

Sudden Oak Death (*Phytophthora ramorum* Blight)

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Introduction

Sudden oak death (SOD) is caused by the fungus-like organism *Phytophthora ramorum*. This non-native pathogen was previously unknown and recently introduced to the United States. It was first identified in 1993 in Germany and The Netherlands from ornamental rhododendrons.

The disease was first reported in the U.S. in 1995 in the central coastal area of California and was associated with the death of thousands of tanoaks (*Lithocarpus densiflorus*), California black oaks (*Quercus kelloggii*) and coast live oaks (*Quercus agrifolia*) (Figure 1). *Phytophthora ramorum* was isolated and confirmed in 2000 from the dying oaks and tanoak trees in California.



Figure 1. SOD symptoms on tanoak.
(Joseph O'Brien, USDA FS, Bugwood.org)

Since its discovery in California, SOD has also been confirmed in forests and ornamental nurseries in Oregon, Washington and British Columbia. The host range of this

pathogen encompasses more than 100 plant species, including forest trees and many woody ornamentals. Tanoak is the most susceptible bark canker host for the pathogen. Woody shrub hosts include rhododendron, camellia, viburnum, pieris, kalmia and lilac.

The fungus-like microorganism spreads by wind and windblown rain or splashing water. It has also been shown to spread by contaminated irrigation water, soil and potting mix. Wet, cool and windy conditions favor pathogen survival and spread by the microscopic spores produced by the pathogen. Long-distance spread is primarily by infected nursery stock moving from areas where the pathogen has been found. The disease has since appeared in various nurseries and garden centers outside the original states of discovery.

The SOD pathogen was confirmed in Arkansas in 2004 from nursery material shipped from an out-of-state area where the pathogen was previously reported. State regulatory agencies were able to swiftly isolate and eradicate the infected plant material.

Symptoms

Phytophthora ramorum produces two distinct types of diseases: bark cankers that can kill the host plant and foliar blights that can serve as a reservoir for the pathogen.

Tree death, branch and shoot dieback and leaf spots may easily result from infection, depending on the host species attacked. Cankers

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which form on the tree hosts often produce a reddish, sticky ooze (Figure 2).



Figure 2. Bleeding bark canker on oak.
(Joseph O'Brien, USDA FS, Bugwood.org)

These “bleeding” cankers are often found on the lower portions of the trunk. If the outer bark is removed from these dripping cankers, a dark brown area is visible beneath. This discolored area is often surrounded by a black “zone” line (Figure 3). The “bleeding” ooze may be difficult to see if it has dried or has been washed off by rain. Cankered trees may live for one or several years, but once crown dieback begins, leaves turn brown within a few weeks.

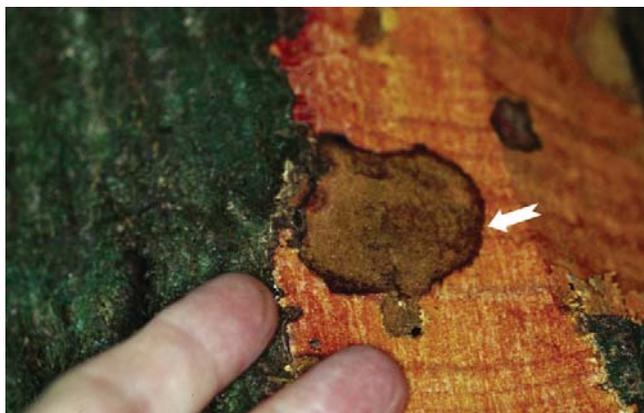


Figure 3. Canker area surrounded by “zone” line.
(Joseph O'Brien, USDA FS, Bugwood.org)

On woody ornamentals, irregular-shaped leaf spots, dieback and cankers on small branches are the most common symptom (Figures 4-6). In many instances, leaf spots appear to originate at or near the leaf edge, leaf tip or along the midrib where overhead water from rainfall or irrigations may tend to accumulate on the leaf. Young leaves are especially prone to infection. Spores landing on wet leaves quickly germinate and infect the leaf. Initial leaf spots often appear water-soaked. Leaf spots may resemble sunburn, salt injury or even other *Phytophthora* diseases. Foliar symptoms vary considerably on different plant species.



Figure 4. Leaf spot symptoms on camellia.
(Cheryl Blomquist, California Department of Food and Agriculture)



Figure 5. Tip dieback symptoms on rhododendron.
(Everett Hansen, Oregon State University)



Figure 6. Leaf spot symptoms on rhododendron.
(Joseph O'Brien, USDA FS, Bugwood.org)

Understory hosts such as viburnum, camellia and rhododendron usually develop leaf spots and twig blights that serve as sources of microscopic spores (sporangia) that can initiate infection of trees. The sites of tree infection are usually through bark cracks and crevices where spores penetrate the living tissues. Sudden oak death symptoms on southern forest trees can sometimes be confused with other tree problems, in particular oak decline, oak wilt and red oak borer (insect).

Management

Quick and accurate identification of symptoms caused by *P. ramorum* is important in the landscape, nursery and forest for developing an effective disease management program. Because of the nondescript symptoms and wide range of plants affected, SOD-infected trees and shrubs are difficult to diagnose. Currently, the most definitive method of diagnosing sudden oak death is by laboratory culturing in combination with polymerase chain reaction (PCR) assays. Early detection of this disease is important for successful disease management. Best management practices, including strict sanitation by nurseries from which horticultural plant materials are sent, in conjunction with regular inspections and phytosanitary measures by state departments of agriculture, are aimed at preventing shipment of infected material from states where the disease has been confirmed. These inspections are ultimately aimed at preventing disease introductions into other nurseries and the landscape outside those key areas where the pathogen has been confirmed previously.

Strict regulatory controls are in place in California, Oregon and Washington to prevent the spread of *P. ramorum*, and quarantine regulations have been established to help prevent the introduction of the disease into other areas on nursery stock, soil or other host materials.

The introduction of this disease and its subsequent spread could threaten the ornamental industries as well as many native plants in the state. Prevention of its introduction and rapid eradication efforts, should the disease be introduced, are key to protect Arkansas nurseries and landscapes from potential losses caused by *P. ramorum*.

To date, there is no known cure for sudden oak death. The most effective way to prevent the pathogen from becoming established is to keep it out of noninfested locations. Several fungicides, including those with the active ingredients of metalaxyl, mefenoxam and pyraclostrobin, have shown some activity when applied in a preventative program but do not appear effective as a curative.

If you suspect shrubs or trees to be infected with *Phytophthora ramorum*, please notify the **Arkansas State Plant Board (501-225-1598)**, <http://www.plantboard.org/>, or the **State Plant Health Director's Office of USDA, APHIS, PPQ**, http://www.aphis.usda.gov/services/report_pest_disease/report_pest_disease.shtml (501-324-5258).

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For More Information

- Arkansas State Plant Board, <http://www.plantboard.org/>.
- USDA APHIS, Pest Detection and Management Programs, *Invasive Species and Pest Management: Sudden Oak Death*, <http://www.aphis.usda.gov/ppq/ispm/pramorur>.
- California Oak Mortality Task Force, <http://www.suddenoakdeath.org/>.
- American Phytopathological Society Education Center. <http://www.apsnet.org/education/lessonsPlantPath/SuddenOakDeath/default.htm>.



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