Kentucky Woodlands Magazine

# Are Kentucky Forests Threatened by Sudden Oak Death?

*By Patricia de Sá & John Hartman*

Sudden oak death (S.O.D.) was first seen in the mid-1990s in the United States in coastal areas of Central California on tanoak and on several oak species including California black oak and coast live oak. S.O.D. was later shown to be caused by the same organism causing dieback and leaf spot symptoms on rhododendrons and viburnums in Germany and in the Netherlands in 1993. The diseases were found to be caused by a new species of *Phytophthora (*pronounced "fy-TOFF-thor-ra"). These organisms are similar to fungi and are sometimes called water molds. Many species of *Phytophthora* are common in the United States causing a number of diseases in agriculture, including black shank on tobacco, and on horticultural and forest plants. The newly discovered species is *Phytophtora ramorum,* or *P. ramorum* for short.

## Where Is Sudden Oak Death Found?

In coastal California and Oregon forests, S.O.D. has killed hundreds of thousands of trees. While the oaks in California are generally not high quality or important timber species, they are closely related to oaks that are native to Kentucky. *P. ramorum* is also found infecting understory plants such as California bay laurel and rhododendron. At present *P. ramorum* is not known to occur in other North American forests, however, the pathogen can be transported long distances on infected nursery stock, and soil or potting mixes. Nursery surveys of 48 U.S. states in 2005 revealed that 99 nurseries in seven states had plants that tested positive for *P. ramorum*; in 2004 infected plants were found in nurseries in 22 states. Infected nursery stock was destroyed.

Although it is not known where *P. ramorum* originated, it has been isolated from plants in Germany, the Netherlands, the United Kingdom, Poland, Spain, France, Belgium, Sweden, Canada, and the United States. There are regulations and quarantines in place to prevent the

spread of *P. ramorum* within countries and from one country to another and to keep the European and North American strains (mating types) apart, since mating could produce progeny with increased genetic variability and virulence.

Due to the significant tree death that can occur from this new disease and the fact that it can be easily spread across the country with the shipment of nursery stock, the U.S. Forest Service has developed risk maps for the United States. These maps are used to show where *P. ramorum* could easily gain a foothold, spread rapidly, and have great impact. Unfortunately, the central Appalachian Mountains were consistently considered high risk areas for the establishment of *P. ramorum*. This pathogen is a nursery and forest problem, and if it were to be introduced into the Appalachian region, it could have devastating consequences for the state of Kentucky. Forty-seven percent of the state is covered with forests that are largely dominated by oaks that are susceptible and ecologically and economically important. Forests in eastern Kentucky would be especially vulnerable.

The Forest Service report can be viewed at www.cnr.berkeley.edu/comtf/html/modeling_phytophthora_ramorum.html.

Photo by John Hartman

*Figure 1. Coast live oak bark cut away to reveal dark-streaked S.O.D. canker; normal internal bark has a pinkish color.*

## Disease symptoms and host plants

*P. ramorum* has a broad host range infecting woody and herbaceous plants and ferns, causing trunk cankers, leaf blight, and shoot dieback. On mature oak trees, *P. ramorum* causes cankers on the main stem that can vary in color from red to brown to black (Figure 1). Dark to reddish sap oozes out of the bleeding canker, and sometimes the sap will dry and leave a dark stain on the outer bark. Cankers that develop on the main stem and branches can coalesce and girdle the tree, leading to crown death — often rapidly; hence, the name sudden oak death (Figure 2). On plants other than oak trees, the symptoms appear mostly on the shoots and on leaves and twigs, and cankers on the stem and branches may also develop. Leaf blight symptoms may appear as triangular blotches at the leaf tip (Figure 3) or brown, necrotic, rounded leaf spots (Figure 4). Shoot dieback symptoms result in drooped shoots that turn brown and necrotic. Unfortunately, the leaf symptoms for *P. ramorum* are similar to the untrained eye to other foliar diseases.

