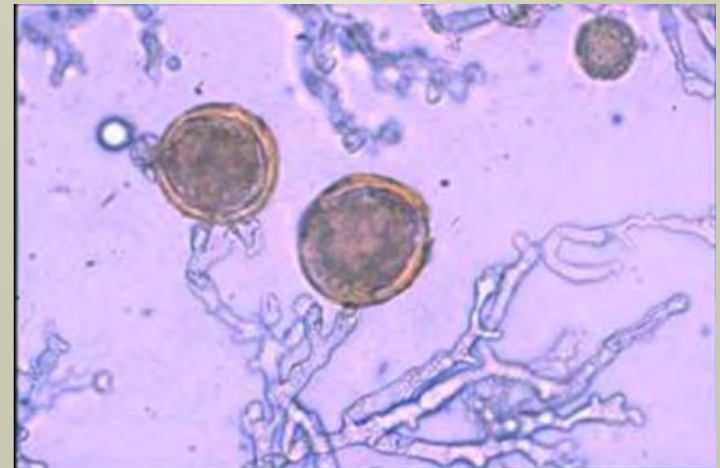
# *Phytophthora ramorum*



*Phytophthora ramorum* in culture



Sporangia releasing  
zoospores



Chlamydospores

# European garden & nursery finds



*Phytophthora ramorum* infection on rhododendron in Europe





*Phytophthora ramorum* infection on the leaves of California bay laurel (*Umbellularia californica*)

Photo: Joseph O'Brien, USDA-Forest Service

# Two sets of symptoms caused by *Phytophthora ramorum*

- Sudden Oak Death
  - Red oak group hosts and tanoak
  - Stem lesions beneath the bark
  - May bleed or ooze
  - Can kill adult plants
- *Phytophthora ramorum* Foliar Blight
  - Non-oak hosts
  - Spots and blotches on leaves
  - Shoot dieback
  - Can kill juvenile plants, occasionally mature plants





Photo: Mike McWilliams, ODF

# *P. ramorum* confirmations in North American forests



Map from [www.suddenoakdeath.org](http://www.suddenoakdeath.org)  
Kelly, UC-Berkeley





