

# Thirty years of Sudden Oak Death: The Consequences of a Pathogen Invasion

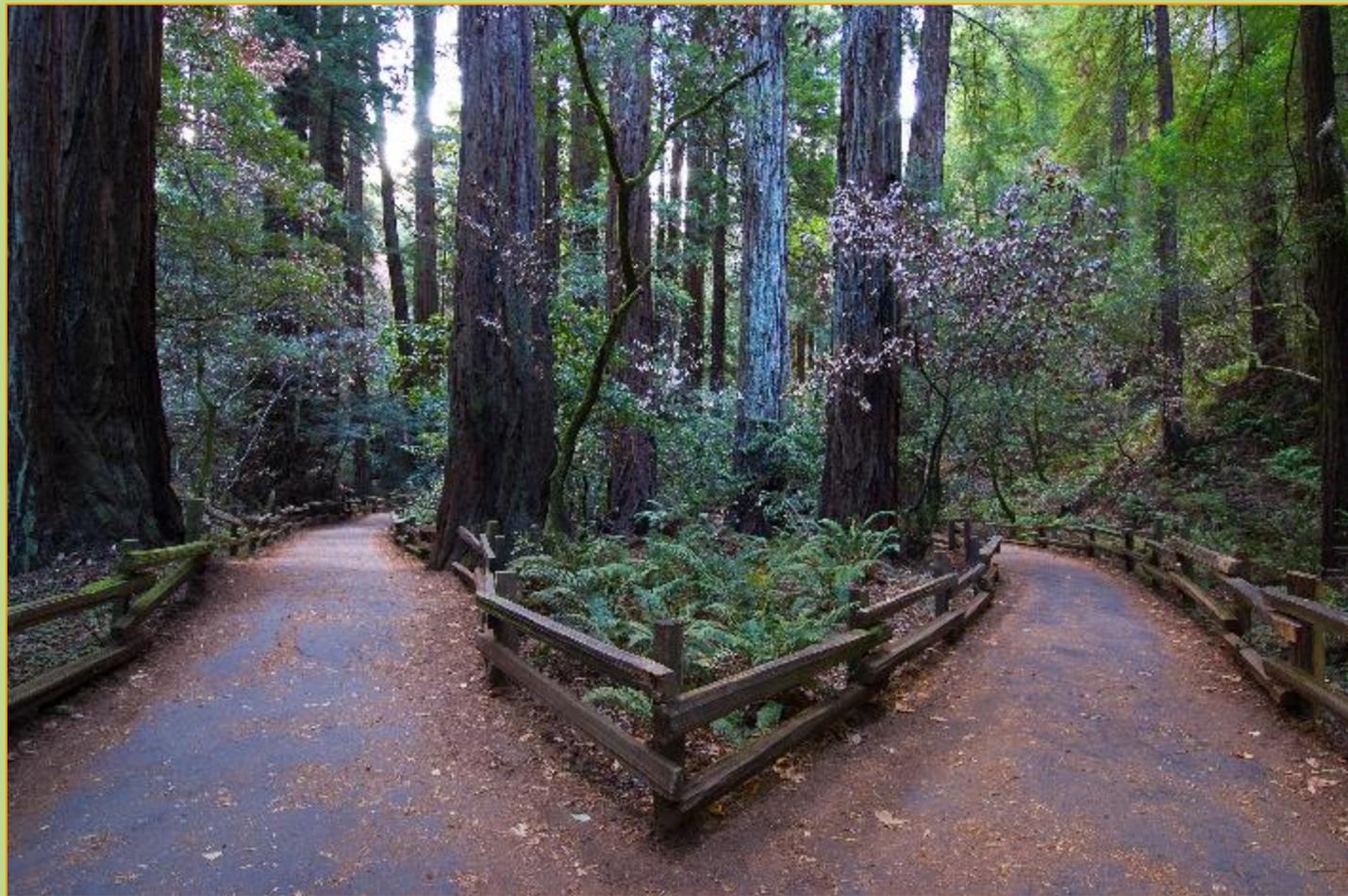


Photo: Stephen Joseph

Susan J. Frankel, USDA Forest Service, Pacific Southwest Research Station  
Albany, CA [susan.frankel@usda.gov](mailto:susan.frankel@usda.gov)





