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EH&S FACT SHEET

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# Sudden Oak Death

Over the past five years, large numbers of tanoaks (*Lithocarpus densiflorus*), coast live oaks (*Quercus agrifolia*), and black oaks (*Quercus kelloggii*) have been dying in California's coastal counties. The epidemic, referred to as Sudden Oak Death (SOD), first appeared in Marin County in 1995 and has subsequently spread throughout coastal California and into Oregon. In October 2001, infected plants were discovered on the grounds of the University of California, Berkeley.

## What is Sudden Oak Death?

Sudden Oak Death (SOD) is a disease caused by a pathogen that can infect and rapidly kill several species of native California oaks and other broadleaf plants, such as rhododendron, madrone, buckeye, and bigleaf maple. The pathogen is a previously unknown species of *Phytophthora* (Phy-TOFF-thoruh), a fungus-like brown alga related to the pathogen that caused the Irish potato famine. The new organism is named *Phytophthora ramorum*. It spreads when spores disperse during wet and windy weather.

An afflicted oak will develop a girdle of dead tissue underneath the bark around its circumference that destroys the tree's vascular system, and the tree dies rapidly, sometimes within a few weeks. Other host plants experience damage to leaves or young shoots.

## Why Is Sudden Oak Death a Problem?

SOD has already devastated large stands of native oak and tanoak, and it appears to be spreading. UC researchers are concerned that *P. ramorum* could produce a tree epidemic similar to the infamous American chestnut blight and Dutch elm disease epidemics. The non-native pathogens that caused those diseases were especially dangerous because the trees had no natural resistance to them. The same seems to be true of SOD. The pathogen was probably imported into California from Europe on ornamental rhododendrons.

The seriousness of SOD arises in part from the importance of native oaks to California. Areas where oaks dominate the landscape are called savannas and woodlands. Oaks are often "keystone species" in these habitats because they support an entire ecological community of other species, including many plants, animals, and fungi that rely on oaks for food and shelter. For example, over 300 species of birds, mammals, lizards, and amphibians live in California habitats dominated by native oaks. Widespread loss of native oak trees threatens many of the species dependent upon them for survival, and it would drastically alter California's landscape and natural diversity.

In addition, California oaks are a cultural heritage. They sustained dense populations of native Indian cultures for thousands of years, provided food and supplies like lumber and tanning acids, and served as religious symbols.

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SOD also infects other native trees and shrubs, including tanoak (*Lithocarpus densiflorus*), bigleaf maple (*Acer macrophyllum*), California bay (*Umbellularia californica*), California buckeye (*Aesculus californica*), huckleberries (*Vaccinium spp*.), toyon (*Heteromeles arbutifolia*), Pacific rhododendron (*Rhododendron macrophyllum*), manzanitas (*Arctostaphylos spp*.), and elderberries (Sambucus *spp*.). It is still unclear how many of these hosts will be killed by SOD, but significant losses of any of these species would reverberate through the food chains of our native ecosystems. Moreover, the pathogen sporulates especially well on several of these species, such as California bay, Pacific rhododendron, and madrone, making them especially instrumental in spreading the epidemic.

## How Serious a Problem is SOD to UC Berkeley?

Imagine the UC Berkeley campus without its heritage oaks. These trees are some of the last remaining vestiges of the campus as it was when the University began more than a century ago. They create much of the beauty and serenity; loss of these venerable and much beloved trees would have a profoundly negative impact on the campus environment and community at large.

## Which Trees on Campus are Infected?

Several California bay laurels, a California buckeye, and a rhododendron near Faculty Glade have been infected by the SOD pathogen. These plants are in a habitat that favors the spread of the disease. Being near Strawberry Creek, they are well shaded and kept moist by taller trees such as the redwoods growing along the creek banks. Researchers studying SOD are not sure how the disease arrived on the Berkeley campus. Since the spores of *P. ramorum* can spread through water, soil, and air, a variety of vectors could be responsible for its arrival.

## How Does Sudden Oak Death Spread?

Both mobile spores and cysts can spread *Pythophthora ramorum*. During wet weather, infected hosts, such as bay laurels, produce sporangia that release large numbers of mobile spores that can travel in moist soil or through the air. People and animals can also track spores to uninfected hosts. Zoospores sometimes encyst and accumulate in leaf litter and can be spread by people and animals walking underneath the infected trees and tracking the cysts. In addition, cysts and spores may be carried on wood, leaves, and wood chips from dead trees that are cut down. For this reason, counties with infected plants, including Alameda County, are quarantined. It is illegal to move plants and plant parts, including wood, into non-quarantined areas.