Photo: Jennifer Parke, Oregon State University

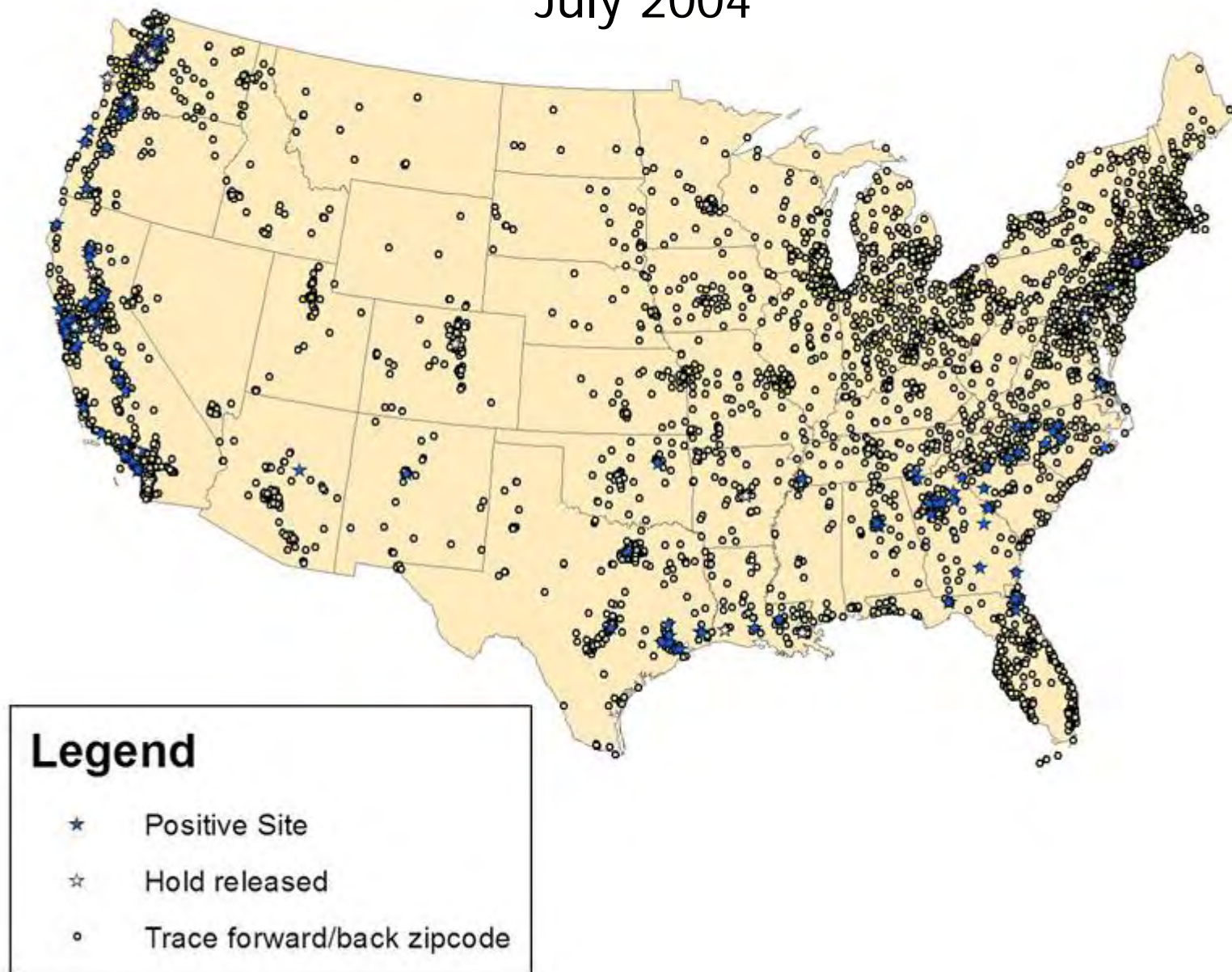




Photo: Jonathan Jones, APHIS, PPQ



# Trace-forwards and positive detections across the U.S. July 2004



# Infected trees in Europe



*Quercus rubra*

*Fagus sylvatica*

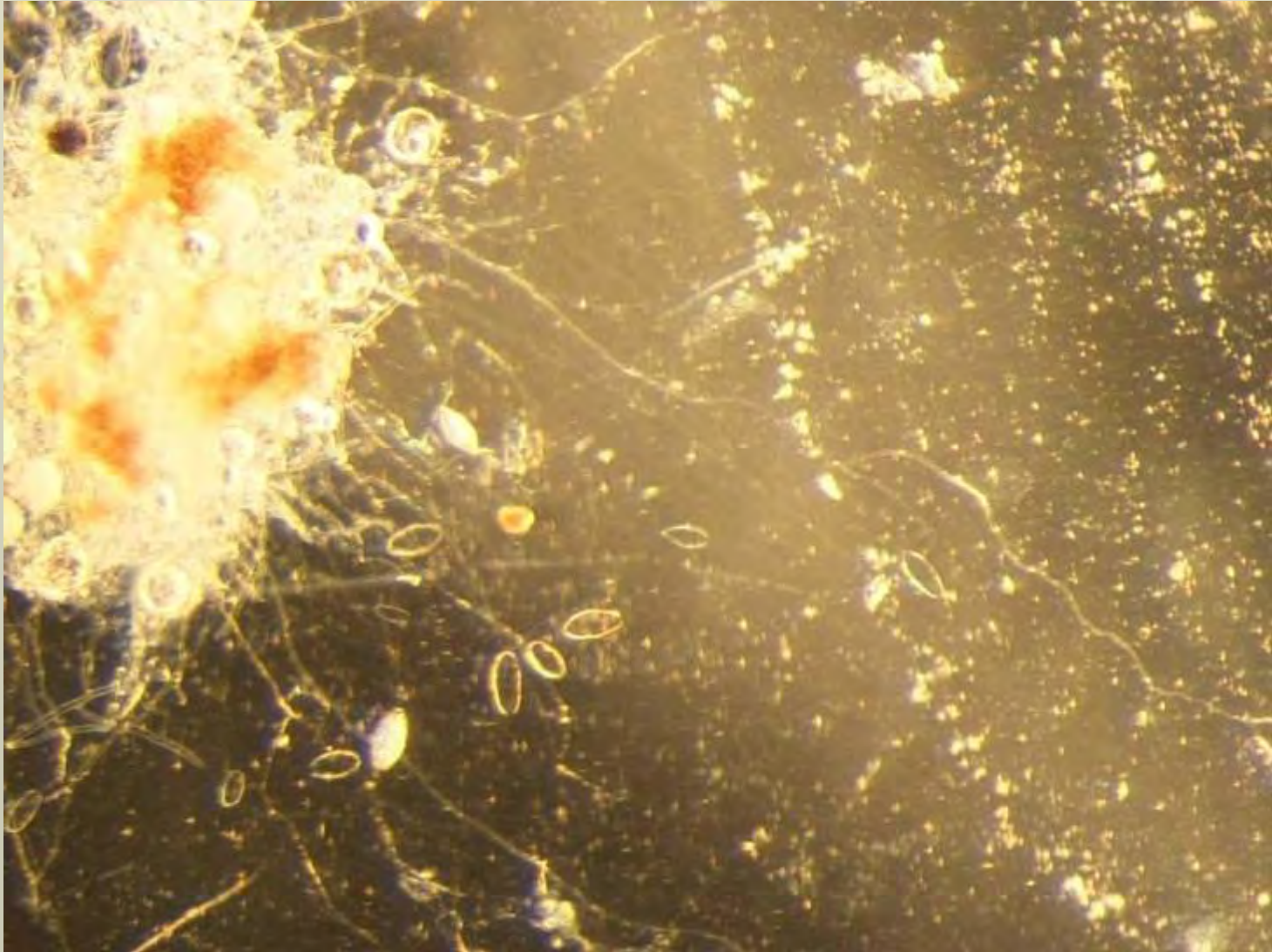
Photo: DEFRA



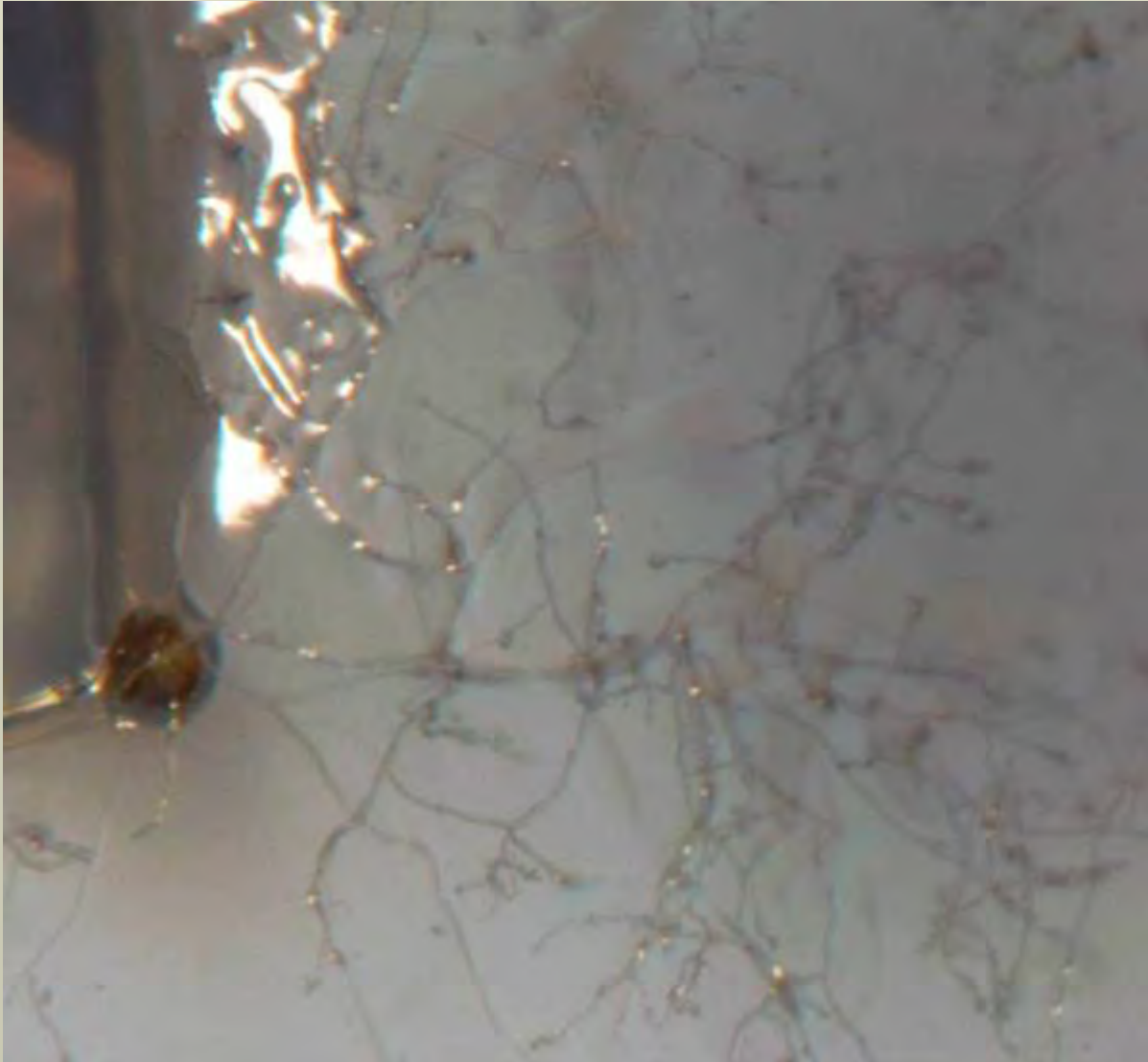
# *Phytophthora species*



# *Phytophthora ramorum*



# *Phytophthora ramorum*







# Susceptible Species\*

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Andrew's clintonia bead lily  
Ardisia  
Bigleaf maple  
California bay laurel  
California black oak  
California buckeye  
California coffeeberry  
California hazelnut  
California honeysuckle  
California maidenhair fern  
California nutmeg  
California wood fern  
Camellia species  
Canyon live oak  
Cascara  
Chinese witchhazel  
Coast live oak  
Coast redwood  
Douglas fir  
Drooping leucothoe  
European ash  
European beech  
European turkey oak  
European yew  
Evergreen huckleberry  
Evergreen maple  
False Solomon's seal  
Formosa firethorn  
Fetterbush