**Coast live oak, *Quercus agrifolia***

**Photo: Stephen Joseph**



**Coast live oak, *Quercus agrifolia***

**Photo: Steven Joseph**



# Sudden oak death, caused by *Phytophthora ramorum*



Photo: Marin County Fire Department

# Thirty years of Sudden Oak Death: The Consequences of a Pathogen Invasion

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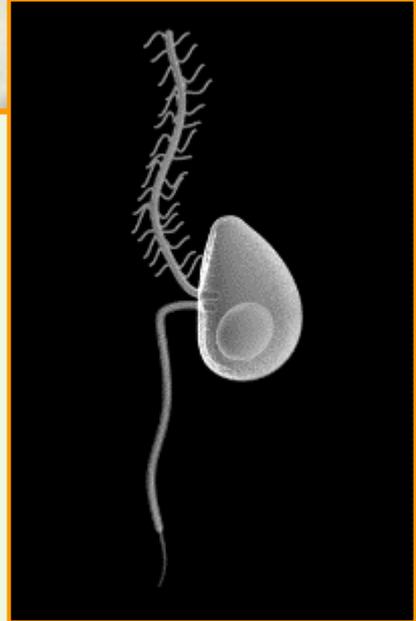
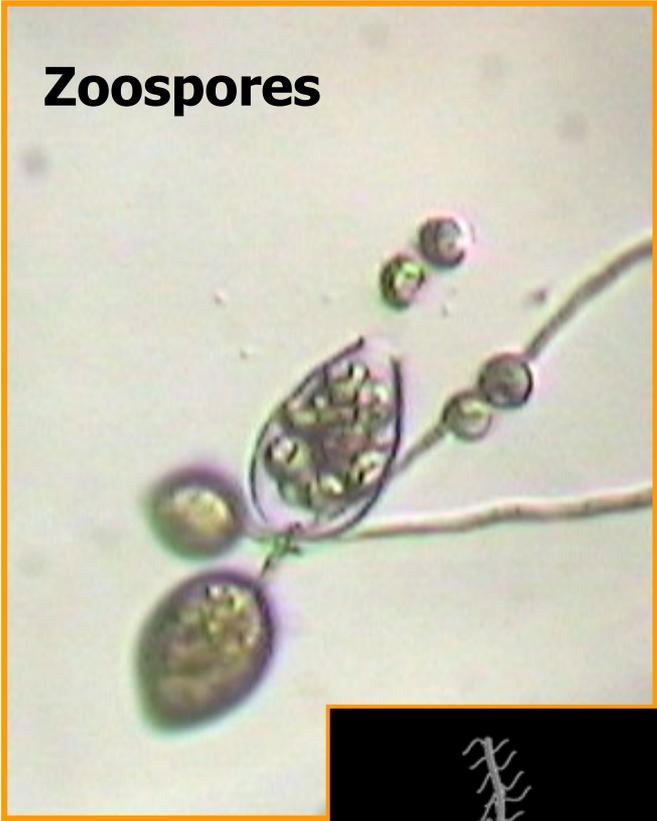
- 1) Background. What is *Phytophthora*? Pathogen. Diseases.
  - 2) Current status. A few consequences of introduction.
  - 3) Management approaches. Lessons learned.
- 

Conclusions...

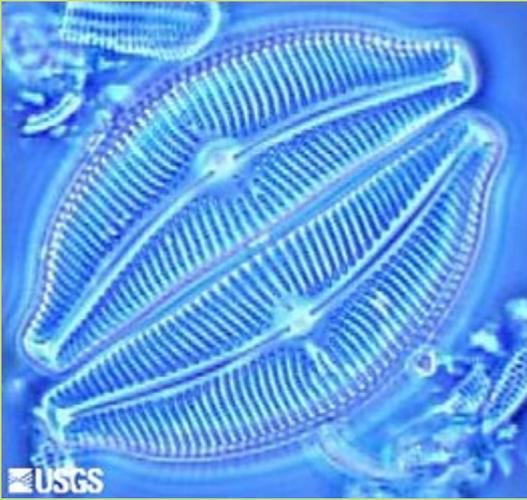
To prevent invasive species introduction & spread –  
stay engaged with regulators (& others).

Prevention = clean nurseries!

