

Sudden Oak Death Caused by a New Species, *Phytophthora ramorum*

Tens of thousands of tanoak (*Lithocarpus densiflorus*), coast live oak (*Quercus agrifolia*), California black oak (*Quercus kelloggii*), Shreve oak (*Quercus parvula* var. *shrevei*), and madrone (*Arbutus menziesii*) have been killed by a newly identified species, *Phytophthora ramorum*, which causes Sudden Oak Death. Sudden Oak Death was first reported in 1995 in central coastal California. The pathogen also infects rhododendron species, huckleberry (*Vaccinium ovatum*), bay laurel (*Umbellularia californica*), and California buckeye (*Aesculus californica*), but usually causes only leaf spot and twig dieback on these hosts. The host list is expected to expand as Dr. David Rizzo, University of California at Davis, and Dr. Matteo Garboletto, University of California at Berkeley, continue their investigations of affected ecosystems.



Tree mortality caused by *Phytophthora ramorum*.

As of summer 2001, the disease has been confirmed in eight counties along the central California coast from Monterey County to Mendocino County, approximately 250 miles to the north. Its furthest extent inland is 45 miles from the coast in Napa County. The disease is widespread in Marin and Santa Cruz Counties in redwood forests with tanoak in the understory, and in mixed hardwood forests of oaks, bay, madrone, and other species.

Symptoms and Impact: On oaks and tanoak, cankers are formed on the stems. Cankered trees may survive for one to several years, but once crown dieback begins, leaves often turn from green to pale yellow to brown within a few weeks.

Black or reddish ooze often bleeds from the cankers, staining the bark as well as killing the mosses that grow on it. Bleeding ooze may be difficult to see if it dries or has been washed off by rain.

Necrotic bark tissues surrounded by black zone lines are present under affected bark. Because these symptoms can also be caused by other *Phytophthora* species, laboratory tests must be done to confirm pathogen identity.



Bleeding ooze from a canker on an oak.



Black zone lines under diseased bark in oak.



To report infected trees or to receive additional information, please contact your state or federal forest health specialist. On the Internet, visit the Sudden Oak Death home page at: www.suddenoakdeath.org. To distinguish this new disease from diseases with similar appearance, visit www.na.fs.fed.us/SOD

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Tim Tidwell, CA Department of Food and Agriculture
David Rizzo, UC-Davis
Steve Oak, USDA Forest Service

Infected Coast live oaks sometimes gradually lose their leaves and fade out slowly. If bleeding oaks and leaf spots on bay laurel or other symptomatic hosts are adjacent to one another, it is a good indicator that *Phytophthora ramorum* may be present. However, laboratory confirmation is needed to be sure since there are many other pathogens that cause similar symptoms.



Leaf and twig dieback symptoms in tanoak.



A range of crown symptoms in an infected forest.

On small tanoaks (less than 4" diameter at breast height) the first symptom is a wilting of branch tips. The branch dies back and re-sprouts with multiple shoots. Eventually, the entire tree dies and re-sprouts from the base, but the new shoots die back as well.

The pathogen has been linked to tree mortality only for oaks in the red oak group and the related tanoak and madrone. It causes leaf spots and twig dieback in bay laurel and several other species, including rhododendron and huckleberry. Spore levels may build-up rapidly on these hosts creating a reservoir of inoculum.

A common saprophytic fungus (*Hypoxyylon thouarsianum*), ambrosia beetles (*Monarthrum* spp.), bark beetles (*Pseudopityophthorus* spp.), and other organisms often colonize infected trees.

Other Oak Disorders with Similar Symptoms: Sudden Oak Death can be confused with many other disorders of oaks. Oaks defoliated by insects may appear dead, but leaves usually re-flush later in the season. Canker rots, slime flux, leaf scorch, root diseases, freeze damage, herbicide injury, and other ailments may be confused with this disease.



Leaf spots caused by *Phytophthora* sp., on rhododendron. Leaf spot margins caused by this *Phytophthora* are often fuzzy, rather than sharply defined.



Other insects and fungi colonize diseased trees. These organisms attack trees weakened by many other agents and are not specific to trees killed by *Phytophthora ramorum*.