Sudden Oak Death Update
for Foresters & Resource Managers

Inglenook
May 8, 2012
Sudden Oak Death

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UC Cooperative Extension-Humboldt/Del Norte Counties
Mid 1990’s: “Bleeding” and dying tanoaks and coast live oaks noted around SF Bay area (Marin and Santa Cruz Counties)

The press dubs this new disease Sudden Oak Death (SOD)
In summer 2000, an unfamiliar species of *Phytophthora* isolated from cankers on tanoaks and oaks.

In late 2000, it was discovered that the unknown *Phytophthora* spp. was same as new pathogen isolated from Rhododendrons in Europe: *Phytophthora ramorum*. 
Studies would later reveal that *P. ramorum* was most likely introduced into California’s wildlands from outplanted nursery stock.

The geographic origin of *P. ramorum* is still UNKNOWN.
All species of *Phytophthora* are pathogens of plants (*Phytophthora* = the Plant Destroyer)

- *P. infestans*: late blight of potatoes and tomatoes
- *P. lateralis*: Port Orford Cedar Root Rot
- *P. cinnamomi*: root rots of numerous tree species
- *P. pinifolia*: disease of Monterey pines in Chile
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**Oomycete:**

- Grow as fungal-like filaments
- Have many spore types, including motile zoospores
- Zoospores “swim” in water
Symptoms of *P. ramorum*: One pathogen, two diseases

**Sudden oak death**
- **Hosts**: Tanoak, coast live oak, black oak, Shreve oak, canyon live oak
- **Symptoms**: bleeding stem cankers on mature trees; sudden death of canopy with dead leaves retained on tree; stem breakage and failure
- Generally always **fatal** to hosts, but some individuals show resistance

**Ramorum leaf blight**
- **Hosts**: Many!!! From ferns to redwoods and nearly everything in between
- **Symptoms**: necrotic spots on leaves and stem; shoot dieback
- Rarely fatal to hosts
Regulated hosts of *P. ramorum*

- Bay laurel
- Bigleaf maple
- California bay laurel
- California black oak
- California buckeye
- California coffeeberry
- California honeysuckle
- California maidenhair fern
- Camellia - all species, hybrids and cultivars
- Camphor tree
- Canyon live oak
- Cascara
- Coast live oak
- Coast redwood
- Douglas fir
- European ash
- European beech
- European turkey oak
- European yew
- Evergreen huckleberry
- False Solomon’s seal
- Goat willow
- Griselinia
- Holm oak
- Horse chestnut
- Lilac
- Madrone
- Manzanita
- Michelia
- Mountain laurel
- Persian ironwood
- Pieris
- Planetree maple
- Red tip photinia
- Rhododendron (including azalea)
- Scotch heather
- Shreve’s oak
- Southern red oak
- Sweet chestnut
- Tanoak
- Toyon
- Viburnum
- Western maidenhair fern
- Western starflower
- Witch hazel
- Wood rose
Regulated hosts native to North Coast

- Bay laurel
- Bigleaf maple
- California bay laurel
- California black oak
- California buckeye
- California coffeeberry
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- Camellia - all species, hybrids and cultivars
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Symptoms on California bay laurel

*P. ramorum* sporulates on and spreads from bay but does NOT have any effect on health of bay
Symptoms on coast live oak

*P. ramorum* does NOT sporulate on coast live oak: A dead-end host
Symptoms on tanoak

Dual function host:
1. Hosts Ramorum leaf blight and spreads the pathogen
2. Dies from sudden oak death
Symptoms on evergreen huckleberry
Symptoms on conifers

Redwood

Douglas-fir
Symptoms on Rhododendrons

a) Leading edge

b) 

c) 

d)
Symptoms on *Camellia*
Symptoms on *Pieris*

- Symptoms often at terminal tips of leaflets
- Twig die-back
How *P. ramorum* reproduces on hosts
The sporangia release zoospores
Proposed Disease Cycle for *Phytophthora ramorum* in Forests