# What is *Phytophthora*?



Photographs: Rizzo, UC Davis & Garbelotto, UC Berkeley



# BROWN ALGAE and DIATOMS



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

✓ Sudden oak death, *Phytophthora ramorum*

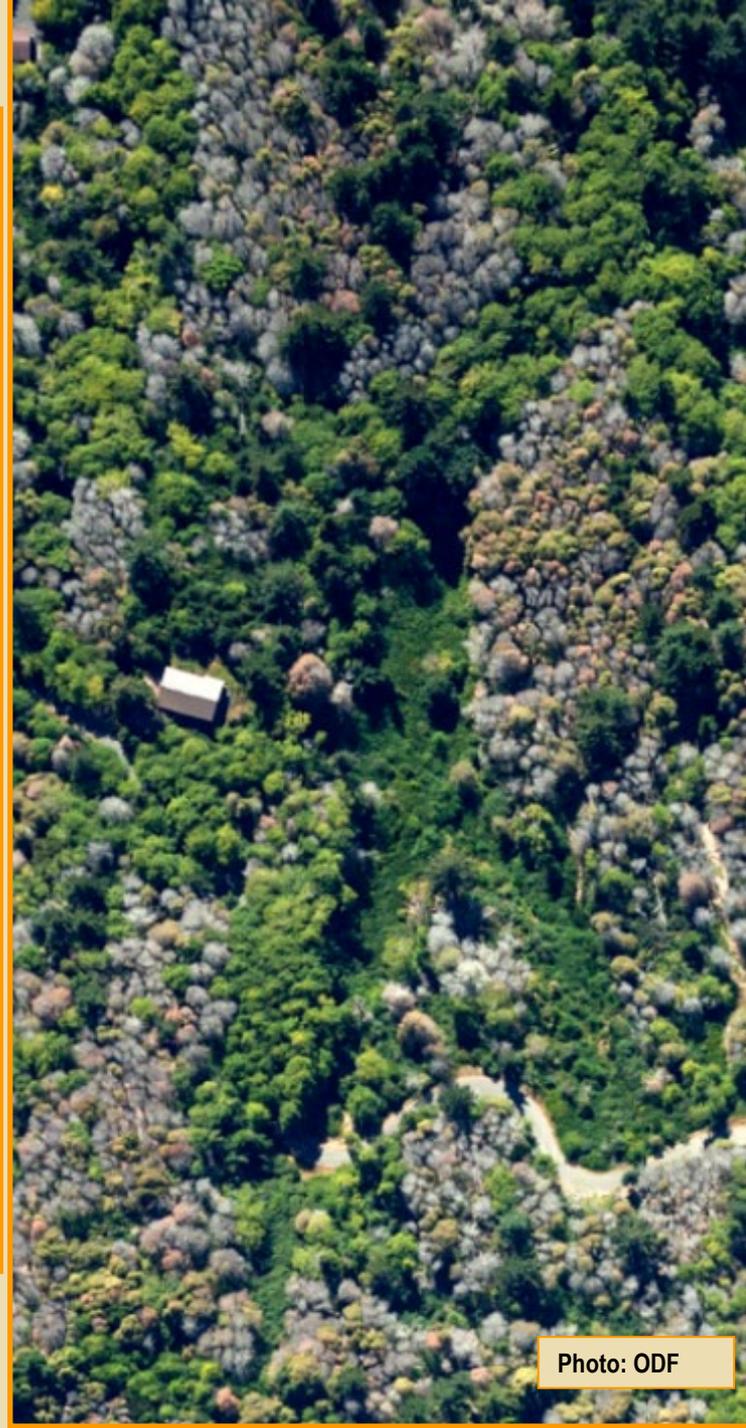
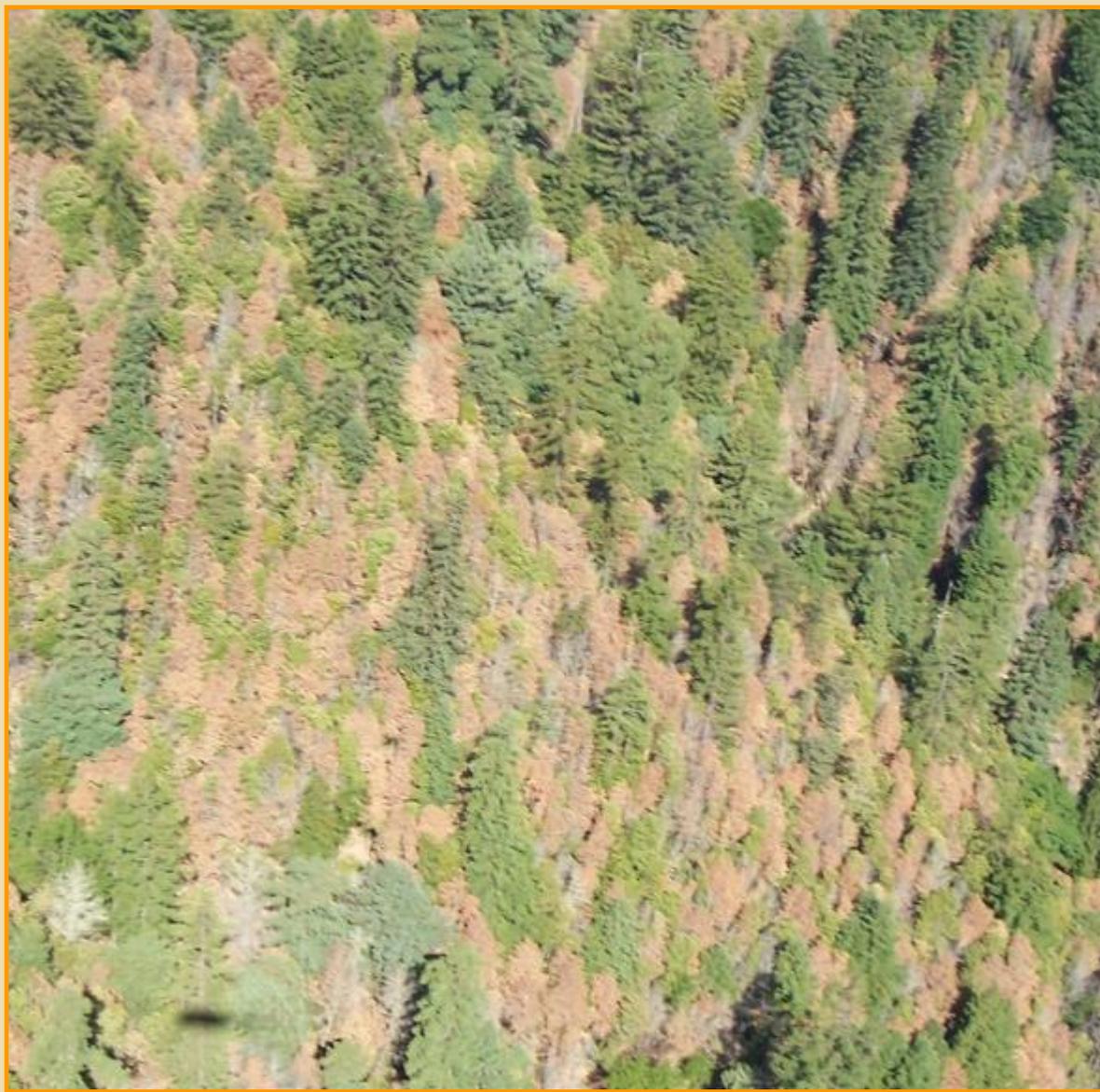
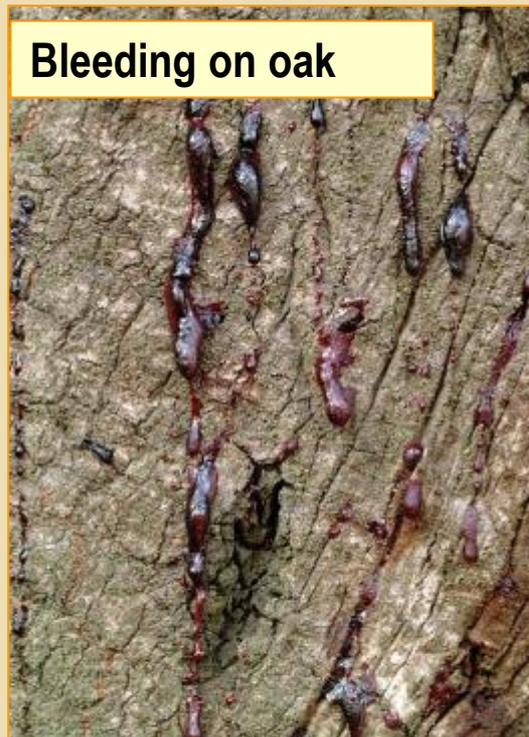