An updated list of host plants and plants associated with *P. ramorum* is available from APHIS at the USDA. The list currently includes 100 plants and can be viewed at www.aphis.usda.gov/ppq/ispm/pramorum/pdf files/usdaprlist.pdf. The list includes Kentucky plants such as northern and southern red oak, rhododendron, and mountain laurel. However, there are other common Kentucky trees susceptible to *P. ramorum* based on greenhouse tests that are not on the list. These species include white oak, cherrybark oak, chestnut oak, laurel oak, willow oak, sugar maple, and black walnut.

Understory plants like rhododendron and California bay laurel (Figure 3) can produce large numbers of spores and provide a means for *P.ramorum* to spread to overstory trees. Rhododendrons are abundant in some Eastern Kentucky forests, and other understory plants such as maple, viburnum, and mountain laurel could have an important role in the establishment of *P. ramorum* in Kentucky. There are likely many more yet-to-be-identified susceptible plants. Of concern here is that *P. ramorum* may spread to parks and native woodlands from introduced infected ornamental plants such as rhododendron, mountain laurel, and camellia. Most Kentucky native plants have not been tested for infection by *P. ramorum,* and their vulnerability is not known.

Photo by John Hartman

*Figure 2. Coast live oak killed by S.O.D.*

Photo by John Hartman

*Figure 3. California bay laurel leaf tip necrosis caused by P. ramorum.*

## The search for P. ramorum in Kentucky.

*P. ramorum* has not been found in Kentucky based on nursery and forest surveys in 2003, 2004, and 2005. It is important to note that there are several native species of *Phytophthora* and many native fungi in forest and nursery environments that cause similar symptoms on leaves and shoots and even bleeding cankers on tree stems. These organisms are part of the ecosystem, having established a balance with native plants over thousands of years. Introducing a pathogen such as *P. ramorum* into Kentucky forests could be very damaging because our native plants have not adapted to this exotic pathogen. Not every bleeding canker or leaf blight is caused by *P. ramorum*, and it is not possible to diagnose it correctly based on symptoms only. Presently two highly technical approaches involving microscopic and DNA analysis by trained professionals are required to correctly diagnose *P. ramorum* infection.

In 2005, a forest survey was made in Kentucky in 26 counties (Figure 5) that included forested areas around six nurseries; four Kentucky state forests; eight privately owned forests; one national, two city, and eight state parks; and a national recreation area. From the 30 locations, 42 leaf and bark samples from common tree species and horticultural plants showing suspicious symptoms similar to those found with *P. ramorum* infections were analyzed by the Plant Pathology Department Laboratory at the University of Kentucky. The DNA analyses were all negative, and no *P. ramorum* was found in any of the samples.

This analysis indicates the difficulty in visually establishing the presence of *P. ramorum* in Kentucky. Regardless, the potential for this exotic pathogen to do considerable harm to Kentucky's impor-

