Sudden Oak Death: Yet another introduced disease to be on the look out for.

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Sudden Oak Death, or SOD as it is known to 'insiders', is a somewhat misnamed disease caused by what most believe is an introduced fungus related to the famed Late Blight of potato pathogen. *Phytophthora ramorum*, the causal agent of SOD, was first identified in California in 2000, but symptoms were noted several years earlier. To date it has been found in only in California and southwestern Oregon in the United States, and also several European countries.

The threat to us is that our oak-dominated eastern deciduous forests could be devastated by this disease were it to become established. Although our climate differs from the cool, moist coastal California climate, we still experience months of moist, mild conditions that the fungus thrives in. Moreover, there is tremendous movement of ornamental plant material from California and Oregon to our region, as well as import of materials from Europe. As described in the current (through May 4th) SOD online symposium at http://www.apsnet.org/online/sod/, the disease affects a number of important, widely grown nursery plants. The symposium has tables, pictures, links and written contributions from all the key players; give it a visit!

If you prefer a brief overview, read on!

SOD has killed many thousands of tanoaks and oaks in California and Oregon's Southwest corner and in California the disease is present in forest types covering a range of microclimates from very wet to fairly dry, and in varied soil types. 26 different plant taxa have been found to be hosts including oak, tanoak, maple, understory bay laurel, rhododendron, viburnum, vines, and a forb. Many others species have been proven susceptible in laboratory inoculations.

Much is still unknown about this disease- including the full host range, conditions under which it survives and is transmitted. Therefore it is prudent for all of us that are in regular contact with plant materials, whether in nurseries or landscapes and natural areas, to be on the alert for SOD symptoms. These symptoms appear different on oak/tanoak (bleeding, oozing trunk cankers) and the other hosts identified, e.g. rhododendron. Ellen Goheen of the USDA Forest Service notes that 'other than the outright mortality of diseased oak trees, the symptoms (on other hosts) tend to be subtle. Chlorosis may be confined to leaf tips and edges, stem bleeding dries out, and infected leaves of evergreen shrubs readily fall off and drop to the forest floor. Furthermore, the symptoms are not unique. The leaf spots, tip dieback, and bleeding associated with *P. ramorum* differ only subtly from symptoms caused by other leaf-inhabiting or canker-causing pathogens.'

It would be prudent to treat leaf blight and dieback symptoms on Rhododendron and viburnum as potential SOD infections, unless you know they are the result of other causes. Collect samples according to guidelines provided at the website below and send them to a University extension laboratory for further testing. Specifics on how to conduct a survey and diagnose SOD are given at the USDA Forest Service, Forest Health Monitoring website:
http://www.na.fs.fed.us/spfo/fhm/sod/sod_natnl.pdf

Highlights from symposium contributors:
SOD in California:
According to Dr. Dave Rizzo, Plant Pathologist, University of California, Davis, the name Sudden Oak Death is a misnomer because tree death is rarely sudden; perhaps taking several years in mature trees and in many hosts, death is not the outcome. "SOD reached epidemic

proportions in oak forests along approximately 300 km of the central California coast. The main hosts included tanoak (*Lithocarpus densiflora*), coast live oak (*Quercus agrifolia*), California black oak (*Q. kelloggii)* and Shreve's oak (*Quercus parvula*var. *shrevei*)." Although species in the white oak group are infected, the disease apparently does not kill them. Unfortunately, species in the red oak group (including pin oak and northern red oak in artificial inoculation tests) are highly susceptible. Oaks are the primary victims, but Dr. M. Garbellotto, UC Berkeley, writes that…"SOD is not spreading via the oaks, it is instead using a huge range of native plants for reproduction." Rhododendron and bay laurel ore two of these. *P. ramorum* attacks the leaves, branches and stems of these plants to reproduce, resulting in lesions and leaf discoloration. *Rhododendron catawbiense*, native to the eastern United States, has been found to be infected by *P. ramorum* in nurseries and gardens in Germany. A complete host and symptoms list can be found at http://www.apsnet.org/online/sod/Papers/Rizzo/default.htm

Other introduced *Phytophthora* species in the U.S.:

Phytophthora ramorum is the headline story, but curiously, the closest relative of *P. ramorum*, at least based on ITS-DNA sequence, is another exotic forest *Phytophthora* that is destructive in Oregon and northern California, *P. lateralis*. *Phytophthora lateralis* kills Port-Orford-cedar (POC) (*Chamaecyparis lawsoniana*), POC is a unique forest tree, growing wild only in southwestern Oregon and northwestern California. It has been planted widely as an ornamental, however, and the disease first appeared in the ornamental nurseries in 1923. There is only speculation about the origin of the pathogen, but it seems likely that unregulated international plant movements in the horticultural trade were somehow responsible for the introduction."

"There is also continuing work on *Phytophthora* (*cinnamomi*) root rot of Frasier fir- a Christmas tree disease. …One infected seedling per hectare may trigger an epidemic in downslope areas following heavy rains."

"It is easy to forget that (*P. cinnamomi*) is an exotic, invasive pathogen with the potential for devastation. The disease is now chronic; there are no longer advancing fronts of infestation marked by dead trees. The dramatic ecological changes are history now, and new, disease-tolerant plant communities have replaced what was lost. Unfortunately, in many cases, we will never know what was lost. *P. cinnamomi* is not gone from these forests, however, and the Frasier fir Christmas tree story illustrates the pathogen's potential to rise to new opportunities created by human activity and perhaps changing climates."

- Everett Hansen, Professor in the Department of Botany and Plant Pathology at Oregon State University

In Europe:
"*P. ramorum*., cause of Sudden Oak Death in the USA, is also spreading in Europe on rhododendrons and viburnums within the ornamental nursery trade."

"….the common use in nurseries of fungistatic (not fungicidal) chemicals can allow *Phytophthora*-infected but healthy looking plants to be sold or exported. Since 1990 evidence has accumulated that infested nursery stock plays a significant role in introducing alien *Phytophthora* species into Europe and in spreading them from nurseries into forests."
-**Clive Brasier** (Emeritus Mycologist at UK Forestry Commission).

Transport via nursery stock:
"Millions of plants have been shipped over the last 5 years from counties where *P. ramorum* has been found, yet so far national survey efforts in the U.S. and Canada have not detected it. This

contrasts with the situation in Europe (that is) mainly a nursery phenomenon. This reality supports stringent regulation and monitoring of incoming plants from Europe and elsewhere."
-Craig Regelbrugge**,** American Nursery & Landscape Association's Senior Director of Government Relations

" It is unknown whether transport of commercially produced plant material will play a role in the dissemination of this pathogen from the mid-Pacific U.S. coastal area or from Europe... Under infected oaks in the U.S., the pathogen has been found on nursery stock such as *Rhododendron* spp., often causing visual symptoms (leaf spots) that are easily overlooked or that mimic those of several other ubiquitous pathogens."

"There are several factors are working against the spread of *P. ramorum* to new areas. State and Federal agencies regulate and critically examine both crops in the nursery and crops destined to be shipped. State surveys will be initiated soon to see if *P. ramorum* already exists in new areas and thus might be eradicated." "…nursery growers routinely examine their plants, treating or roguing those that are not in an acceptable condition, and these folks are known to be very discriminating."
-Larry Englander and Paul Tooley**,** Plant Pathologists, University of Rhode Island and USDA, respectively.