CALIFORNIA OAK MORTALITY TASK FORCE REPORT
JANUARY 2005

REGULATION

The USDA Animal and Plant Health Inspection Service (APHIS) issued an emergency federal order for nurseries 12/21/04 that will take effect on 1/10/05, superseding the 4/22/04 emergency order that restricted the interstate movement of several varieties of *Phytophthora ramorum* host and associated plants from California. The new order regulates the interstate movement of plants from all nurseries in California, Oregon and Washington to help prevent the spread of *P. ramorum* to uninfested areas of the United States.

Under the new federal order, California, Oregon, and Washington nurseries that ship *P. ramorum* host and associated host plants interstate must be inspected, sampled, tested, and certified as *P. ramorum*-free before transporting plants across state lines. In addition, all nurseries that ship non-host plants interstate must undergo a visual inspection to ensure plants are not exhibiting *P. ramorum* symptoms. These inspections will be repeated annually.

The details of the order can be found on the APHIS Plant Protection and Quarantine *P. ramorum* website at: http://www.aphis.usda.gov/ppq/ispm/sod/pdf_files/federalorder12-21-04-final.pdf.

With the issuance of the new USDA APHIS emergency *P. ramorum* order, Canada will rescind regulations implemented as a result of the Monrovia event last March. Following the Monrovia confirmations, Canada quarantined all rose plants and cut roses as well as all host plants and plant parts at the genus-level from the state of CA. Canada's updated regulation will only affect CA's 14 quarantined counties and will only address those plants in the US federal order. Additionally, Canada is no longer considering quarantine regulations for WA and OR. With the new federal order in place, Canada will accept any material leaving CA, OR, or WA that is in compliance with the US rules.

Additionally, in mid-November, USDA APHIS and the Canadian Food Inspection Agency (CFIA) met to develop a North American *P. ramorum* management plan. The outcome of the meeting was an agreed to five-point-plan, which included a framework to use over the next few years. Efforts will include the harmonization of Canadian and United States scenario responses to future finds.

USDA APHIS has added *Fraxinus excelsior* (European ash) and *Nothofagus oblique* (Roble beech) to the federal *P. ramorum* regulation. The additions are based on detection and confirmation in the UK, where *P. ramorum* was found infecting the boles of these species.

Additionally, False Solomon's seal *(Maianthemum racemosum*, formerly *Smilacina racemosa), Calluna vulgaris* (Scotch heather), and *Photinia fraseri* (Red tip photinia*)*

were moved from the APHIS associated host list to the host list in the 12/21/04 Federal Order. These changes were made because of the completion of Koch's postulates for each species. To access the APHIS host and associated host list, go to: http://www.aphis.usda.gov/ppq/ispm/sod/usdasodlist.html.

More information on *Calluna vulgaris* (Scotch heather), can be found in the COMTF October report; for *Photinia fraseri* (Red tip photinia), see the COMTF November report; for false Solomon's seal, see the August and December COMTF reports. Additional information on European Ash and Roble Beech will be included in the COMTF February newsletter.

RESEARCH

Three Recently Published *P. ramorum* Papers, and One in Press:

Efficacy of Heat-based Treatments in Eliminating the Recovery of the Sudden Oak Death Pathogen (*Phytophthora ramorum*) from Infected California Bay Laurel Leaves. Tamar Y. Harnik, Monica Mejia-Chang, James Lewis, and Matteo Garbelotto. HortScience Vol. 39(7):1677-1680. December 2004.

Abstract: *Phytophthora ramorum* (Oomycota) (Werres et al., 2001) is the plant pathogen responsible for the lethal disease of several oak species in California known as sudden oak death. The pathogen also causes a foliar disease on *Umbellularia californica* (bay laurel or simply bay). Bay leaves have been identified as the major source of natural inoculum in California coastal woodlands. Because of the epidemiological relevance of bay leaves, their movement needs to be regulated. Our study shows that *P. ramorum* is highly heat tolerant and can be reisolated from artificially inoculated bay laurel leaves placed at 55°C for up to 1 week. The pathogen cannot be recovered after 2 weeks at 55°C. Prolonged heat treatments, however, are impractical for bay leaves intended to be sold commercially as a spice, since they negatively impact the quality of the leaves. Here we describe a treatment involving a progressive and gradual heating process combined with the application of moderate vacuum. This method can be completed in 22 hours and is shown here to eliminate the recovery of *P. ramorum* without having a negative impact on the quality of the bay leaves.

