Technical Bulletin
Forest Health Notes # 39
Issued: 01/01/2011

Keep An Eye Out For Sudden Oak Death

Introduction

It has been over two years since our last Forest Health Note about Sudden Oak Death (SOD), so I thought it might be time to revisit this fungal disease that could pose a major threat to Mississippi forests. SOD was discovered in Germany and the Netherlands in 1993 on rhododendrons and viburnum. In 1995, the disease was discovered in California on tanoaks. Later it was also found in Oregon. The causative agent was eventually identified as *Phytophthora ramorum*, a previously un-described water mold. The origin of *P. ramorum,* the fungal pathogen responsible for SOD, is unknown. There were no reports of this fungus in the U.S.A. or Europe prior to the 1990's. The fungus can live and be spread through natural or human-mediated movement of infected plant material and soil, as well as natural movement of water and wind.

In the Western U.S., where it is primarily established, this disease was first noticed in tanoaks (*Lithocarpus densiflorus*). The rapid onset of symptoms (we will get to those in a minute) and tree death over widespread areas in the Western U.S.A. (Fig. 1.) earned the disease the moniker "Sudden Oak Death". Hundreds of thousands of

Figure 1: Tanoak mortality caused by *Phytophthora ramorum* on the Los Padres National Forest (Monterey County, CA).

Service (APHIS) because of their susceptibility to or association with SOD. Many of these are important Western species and/or horticultural species, such as tanoak, *Quercus agrifolia* (coast live oak), *Q. kellogii* (black oak), *Umbellularia californica* (California bay laurel), *Rhododendron* species, *Viburnum* species, *Camellia* species, grand fir (*Abies grandis*) and Douglas fir (*Pseudotsuga menziesii*)[1-5].

Some Eastern forest and landscape trees have also been shown to be susceptible to sudden oak disease as well, including some species from both the red and white oak groups. Southeastern forest trees that may be under threat from this pathogen are the southern magnolia (*Magnolia grandiflora*), southern red oak (*Q. falcata*), pin oak (*Q. palustris*), northern red oak (*Q. rubra*), white oak (*Q. alba*), cherrybark oak (*Q. pagoda*), chestnut oak (*Q. prinus*), laurel oak (*Q. laurifolia*), live oak (*Q. virginiana*), water oak (*Q. nigra*), and willow oak (*Q. phellos*)[6].

Widespread susceptibility of many Eastern forest and landscape trees and shrubs makes establishment of SOD to Mississippi or other Southeastern States a very real and frightening possibility. Research has shown the pathogen to be capable of reproducing in a wide range of climatic conditions, indicating *P. ramorum* should have no trouble coping with climate in Eastern U.S. forests if it were to become established here. Additionally, the susceptibility of many popular horticultural plants such as camellias, rhododendrons (including azaleas), and viburnums has already lead to the pathogen being spread to some eastern states, such as Georgia, Florida, the Carolinas, and Mississippi. In these locations, *P. ramorum* was usually detected in potted plants, soil, and water in and/or adjacent to a nursery that had unknowingly obtained infected stock. **Luckily, the pathogen is not yet established in natural forests in Mississippi or elsewhere in the Eastern U.S.**, although runoff from one affected nursery in Jackson, MS

has consistently tested positive for the presence of *P. ramorum*.

As noted in a previous MFC forest health note (http://www.mfc.ms.gov/pdf/Mgt/FH/2008/TB10-SuddenOakDeath.pdf), appropriate eradication actions were taken to eliminate the pathogen from the nursery. It is still not known if *P. ramorum* will become established in wilder portions of Mississippi, but these detections increase our level of concern about this organism. Agencies such as the USDA Forest Service and APHIS continue to closely monitor the situation at this time.

This brings us to the reason I chose this topic: the foresters, arborists, gardeners, and general public of Mississippi are the first line of defense for many forest health problems that we face. University researchers, Mississippi Forestry Commission personnel, County Extension Agents, and other professionals can't be everywhere at once, so it is often the observant private individual who first notices new problems such as SOD.

Signs and Symptoms

Signs and symptoms of SOD are somewhat difficult to identify because there are two categories of hosts for *P. ramorum*: Bark canker hosts characterized mainly by oaks, and foliar hosts such as camellias, rhododendrons, and magnolias, among many others (Fig. 2). Bark canker hosts become infected on the woody portions of the tree, forming lesions called cankers that

Figure 2: Bark oozing from canker caused by sudden oak death, *Phytophthora ramorum*. Photo: Joseph O'Brien, USDA Forest Service, Bugwood.org

usually lead to death by girdling the stem. The tree can die rapidly, sometimes within a few weeks, or linger on for a year or more. Bark cankers caused by *P. ramorum* have characteristic oozing and weeping of dark reddish brown liquid (Fig. 2).

Other less harmful cankers and diseases of oaks exist in the Eastern U.S., and should not be confused with SOD. Trees afflicted with SOD will exhibit cankers and oozing on the bark, but usually not associated with bark crevices or insect holes. If the outer bark is scraped away, a dark brown necrotic lesion surrounded by a dark line is visible in the inner bark (Fig. 3). Once the canker girdles the tree, the leaves turn brown and the entire crown dies. The cankers are often attacked by other organisms such as ambrosia beetles and other decay fungi once they are weakened by *P. ramorum*.