Photo: Marin Municipal Water District

Photo: ODF

# *Phytophthora ramorum* symptoms

Camellia leaf spot



Bleeding on oak



Canker on oak



Camellia leaf spot

Rhododendron



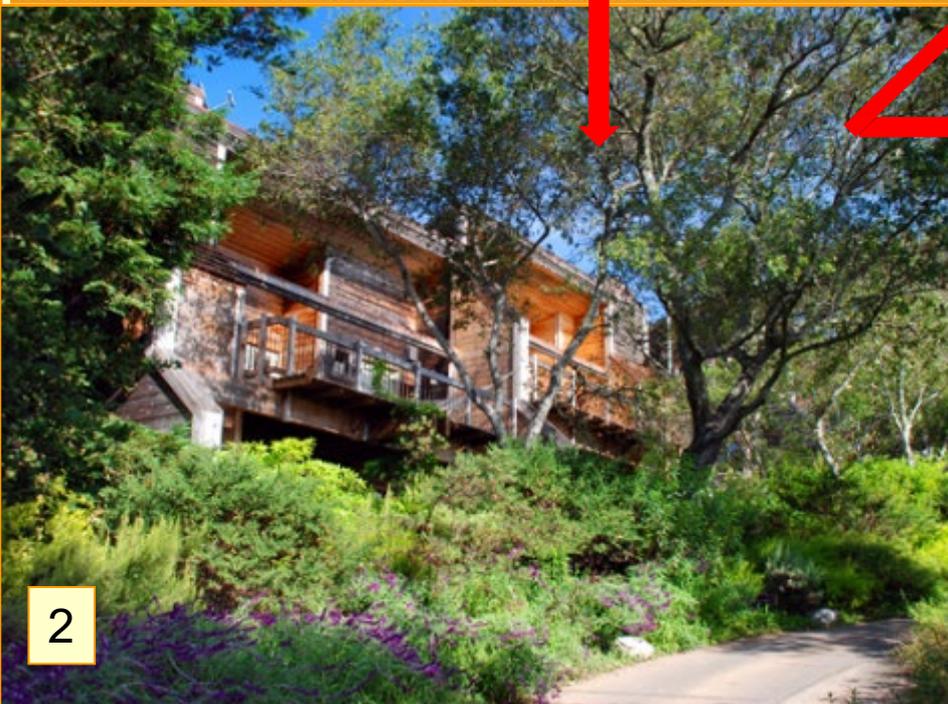
Leaf spot bay laurel



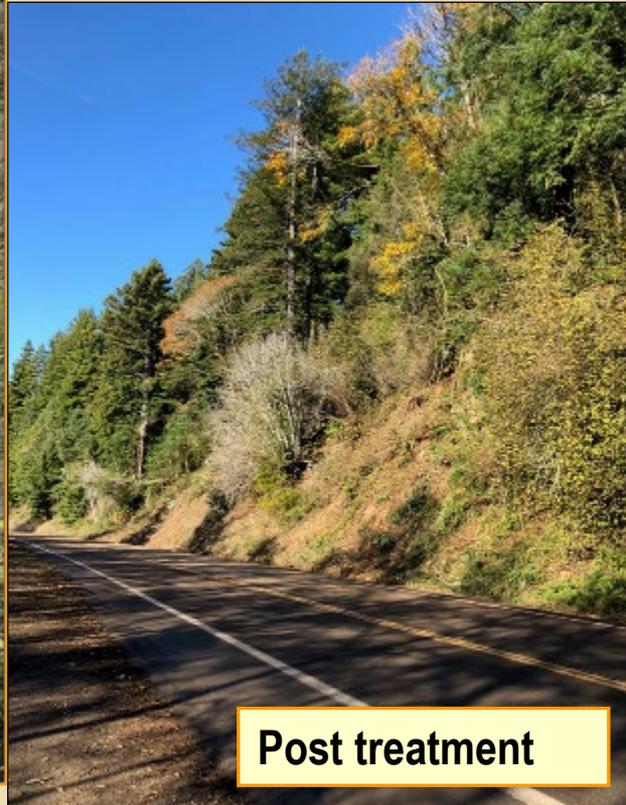
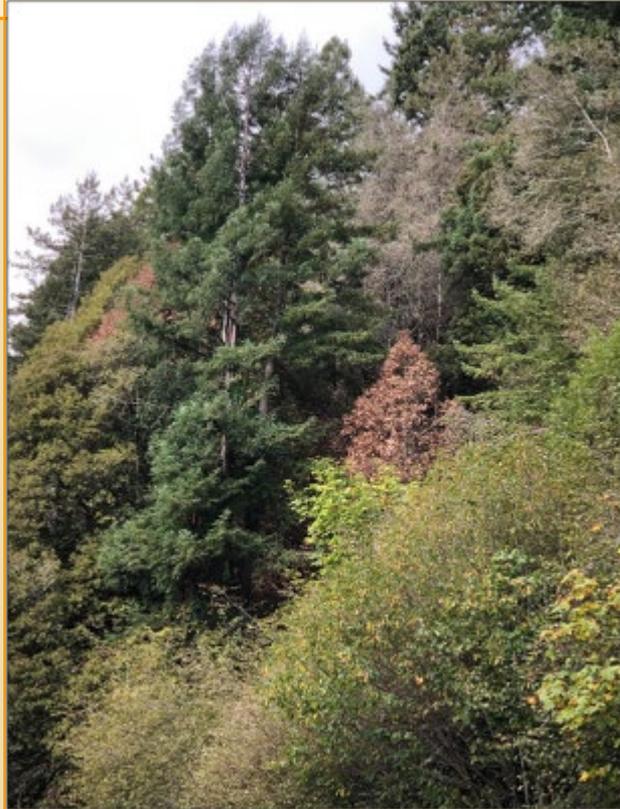
Maidenhair fern leaf spot

# Pathway for the SOD pathogen. [1980s?]

1. From Santa Cruz nursery. 2. Big Sur hotel 3. Los Padres NF



# 2020. First detection of EU1 *P. ramorum* in California on tanoak (Del Norte County)



Post treatment

Garbelotto, M., Dovana, F., Schmidt, D., Chee, C., Lee, C., Fieland, V., ... & Valachovic, Y. 2021. First reports of *Phytophthora ramorum* clonal lineages NA1 and EU1 causing Sudden Oak Death on tanoaks in Del Norte County, California. *Plant Disease* (Early view).