*Figure 4. California bigleaf maple leaf spots caused by P. ramorum.*

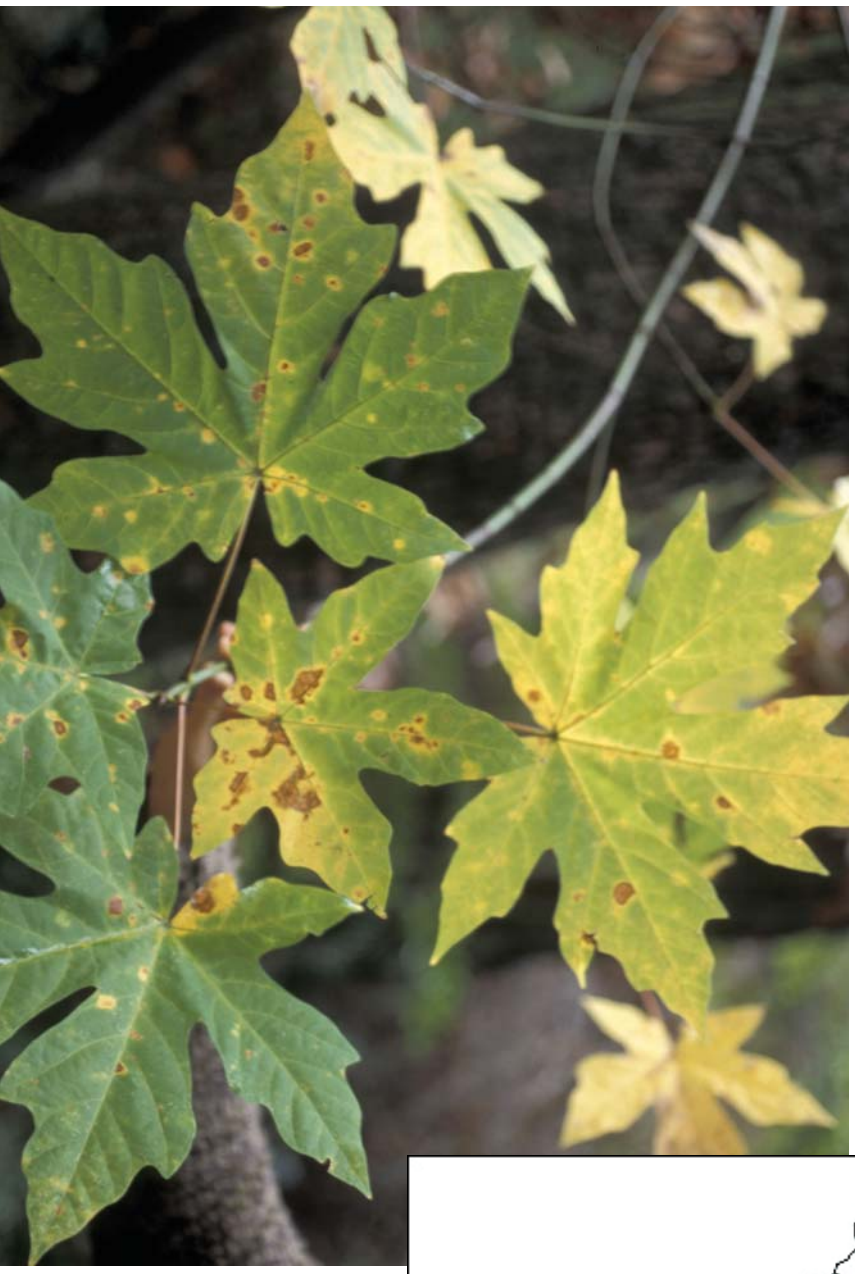

*Photo by John Hartman*

tant forest species and drastically harm yard trees and ornamental plants is significant. Certainly, continued sampling and vigilance are warranted.

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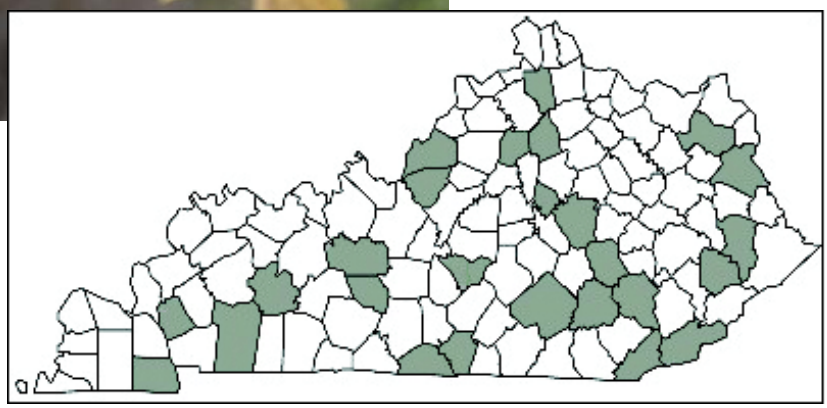

*Figure 5. Kentucky counties where plants were collected for the P. ramorum forest survey.*