Goat willow  
Grand fir  
Griselinia  
Holm oak  
Horse chestnut  
Hybrid witchhazel  
Laurustinus  
Lilac  
Madrone  
Magnolia varieties  
Manzanita  
Michelia  
Mountain laurel  
Northern red oak  
Oregon ash  
Osmanthus  
Pacific yew  
Persian ironwood  
Pieris varieties  
Planetree maple  
Poison oak  
Portugese laurel cherry  
Red fir  
Red tip photinia  
Redwood ivy  
Rhododendron species

Roble beech  
Rugosa rose  
Salal  
Salmonberry  
Scotch heather  
Sessile oak  
Shreve oak  
Southern red oak  
Spicebush  
Spreading euonymus  
Star magnolia  
Strawberry tree  
Striped bark maple  
Sweet bay laurel  
Sweet chestnut  
Sweet Cicely  
Tanoak  
Toyon  
Viburnum varieties  
Victorian box  
Western maidenhair fern  
Western starflower  
White fir  
Winter's bark  
Witch hazel  
Wood rose  
Yew



# *Phytophthora ramorum* in North American Wildlands

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# Symptoms caused by *P. ramorum* differ on different hosts

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Sudden Oak Death  
affects members of the oak family  
(Fagaceae)

- True oaks (*Quercus* spp.)
- Tanoak (*Lithocarpus densiflorus*)
- Chestnut (*Castanea*) [Europe only]
- Beech (*Fagus*) [Europe only]

***P. ramorum* on coast live oak**





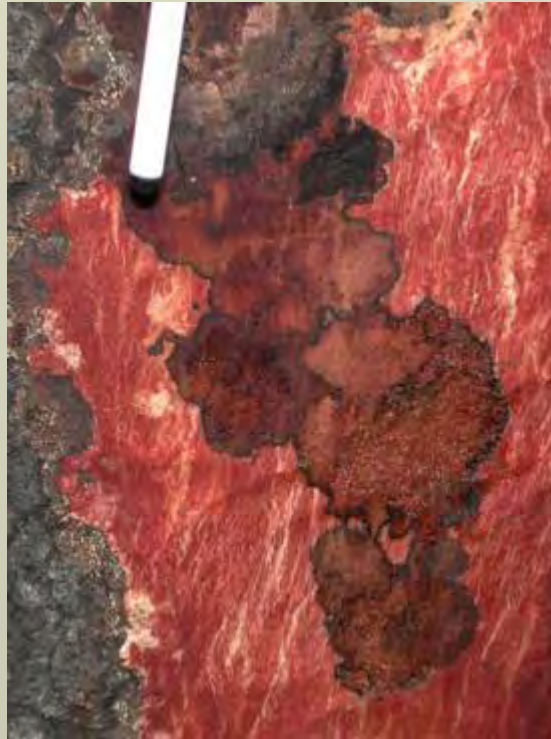
# *Phytophthora ramorum*



- 'Bleeding' or oozing on the bark
- Not associated with cracks in bark or insect holes
- Usually on the lower 6 ft. of tree trunks



# *Phytophthora ramorum*





# Other common diseases & injuries



- Bacterial wetwood
- Boring insects
- Mechanical injury
- Fungi

# Similar symptoms – not *P. ramorum*



outer bark



inner bark

Bleeding canker caused by *Armillaria*



# Similar symptoms – not *P. ramorum*



outer bark



inner bark

Bleeding canker caused by inner-bark boring insect

# Similar symptoms – not *P. ramorum*



outer bark



inner bark

Bleeding canker caused by *Inonotus hispidus*



# On other plant hosts, *P. ramorum* causes symptoms of foliar blight

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- Mountain laurel
- Viburnum
- Ferns
- *Vaccinium*
- Conifers
- etc...

*P. ramorum* symptoms on  
California bay laurel (*Umbellularia californica*)





# *P. ramorum* symptoms on kalmia (mountain laurel)



# *P. ramorum* symptoms on conifers



Grand fir



Douglas-fir





# Early detection & monitoring

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- Forest Service aerial survey





# Early detection & monitoring

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- Stream baiting







# Early detection & monitoring

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- Ground surveys





# Management Issues

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- Treatment







# Management Issues

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- Eradication





# Management Issues

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- Suppression







# Management Issues

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- Containment