# 2019. First detection of NA2 *P. ramorum* lineage in Indiana (and 13 other states).



On Nursery plants

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DISEASE NOTES

## First Report of the NA2 Clonal Lineage of *Phytophthora ramorum* in Indiana



**FOX 59**

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## DNR finds oak tree killing fungal pathogen in rhododendrons

POSTED 7:34 PM, MAY 22, 2019, BY JOE HOPKINS

[☰](#) **St.LouisPublicRadio**

## Sudden Oak Death Pathogen Found In Illinois And Missouri



Photo: Indiana Dept of Natural Resources

# Consequence 1. Dead trees in CA & OR

## Sudden Oak Death Taking a Toll on U.S. West Coast

50 million dead trees and counting

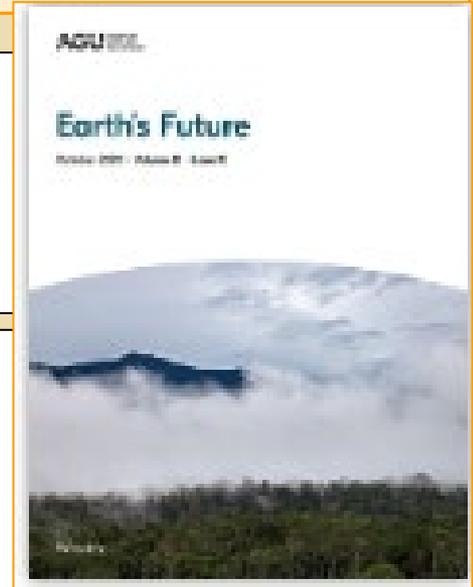
### Earth's Future

Research Article | [Open Access](#) |  

#### The Magnitude of Regional-Scale Tree Mortality Caused by the Invasive Pathogen *Phytophthora ramorum*

Richard C. Cobb , Sarah E. Haas, Nicholas Kruskamp, Whalen W. Dillon, Tedmund J. Swiecki, David M. Rizzo, Susan J. Frankel, Ross K. Meentemeyer

First published: 08 June 2020 | <https://doi.org/10.1029/2020EF001792>



### Earth's Future

Commentary | [Open Access](#) |  

#### More Trees Are Dying Due to Drought and Wildfire but Do Not Lose Sight of Forest Pathogens

Frank W. Davis 

First published: 05 October 2020 | <https://doi.org/10.1029/2020EF001792>

# Consequence 2. Challenge to nursery industry and to regulators (state agriculture depts & APHIS).



Photos courtesy of CDFA, ODA

# Consequence 3. Loss of tribal resources and well-being

- Fewer acorns. Loss of heritage trees.
- Fewer bay leaves and nuts (concerns for collection)
- Ecological damage in traditional gathering areas
- Physical hazard (falling trees) on tribal lands
- Bad karma. Spiritual depression.

Sierra Club photo



## Consequence 4. Threat to rare species & conservation, biodiversity collections.

Montara manzanita, *A. montaraensis*



Photo Credit T. Swiecki, E. Bernhardt- Phytosphere Research

Rebecca Gabriel

Manzanitas (*Arctostaphylos*) as host - first recognized in 2017 or so.

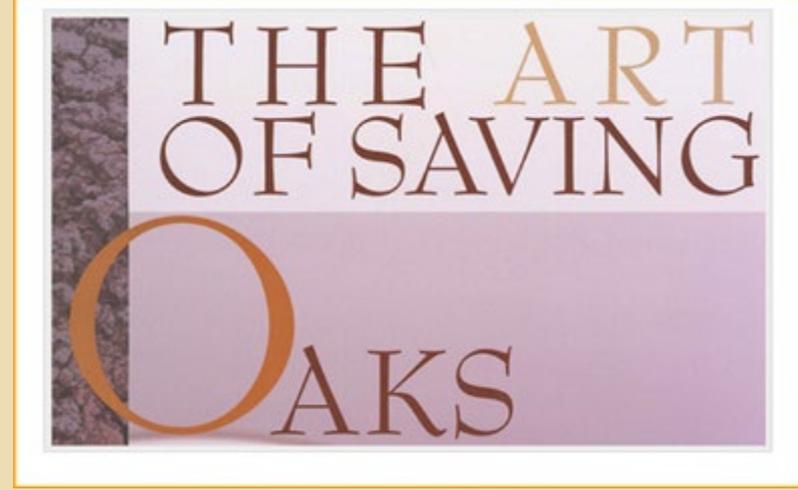
# Consequence 4. Threat to endangered species & plant conservation collections.