In foliar and twig hosts, symptoms can range from leaf spots (Fig. 4) to twig dieback, but these hosts rarely die from the infection. Infection on foliar hosts is indicated by dark grey-to-brown lesions. These lesions can occur anywhere on the leaf blade, in vascular tissue, or on the petiole. Petiole lesions are often accompanied by stem lesions. Some hosts with leaf lesions defoliate and eventually show twig dieback. Symptoms on these hosts vary depending on the species, but generally there is discoloration of the leaves, or leaf spots, often near the tips. Sometimes whole braches can be affected.

Figure 3: Localized area of necrotic inner bark typical of bark canker hosts of sudden oak death (*Phytophthora ramorum*). Note the characteristic dark borderline between healthy and unhealthy tissue. Photo: Joseph O'Brien, USDA Forest Service, Bugwood.org

Management and Control

Since there is no known cure for oaks infected with *P. ramorum*, control measures have focused on regulation (quaranines), detection, eradication, and education. Federal and State entities are continuing to monitor nurseries throughout the Country for new cases of sudden oak death. When new infestations are discovered, extensive eradication and quarantines are enacted, and have been fairly successful at containing the

disease in the Western U.S., as well as when it has been intercepted in Southeastern States.

Figure 4: Foliar blight caused by *Phytophthora ramorum*. Photo: Joseph O'Brien, USDA Forest Service, Bugwood.org

P. ramorum can utilize many common horticultural plants as hosts, . Nurseries in California, Oregon, and several other States and Countries have reported the pathogen on their plants. Federal and State quarantines have been enacted to control the spread of SOD while its range of infestation remains relatively localized. For example, all *P. ramorum* host plants in California's regulated counties must be inspected and approved prior to shipment out of the regulated area.

Gardeners can do their part to slow the spread of the disease by carefully inspecting the leaves of host plants for symptoms before making a purchase from a nursery, especially if the plant is on the list of regulated host plants (http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/downloads/pdf_files/usdaprlist.pdf). **Purchase your plants only from reputable nurseries** that obtain their stock from certified disease-free distributors.

Many nurseries use fungicides as a normal rule of practice that can inadvertantly mask *P. ramorum* symptoms (but will not cure the plant), and some plants could have infections that might not be visible at the time of purchase. Consider quarantining the new plant in a container or secluded area of your yard for up to 8 weeks to see if symptoms manifest before you transplant it to its permanent home. Additionally, you might want to refrain from planting any of these horticultural hosts near susceptible oaks in your yard.

Two other simple rules will not only help to protect Mississippi from being invaded by sudden oak death, but also numerous other destructive non-native forest insects and diseases. The first is to ***never move firewood*** long distances. Don't take Mississippi firewood with you during your summer camping trip, and definitely don't bring any back here with you! Obtain your firewood from local sources, and either use it all or leave it behind! There is plenty more firewood wherever you are going, except for maybe Antarctica.

Secondly, practice good sanitation measures if you are traveling to areas of California or Oregon that are known to be infested with sudden oak death (see range map at: http://fhm.fs.fed.us/sp/sod/maps/pramorum_early_detection.pdf). If hiking in infected areas, boots should be scrubbed with a disinfectant such as bleach to kill any fungus present in the soil before you come home. Lastly, please don't bring back any plant material with you either!

For more information

Contact your Mississippi Forestry Commission Local Office or Dr. John J. Riggins johnjriggins@gmail.com

Other Sources of Information

- http://www.suddenoakdeath.org/
- http://www.na.fs.fed.us/sod/
- http://www.aphis.usda.gov/hungrypests/suddenOakDeath.shtml
- http://www.na.fs.fed.us/spfo/pubs/pest_al/sodeast/sodeast.htm

References

1. Brasier, C. M., Denman, S., Rose, J., Kirk, S. A., Hughes, K. J. D., Griffin, R. L., Lane, C. R., Inman, A. J., and Webber, J. F. 2004. First report of ramorum bleeding canker on *Quercus falcata*, caused by *Phytophthora ramorum*. Plant Pathol. 53:804.
2. Kirk, S. A., Brasier, C. M., Barton, V. C., Hughes, K. J. D., and Webber, J. F. 2005. *Phytophthora ramorum* on *Quercus ilex* in the United Kingdom. Plant Dis. 89:1241.
3. McPherson, B. A., Mori, S. R., Wood, D. L., Storer, A. J., Svihra, P., Maggi Kelly, N., and Standiford, R. B. 2005. Sudden oak death in California: disease

progression in oaks and tanoaks. For. Ecol. Manage. 213:71-89.

4. Rizzo, D. M., Garbelotto, M., Davidson, J. M., Slaughter, G. W., and Koike, S. T. 2002. *Phytophthora ramorum* as the cause of extensive mortality of *Quercus* spp. and *Lithocarpus densiflorus* in California. Plant Dis. 86:205-214.
5. Rizzo, D. M., Garbelotto, M., Davidson, J. M., Slaughter, G. W., and Koike, S. T. 2002. *Phytophthora ramorum* and sudden oak death in California: I. Host relationships. Pages 733-740 ***in***: 5th Symp. California Oak Woodlands. R. Standiford and D. McCreary, eds. U. S. For. Serv. Gen. Tech. Rep. PSW-GTR-184.
6. Tooley, P.W., and K.L. Kyde. 2007. Susceptibility of Some Eastern Forest Species to *Phytophthora ramorum*. Plant Disease 91: 435-438.