Illustration by N. Ochial

* not drawn to scale
Pathogen dispersal in the forest

- Spores form on bay laurel leaves and tanoak twigs in tree canopies
- Blown by windy rain and air currents
  - Usually 5-10 meters from host
  - Sometimes much further
- These spores infect susceptible hosts that they land on
- Most spores produced in spring time during warm rains
Many modes of pathogen movement

- Naturally in wind and rain
- In soil
- On shoes, tires, and equipment
- In water!
- Via human movement of infected plants
The Latest in the SOD Regulatory World

Mark Stanley
Chair, California Oak Mortality Task Force
Chief Deputy Director CDF (Retired)
RPF 1736
Regulations 101

State vs. federal regulations
Quarantined counties
Bole hosts vs. foliar hosts
Movement inside the 14 counties
Movement outside the 14 counties
### Quarantined Counties

<table>
<thead>
<tr>
<th>Humboldt</th>
<th>Contra Costa</th>
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<tbody>
<tr>
<td>Mendocino</td>
<td>Alameda</td>
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<td>Sonoma</td>
<td>San Francisco</td>
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<td>Marin</td>
<td>San Mateo</td>
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<td>Napa</td>
<td>Santa Cruz</td>
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<td>Solano</td>
<td>Monterey</td>
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Federal vs. State

Federal Regulation - USDA Agricultural and Plant Health Inspection Service (APHIS)

California Department of Food and Agriculture (CDFA)

They are “Harmonized”

Both enforced by Ag Commissioner
Regulated material cannot move outside of the quarantined area without some action.

- This could be an inspection
- Free from protocol
- Mitigation or treatment

Purpose is to not have this disease/pathogen move through human means.
Bole cankers on coast live oak, Shreve’s oak, tanoak, black oak, do not sporulate and therefore do not present a risk for spreading the infection, but they are still regulated.

Foliar hosts such as bay, madrone, huckleberry, poison oak, tanoak, yew, salmonberry, … are the inoculum source for this disease to infect the trees.

Redwood, Douglas fir, grand fir, are confirmed foliar hosts but only needles and twigs <1” are regulated for these… for now.

Foliar Symptoms
Mainly pertains to nursery products but may include other products:

- burls, wreaths, spices, greens, xmas trees

Seeds are not regulated.
“Free From” Protocol

Currently done in and around nurseries in quarantined counties’ “Pest Free Zone”. Currently available in forests for movement within the state. Proposed to APHIS for those counties that are not generally infested. (Still waiting for action from APHIS).
Different for different products

Wreaths - boiling or vacuum treatment
Tanoak, debarking, kiln drying, fumigation ...

Other bole hosts - debarking

Movement will require some kind of phytosanitary certificate so the receiving party is assured that there is no risk of spread.
Redwood and Douglas fir, grand fir, logs:
Logs are not regulated but they must be free of leaves, needles and twigs if leaving the 14 counties.

Tanoak - The whole tree is regulated and must be debarked to move or have some other mitigation, depending on destination.

Douglas fir and redwood cones
The seeds and cones are not regulated but as with logs, needles must be removed to ship out of California.
Christmas trees - Douglas fir, grand fir, red fir....
Treated as nursery stock and farm is inspected prior to season.

Df boughs for wreaths are regulated as a product and have to be inspected.

The bottom line is that a regulated host has to be treated or mitigated and inspected in order to move out of the 14 counties.
Douglas fir, western hemlock, Port Orford cedar, and Japanese & European larch have been found as bole hosts in the UK. Sitka spruce has been found as foliar host. In the past these would have been put on the host list by APHIS, but that has not happened yet. Could have significant impact on the timber industry on the west coast. Debarking at a minimum, manufacturing in the 14 county area only, and potentially kiln drying.
Stay Tuned

www.suddenoakdeath.org

California Oak Mortality Task Force