First report of ramorum bleeding canker on *Quercus falcata*, caused by *Phytophthora ramorum*. C. M. Brasier, S. Denman, J. Rose, S. A. Kirk, K. J. D. Hughes, R. L. Griffin, C. R. Lane, A. J. Inman, and J. F. Webber. Plant Pathology (December 2004) 53, 804.

Phytophthora ramorum (Werres *et al*., 2001) is the cause of a bleeding canker of native American oaks in California and southern Oregon, USA, known as sudden oak death (Rizzo *et al*., 2002). In Europe, *P. ramorum* has caused dieback and leaf blight of various shrubs, especially *Rhododendron* (e.g. Lane *et al*., 2003). Many European trees are potentially susceptible to *P. ramorum* (Brasier *et al*., 2002). Trees at woodland and garden sites in the UK with infected rhododendrons are therefore being monitored.

In October 2003, a mature 60-cm-diameter American southern red oak, *Quercus falcata*, was found in southeast England with 'bleeding' in the lower 1 m of the trunk. Samples taken at ~2 m above ground level revealed fresh lesion edges in the inner bark, consistent with a phytophthora bark necrosis, girdling the entire circumference of the tree. The lesion edges were mottled (i.e. with islands of necrotic and healthy tissue) and pale orange-brown to red-brown. Staining extended ~3 mm into the outer wood vessels. Older lesion areas extended down to the root flares and were a darker red-brown. Extensive frass, indicating bark beetle colonization of the stressed tree, was present to 1 m and fresh frass was present sporadically to ~2 m.

When samples of inner bark from lesion edges were plated onto a selective medium, a *Phytophthora* sp. was consistently isolated. On carrot agar, isolates exhibited the combination of temperature-growth relationships, sporangia, chlamydospores and denticulate hyphae unique to *P. ramorum* (Werres *et al*., 2001). Its ITS sequence (AY616757) was identical to that of other *P. ramorum* isolates. Physiological and genetic analyses showed the isolates were of A1 sexual compatibility type and conformed to the European population of *P. ramorum*. When wound-inoculated (Brasier *et al*., 2002) into bark of 100-cm-diameter *Q. falcata* branch material, the pathogen caused long lesions (~70mm) in 5 weeks and was successfully reisolated. Control agar plugs only caused a few mm of bark discoloration.

This is the first report of ramorum bleeding canker in the UK. *Quercus falcata* is a close relative of American northern red oak, *Q. rubra*, a common plantation or ornamental tree in the UK and Europe. Bark of mature *Q. rubra* is susceptible to *P. ramorum* on inoculation (Brasier *et al*., 2002) and two trees have been found naturally infected in the Netherlands (P. D. de Gruyter, Wageningen, personal communication). Both *Q. falcata* and *Q. rubra* are therefore at risk from *P. ramorum*.

Isolation and characterization of microsatellite markers in *Phytophthora ramorum*, the causal agent of sudden oak death. S. Prospero, J. A. Black, and L. M. Winton. Molecular Ecology Notes (2004) 4, 672-674.

Abstract: We describe specific primers and conditions to amplify two dinucleotide and five trinucleotide microsatellite DNA loci isolated from the oomycete *Phytophthora ramorum*, the causal agent of sudden oak death. The primer sets were tested on 14-30 isolates from North America and Europe. Seven of 14 loci differentiated between A1 and A2 mating types. All seven loci successfully amplified DNA isolated from infected plant tissue. Four loci may be useful for the diagnosis of *P. ramorum* because they do not amplify closely related *Phytophthora* species.

Support vector machines for predicting distribution of Sudden Oak Death in California. Qinghua Guo, Maggi Kelly, Catherine H. Graham. Ecological Modelling 182 (2005) 75-90. In press.

