Sudden Oak Death (SOD): Biology and Current Situation

GGIA/GDA Town Hall Meetings

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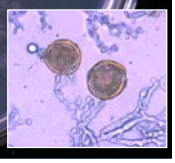
SOD History in California

- 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

California counties with confirmed naturally-occurring SOD

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

SOD shipped into Georgia in 2004

- March 2004, Monrovia Nursery (CA)
  - 28,000 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. 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. ramorum* found
  - Can only import plants from other certified nurseries
- Visual inspection for nurseries growing non-hosts

Photos by Cheryl Blomquist, CDFA

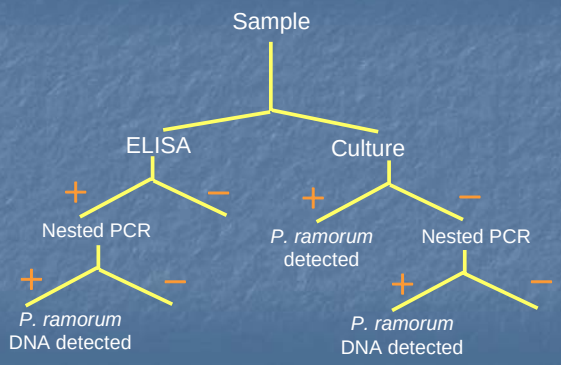
SOD Diagnosis

- 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

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

Phytophthora ramorum Detection



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

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

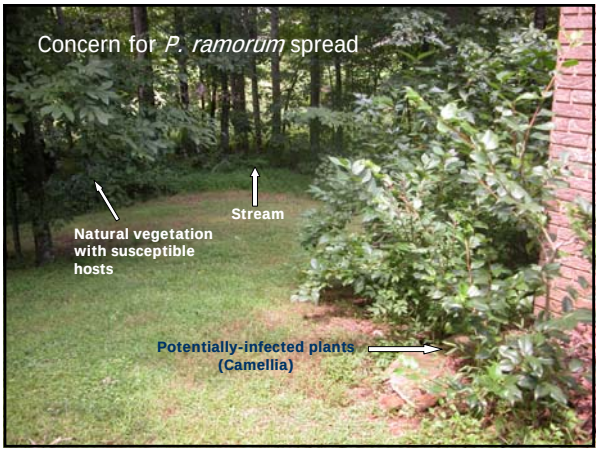
Water-baiting stream adjacent to GA nursery to detect *P. ramorum*

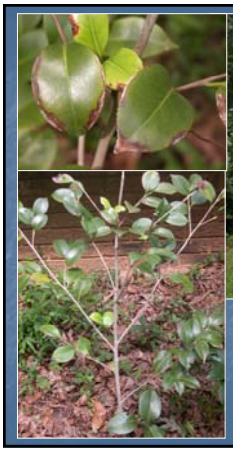
Stream flows through residential and forested areas

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



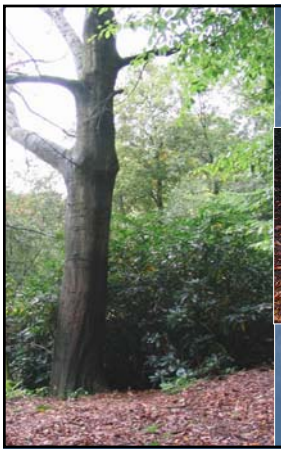


Suspect *P. ramorum* infected home landscape site, an example

Samples should be collected

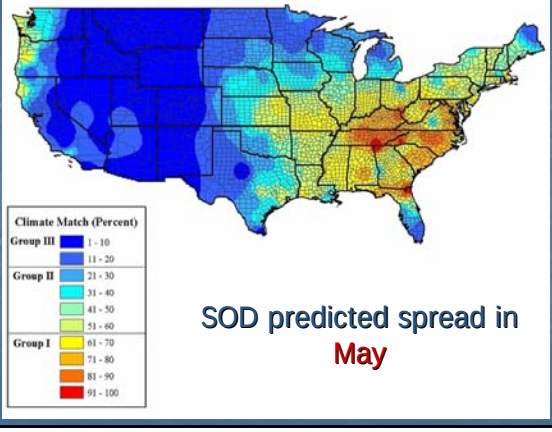
Will SOD spread in Georgia landscapes and forests?

- 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* diseases – 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
  - Use 2-meter rule of interspersing non-hosts or alleys between host plants
- Be prepared for possible compliance agreement restrictions and surveys

More information...

- www.suddenoakdeath.org
- www.aphis.usda.gov/ppq/ispm/sod
  - Updated host lists
  - Regulatory action
  - News releases
- www.invasive.org/sod/sod/cfm

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

Camellia symptoms

- Questions?
- Thank You