Berkeley, CA also Santa Cruz

RAINBOW MANZANITA  
( RARE & ENDANGERED )  
ARCTOSTAPHYLOS RAINBOWENSIS  
76.8 - ERICACEAE  
NORTH OF FALLBROOK  
SAN DIEGO COUNTY

# Consequence 5. “Spiritual” loss



**Sudden Oak Death piano  
“Sing for Hope”**



**Consequence 6. Challenge to parks, open space**

**Consequence 7. Homeowners & landowners**

**Consequence 8. Problem for green waste industry**

**Consequence 9. Problem for utility companies**

**Consequence 10. Risk of fire & to firefighters**



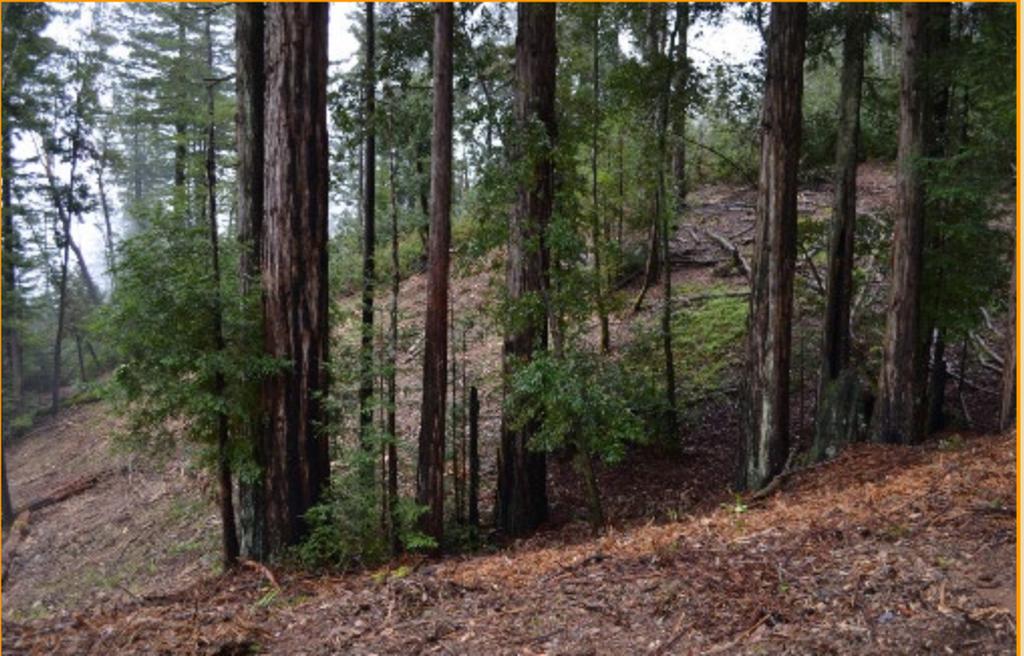
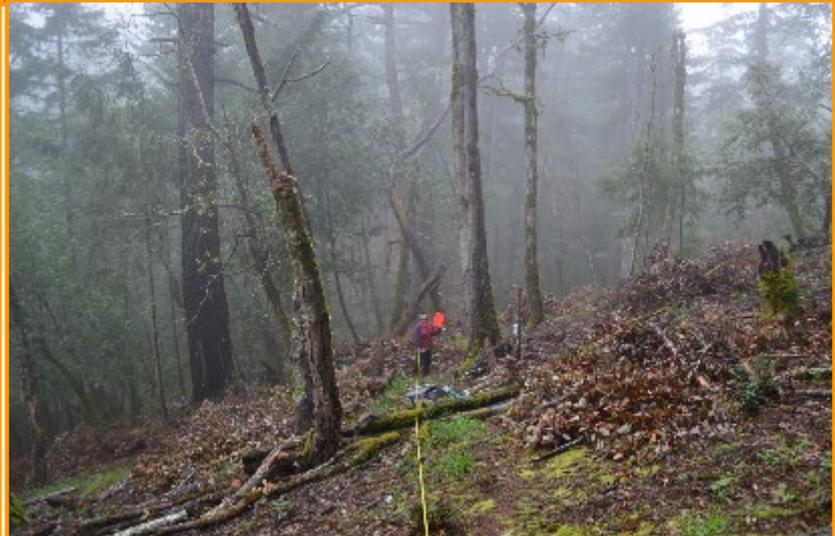
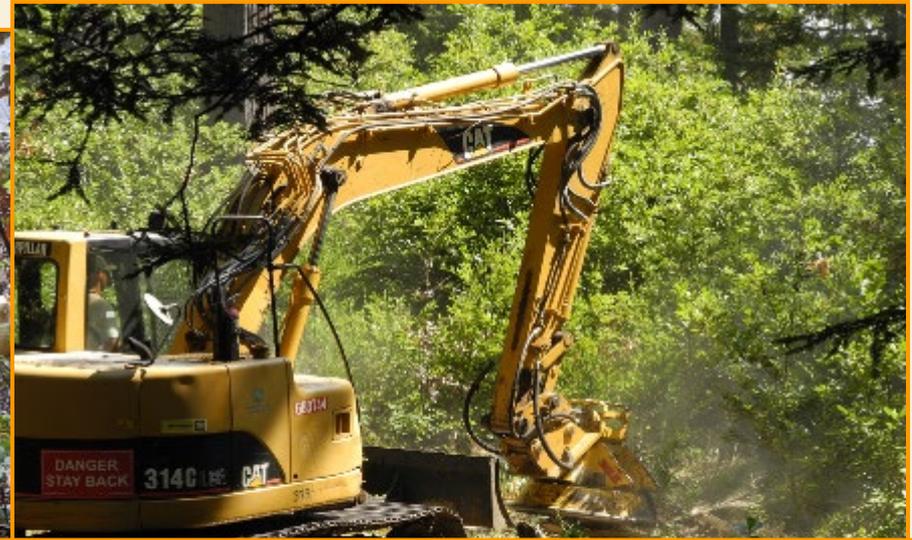
# Mandatory, state & federally funded eradication

