

National Pest Alert

Sudden Oak Death

Phytophthora ramorum

The causal agent of sudden oak death (SOD, also known as Phytophthora canker disease), *Phytophthora ramorum*, was first identified in 1993 in Germany and The Netherlands on ornamental rhododendrons. *P. ramorum* was isolated in June 2000 from dying trees in California. Since its discovery in North America, *P. ramorum* has been confirmed in forests in California and Oregon and in nurseries in California, Oregon, Washington, and British Columbia.

Origin of *P. ramorum*

The geographic origin of *P. ramorum* is unknown. Before the mid-1990s, there were no reports of this species in the United States or Europe. *P. ramorum*'s limited known geographical distribution in relation to its hosts' distribution suggests it was recently introduced into the United States. The European and North American populations are thought to be distinct populations transported independently from another location, perhaps the site of origin.

Host Range

P. ramorum causes two types of diseases, bark cankers that may kill the host and foliar blights that may serve as a reservoir for the pathogen. In response to the identification of *P. ramorum*, the United States Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS) has developed a list of regulated hosts. Visit <http://www.ncpmc.org/sod> for the most current and complete lists of regulated and associated hosts.

Regulated bark canker hosts include tanoak (*Lithocarpus densiflora*), coast live oak (*Quercus agrifolia*), California black oak (*Q. kelloggii*), Shreve's oak (*Q. parvula* var. *shrevei*), canyon live oak (*Q. chrysolepis*), coast redwood (*Sequoia sempervirens*), Douglas fir (*Pseudotsuga menziesii*), and others. Tanoak is the most susceptible bark canker host. The list of regulated foliar hosts is extensive and expanding. Included are: *Vaccinium* spp., manzanita (*Arctostaphylos manzanita*), *Rhododendron* spp., bay laurel or Oregon myrtle (*Umbellularia californica*), bigleaf maple (*Acer macrophyllum*), toyon (*Heteromeles arbutifolia*), California buckeye (*Aesculus californica*), coffeeberry (*Rhamnus californica*), honeysuckle (*Lonicera hispidula*), arrowwood (*Viburnum* spp.), western starflower (*Trientalis latifolia*), *Camellia* spp., madrone (*Arbutus menziesii*), and *Pieris* spp.

Additional associated hosts include cascara (*Rhamnus purshiana*), California hazelnut (*Corylus cornuta*), grand fir (*Abies grandis*), lilac (*Syringa* sp.), mountain laurel (*Kalmia latifolia*), poison oak (*Toxicodendron diversiloba*), and Victorian box (*Pittosporum undulatum*). Species from the white oak group, including blue oak (*Q. douglasii*), valley oak (*Q. lobata*) and Oregon white oak (*Q. garryana*), have not been confirmed as hosts and do not exhibit symptoms in the field. Northern red oak (*Q. rubra*), and pin oak (*Q. palustris*), from the red oak group, were susceptible in

Foliar lesions on Rhododendron vaseyi infected by P. ramorum.



laboratory assays, suggesting the potential for establishment of SOD beyond the West Coast.

Transmission of SOD

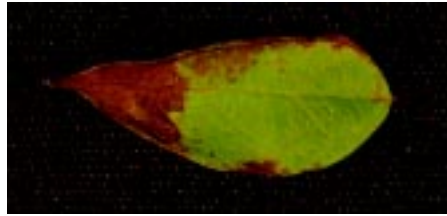
The spread of SOD likely occurs through infected plant material, rainwater, and soil. Foliar hosts may play an important role in the transmission of *P. ramorum* to bark canker hosts. Data suggest foliar hosts support spore production and foliar infection may precede bark canker host infection. Moist, cool, windy conditions are thought to spread the pathogen by dispersing spores from the leaves of foliar hosts. Transport of infected foliar host plants may aid the spread of SOD throughout the United States.

Symptoms and Identification

Bark canker hosts infected with *P. ramorum* have large cankers on the trunk or main stem accompanied by browning of leaves. Tree death may occur within several months to several years after initial infection. Infected trees may be infested with ambrosia beetles (*Monarthrum scutellare* and *M. dentiger*), bark beetles (*Pseudopityophthorus pubipennis*), and sapwood rotting fungus (*Hypoxylon thouarsianum*). These organisms may contribute to the death of the tree. Infection on foliar hosts is indicated by dark grey-to-brown lesions with indistinct edges. 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.

Monitoring and Management Recommendations

Symptoms on affected hosts vary considerably by species and it is difficult to differentiate *P. ramorum*-infected plants from those infected by other pathogens. If you suspect trees or plants are infected with *P. ramorum*, contact your state's university diagnostic laboratory or Department of Agriculture diagnostic laboratory immediately (contact university extension personnel for the address of the diagnostic



Foliar lesion resulting from P. ramorum on Vaccinium angustifolium.



Small lesions on Vaccinium corymbosum 'Weymouth' infected by P. ramorum.

laboratory). Plants infected with *P. ramorum* should be destroyed because no chemical control measures are currently available. Because *P. ramorum* is a regulated organism, destruction and disposal protocols will be coordinated by state regulatory officials. If diagnosticians confirm *P. ramorum* infestation of plants at nurseries or other commercial landscape facilities, an Emergency Action Order from APHIS may be issued. The order may require that *P. ramorum*-infected plants and all susceptible plants within 2 meters of infected plants be destroyed and that all susceptible plants within 10 meters be held for 90 days until inspected.



Kalmia latifolia 'Minuet' with severe foliar symptoms from P. ramorum.

For more information on sudden oak death, visit our Web site at

<http://www.ncpmc.org/sod>

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