In the central California coastal forests, a newly discovered virulent pathogen (*Phytophthora ramorum*) has killed hundreds of thousands of native oak trees. Predicting the potential distribution of the disease in California remains an urgent demand of regulators and scientists. Most methods used to map potential ranges of species (e.g. multivariate or logistic regression) require both presence and absence data, the latter of which are not always feasibly collected, and thus the methods often require the generation of 'pseudo' absence data. Other methods (e.g. BIOCLIM and DOMAIN) seek to model the presence-only data directly. In this study, we present alternative methods to conventional approaches to modeling by developing support vector machines (SVMs), which are the new generation of machine learning algorithms used to find optimal separability between classes within datasets, to predict the potential distribution of Sudden Oak Death in California. We compared the performances of two types of SVMs models: two-class SVMs with 'pseudo' absence data and one-class SVMs. Both models performed well. The one-class SVMs have a slightly better true-positive rate (0.9272 ± 0.0460 S.D.) than the two-class SVMs (0.9105 ± 0.0712 S.D.). However, the area predicted to be at risk for the disease using the one-class SVMs (18,441 km²) is much larger than that of the two-class SVMs (13,828 km²). Both models show that the majority of disease risk will occur in coastal areas. Compared with the results of two-class SVMs, the one-class SVMs predict a potential risk in the foothills of the Sierra Nevada mountain ranges; much greater risks are also found in Los Angeles and Humboldt Counties. We believe the support vector machines when coupled with geographic information system (GIS) will be a useful method to deal with presence-only data in ecological analysis over a range of scales.

NURSERIES

Currently there are 176 USDA APHIS confirmed positive *P. ramorum* sites in 22 states from trace-forward, national, and other surveys. The breakdown per state is: AL(3), AR(1), AZ(1), CA(55), CO(1), CT(3), FL(6), GA(16), LA(5), MD(3), NC(9), NJ(1), NM(1), NY(1), OK(1), OR(24), PA(1), SC(4), TN(2), TX(11), VA(2), and WA(25). The newly identified Maryland nursery tested positive after being sampled as part of the Hines Nursery (OR) trace-forward investigation. The two California nurseries added to CA's totals were found positive earlier this year, but not included in APHIS statistics until now. One was a trace forward from Monrovia and the second was identified during a compliance survey.

EUROPE

The Department for Environment, Food, and Rural Affairs (DEFRA) hosted a meeting 11/30/04 at the Emmanuel Centre in London to update representatives of interested organizations on *P. ramorum* and *P. kernovii*. Over 100 people representing a range of affected industries and other stakeholders attended the meeting. Following formal presentations, there was a question and answer forum. Many questions related to the proposed hardship fund, but there were also questions about research funding, integrated thinking, bio security, effect of fungicides, and specific questions about control measures. The presentations and posters are posted to the DEFRA website at: http://www.defra.gov.uk/planth/pramevent.htm.

The *P. ramorum* Industry Liaison Group met for the third time on 11/2/04. At the meeting, the current *P. ramorum* and *P. kernovii* situations were discussed and industry representatives provided feedback on their *P. ramorum* experiences since the group's last meeting. Among many other topics discussed was the UK compensation/risk sharing program. To review the meeting minutes, go to the DEFRA website at: http://www.defra.gov.uk/planth/newsitems/ramorum/third.pdf.

RESOURCES

DEFRA posted "*P. ramorum* Frequently Asked Questions" to its website 11/24/04. The FAQ sheet can be found at: http://www.defra.gov.uk/planth/pramorum8.htm. Also posted is an FAQ on *P. kernovii*. This document can be found at: http://www.defra.gov.uk/planth/kernovii/kernqa.pdf.

PERSONNEL

Open Position - The University of California Cooperative Extension (UCCE) office in Marin is interested in hiring a Sudden Oak Death Outreach Assistant to evaluate CA's past Sudden Oak Death outreach activities in order to improve future efforts. The intern will learn about Sudden Oak Death ecology, management, and outreach activities in CA's forests, surveying Agricultural Commissioners and their staff, Cooperative Extension offices, and other natural resource professionals. Applicants must be students knowledgeable in computer spreadsheets, email, and word processing. The position will be classified as a Student Assistant III ($10-13.50/hr, depending on experience). For more information, contact Janice Alexander, UCCE Marin, at 415-499-3041 or via email at jalexander@ucdavis.edu.

WWW.SUDDENOAKDEATH.ORG

Photos, maps, and summary reports from several 2004 *P. ramorum* surveys in California have been posted to a new research section of the COMTF website. Results of California's National *P. ramorum* Wildland Survey, Ground-based Targeted Risk Survey, and aerial survey are available. A summary of watershed monitoring results and other surveys will be added soon.

CALENDAR OF EVENTS

1/18 – 21/05 - Second Sudden Oak Death Science Symposium, Marriott Hotel, Monterey, CA. For Symposium program content, or to register, go to http://nature.berkeley.edu/forestry/sodsymposium.