# Management approaches - Oregon



## Management approaches – California. Mitigation.

# Restoration at Mt. Tamalpais, Marin Municipal Water Dept.



# Management approaches

- Early detection & hot spot eradication
- Removal of bay laurel
- Application of phosphonate
- Resistance development
- Soil Steaming in nurseries

Photo: Phytosphere Research



Photo: UC Berkeley Garbelotto lab

# Lessons learned – 30 years of SOD



- 1. Prevention is key. Management and eradication are difficult!**
- 2. Follow quarantine policy. Get to know plant regulators & lingo.**
- 3. Over time interest will shift to the next invader. Personnel will change. Keep a chronology. Track impacts, response, etc. Consolidate findings.**
- 4. Serve communities and people.**

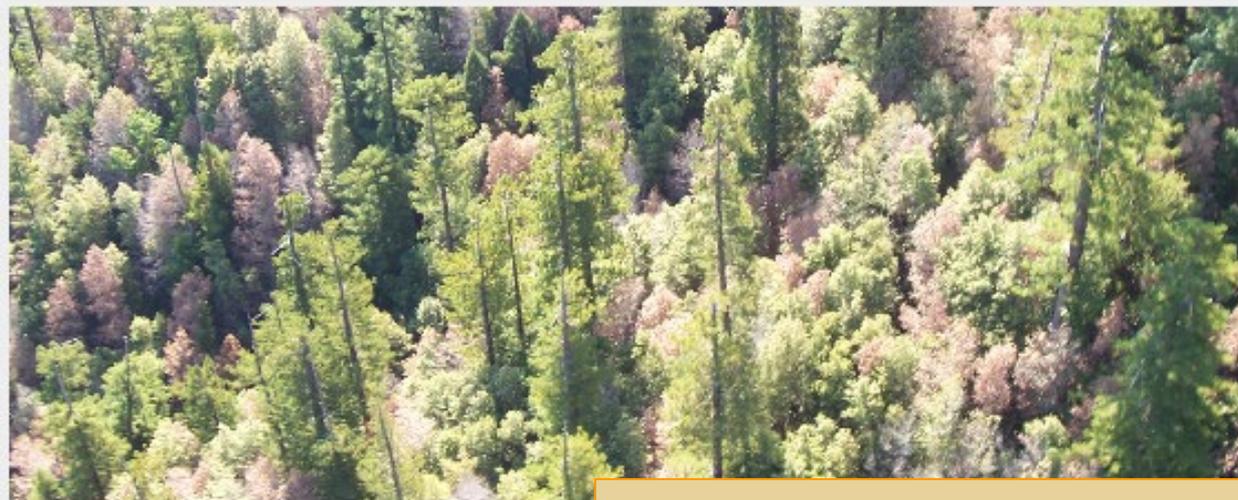


# California Oak Mortality Task Force



CALIFORNIA  
OAK MORTALITY TASK FORCE

Home What is Sudden Oak Death? Diagnosis and Management Maps & Visual Media Newslett



[www.suddenoakdeath.org](http://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 densiflorus*) and has had devastating effects on

coastal forests in California and Oregon. The pathogen also infects rhododendrons, camellias, and other

# Acknowledgements

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**Jessica Wright, USFS PSW**

**Ellen Goheen (retired), Sarah Navarro, USFS, FHP, PNW Region  
-and many others.**

**For info on sudden oak death: [www.suddenoakdeath.org](http://www.suddenoakdeath.org).**





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