## Can Sudden Oak Death Be Stopped?

Currently, it appears that SOD will spread into more areas of California and will eventually infect other trees on campus. Moving plants or plant parts from known hosts out of infected areas may cause the disease to spread widely across the state and even to other regions of North America.

UC Berkeley is taking steps to slow disease spread, prevent infection of healthy coast live oaks, and treat infected trees. An important way to slow disease spread is to clean and disinfect footwear and tires that might have traveled through infected areas.

## Do We Have Chemical Treatments?

Researchers at UC Berkeley are at the forefront of testing ways to stop SOD from killing large numbers of California's native oaks. Experimenters are exploring chemical treatments that prevent the infection of healthy trees and cure or slow the death rate of infected trees.

One preventative treatment being tested is the use of copper sulfate sprays, which are used in organic orchards to treat fruit and nut crops for many tree diseases. UC Berkeley gardeners and researchers hope that copper sulfate applied to coast live oak trunks will protect healthy trees from becoming infected with *P. ramorum*.

Another compound that will be tested on campus as a treatment will be injected into infected trees just under the bark at the base of the trees. Water and nutrients will carry this compound up into the tree's branches and leaves to attack the pathogen systemically. Although research has not shown that this treatment cures infected trees, it may dramatically prolong the life of a tree and slow the production of spores that spread the pathogen to other trees and plants.

## What Are the Risks of Chemical Treatment?

The use of even the most benign pesticides poses risks to the environment. Campus gardeners are working closely with researchers and the Office of Environment, Health & Safety (EH&S) to address and reduce these risks wherever they identify them. Guidelines for the safe application of the compounds have been developed and are being implemented as the campus trees are being treated. These guidelines help prevent exposure of the campus community and grounds in three ways. They curtail spraying on windy days and on days when rain is imminent. They require the use of drop cloths to catch over-spray and drift when treating trees near Strawberry Creek. They employ barricades and signage to warn members of the community when treatment is taking place.

We hope these treatment guidelines and techniques will help protect the campus oaks and other valuable trees from SOD without having a negative impact on the rest of the university grounds and inhabitants. If successful, these techniques may become the standard for protecting California's oaks around the state.

## Why Not Simply Let the Trees Die?

It is not easy to predict the effect of a massive oak die-off in California. Falling dead trees are an immediate threat in areas recently devastated by the epidemic. Dead trees also greatly increase fuel loads, causing serious fire danger. Over the long term, the loss of many oaks would drastically alter the visual landscape of the state. More important, however, is the threat to complex ecosystems that are supported by oaks and that have evolved over thousands of years. Loss of these ecosystems would probably spell the end of several species of animals, plants, and fungi that depend on the trees for shelter and food.

## What Can I Do To Help?

First, take the time to learn more about SOD and California's oak savannas and woodlands. At the end of this publication are the URLs for several excellent websites that provide information on the latest developments in the fight to save our native oaks from infection.

On campus, please stay out of areas cordoned off by barricade tape and SOD signs. People walking through these areas may spread the disease to parts of the campus that are currently free of the pathogen.

If you have visited parts of the state where SOD is present, please be aware that the disease can be transported on motor vehicles, bicycles, footwear, and gardening tools used in these areas. Such items should be cleaned of mud and soil and disinfected, if possible, using a dilute bleach solution or similar disinfectant.

## Where Can I Get More Information about Sudden Oak Death?

The websites listed below contain information on SOD and are updated regularly with developments in the fight to prevent the disease from devastating California's oak forests:

Cooperative Extension Office-Marin http://cemarin.ucdavis.edu/index2.html

California Oak Mortality Task Force http://www.cnr.berkeley.edu/comtf/

SOD Mapping Project http://camfer.cnr.berkeley.edu/oaks/

California Oaks Foundation http://www.californiaoaks.org/

On campus you may contact the Office of Environment, Health, and Safety at (510) 642-3073 for questions regarding environmental and health hazards related to the treatment of trees and landscape with fungicides.

Questions about the schedule of treatments or the location of spray areas may be addressed to the Grounds Department at (510) 642-7408.