Sudden Oak Death (SOD): Biology and Current Situation

GGIA/GDA Town Hall Meetings

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Oak trees killed in California

SOD History in California

- Tanoaks, and then coast live oaks, began dying in 1995 in central and northern coastal California counties.
- *Phytophthora ramorum* was identified as the cause of the tree death in 2000.
- Pathogen found in Oregon, Washington, British Columbia, and in Europe (Germany, Spain, Poland, Belgium, Sweden, Italy, Netherlands) and the United Kingdom.
- Mostly in ornamental nurseries

Phytophthora ramorum

- Different from other *Phytophthora* species
- Attacks primarily above ground
- Produces chlamydospores (survival spores) and dehiscent sporangia

Spread and Infection

- **Spread**
  - Short distance dispersal by wind-driven rain, irrigation water splash and run-off (puddles)
  - Long distance dispersal in contaminated soil, ornamental nursery stock, and possibly rivers and streams
- **Infection**
  - Requires wet surfaces for infection
  - Prefers cool temperatures (50-65 °F)
  - Can withstand heat and drought
What is Sudden Oak Death?

- Potentially devastating disease that is lethal to oak trees
- Non-lethal disease on numerous forest under-story plants

Role of Non-lethal hosts

- Chlamydospores and sporangia are produced within leaf spots and leaf blights that are water-splashed and wind dispersed
- Leaf drop is also a symptom, which contaminates soil beneath infected plants
- Fungus has been recovered from soil contaminated shoes, tires, and clothing

California bay laurel/Oregon myrtle

- Primary sporangial host in CA and OR
- Abundant sporangia and chlamydospores produced during cooler, wet weather

Other oak forest under-story plants

- Big-leaf maple
- California buckeye

Rhododendron: spots and blights

- P. ramorum-infected Rhododendron
Branch and stem dieback

P. ramorum-infected Viburnum tinus

Viburnum spp. can be killed

Pieris spp.

Camellia japonica and C. sasanqua

P. ramorum - Infected Camellia Leaves

Coral Delight

Silverwaves

Mrs. Charles Cobb

Sonanza
SOD shipped into Georgia in 2004
- March 2004, Monrovia Nursery (CA)
  - 26,000 camellias mostly to independent garden centers and Wight’s (Monrovia) Nursery
  - 17 confirmed positive sites
- July 2004, Means Nursery (OR)
  - Rhododendrons mostly to Lowe’s
  - No P. ramorum found
- October 2004, Hines Nursery (OR)
  - Over 30,000 rhododendron and Pieris
    mostly to Home Depot stores
  - No P. ramorum found

SOD in Georgia in 2005?
- 4 retail nurseries found with $P. \text{ramorum}$ infected plants
  - Kalmia latifolia
  - Camellia cvs. Jean May, Kramer’s Supreme
  - Rhododendron cvs. Bessie Howell, English Roseum, Catawbiense Boursault
- 3 of 4 received infected camellias in 2004

Current Quarantines and Regulatory Action
- Emergency Federal Order restricts movement of nursery stock from CA, OR, and WA nurseries
- Regulated and associated hosts cannot be shipped interstate without visual inspection and testing to be “free of Phytophthora ramorum”
- A minimum of 40 samples per nursery (symptomatic and/or asymptomatic) if growing host plants
  - No shipments until test results are returned and no $P. \text{ramorum}$ found
  - Can only import plants from other certified nurseries
- Visual inspection for nurseries growing non-hosts

Nursery Microclimate

SOD Diagnosis
- SOD cannot be diagnosed in the field or just by looking at plant symptoms
- Suspect samples need to be evaluated in a “certified” department of agriculture or state university plant disease laboratory

Photos by Cheryl Blomquist, CDFA

Sandy Jordan, USDA-APHIS
3-step Laboratory Testing

- **Culturing**
  - Upon receipt, symptomatic leaves are plated on artificial agar medium (PARP) that is semi-selective for Oomycetes

- **ELISA**
  - Leaves are ground and tested for presence of *Phytophthora* using antibodies.
  - Test is not specific for *P. ramorum*

- **PCR**
  - DNA is extracted from leaves, regardless if symptoms are present
  - A nested PCR process is completed on each sample to detect *P. ramorum* DNA

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**Phytophthora ramorum** Detection

- **Sample**
  - **ELISA**
    - Positive
    - **Culture**
    - Positive
      - Nested PCR
        - Positive
        - **P. ramorum DNA detected**
    - Negative
  - Negative
    - **Nested PCR**
      - Positive
      - **P. ramorum DNA detected**
    - Negative

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*P. ramorum*-infected *Kalmia latifolia* in GA retail nursery in 2005

*P. ramorum* also found in rhododendrons in adjacent shade house in second survey

Water-baiting stream adjacent to GA nursery to detect *P. ramorum*

Stream flows through residential and forested areas
No *P. ramorum* recovered within production nurseries in Georgia – Keep it this way!

SOD in GA residential landscapes?
- 3 confirmed positive (2 PCR, 1 culture) homeowner samples from Monrovia camellias in 2004
- No new home landscapes finds to date, but we are still asking for samples and testing plants
- All suspect and confirmed plants have been removed from the landscape
- Home landscape forested perimeter and soil sampling is being conducted

Concern for *P. ramorum* spread
- Natural vegetation with susceptible hosts
- Potentially-infected plants (Camellia)
- Stream

Will SOD spread in Georgia landscapes and forests?
- We don’t know, but it is likely
- Assumptions:
  - We don’t have the same sporangial hosts (spore-spreaders) as in CA, so it may not spread to our oaks as fast
  - It is too hot in most of GA to support natural spread (spread is more likely in nurseries)
  - Could be pockets of infection, but not widespread death

European similarity to probable spread in the Eastern USA
- Infected northern red oak tree in close proximity to infected rhododendron plants in the Netherlands
**SOD predicted spread in May**

**Situation Today**
- All infected and suspect-infected plants have been destroyed both in production and retail nurseries and landscapes.
- 2004 sites and any new finds in 2005 have been or are being surveyed, and surrounding natural vegetation, soil, and water have been sampled and tested for *P. ramorum*.
- No *P. ramorum* has been detected in the environment (soil, water or natural vegetation).

**SOD Symptoms:**

- “Bleeding” cankers on oak

**SOD and the GA green industry**
- Use best management practices to control *Phytophthora* disease - not just *P. ramorum* (SOD).
- Plant healthy plants, avoid overhead irrigation, plant in well-draining areas, reduce plant wetness.
- Fungicides: Subdue MAXX, Stature, Mancozeb, Aliette, Phosphonates.
- Do not introduce *P. ramorum* infected plants.
- Re-organize production operation if importing and growing plants from western USA or Europe.
- Keep plants segregated from GA-produced plants.
- Be prepared for possible compliance agreement restrictions and surveys.

**More information...**
- [www.suddenoakdeath.org](http://www.suddenoakdeath.org)
- Updated host lists
- Regulatory action
- News releases
- [www.invasive.org/sod/sod/cfm](http://www.invasive.org/sod/sod/cfm)

All images in presentation from CDFA, ODA or suddenoakdeath.org website.

**Questions?**

**Thank You**