CALIFORNIA OAK MORTALITY TASK FORCE
2008 SUDDEN OAK DEATH &
PHYTOPHTHORA RAMORUM SUMMARY REPORT
A Compendium of COMTF Monthly Newsletters

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FEBRUARY

P. KERNOVIAE

The UK's DEFRA has confirmed the first finding in the wild of *P. kernoviae* on Bilberry (*Vaccinium myrtillus*) at a site in Cornwall, England. Containment and eradication strategies are under consideration with local stakeholders, and further investigations are underway to confirm that this finding is an isolated incident.

Bilberry is native to heaths, moors, and acidic woodlands, and forms an integral component of native heathland. It is commonly found throughout the British Isles and southeast England. Other known hosts to date include *Fagus sylvatica* (beech), *Rhododendron* spp., *Quercus robur* (English oak), *Quercus ilex* (Holm Oak), *Gevuina avellana* (Chilean hazelnut), *Liriodendron tulipifera* (tulip tree), *Magnolia stellata* (star magnolia), *Michelia doltsopa* (sweet Michelia), and *Pieris formosa* (Himalayan pieris). For more information, go to the DEFRA website at http://www.defra.gov.uk/news/2008/080114b.htm.

In January 2008, *P. kernoviae* was found for the first time in Scotland on two rhododendron plants in a private garden. Inspectors with the Scottish Government and Forestry Commission are surveying the rest of the garden and a 3km-wide zone around the outbreak site. All plants found to be infected will be destroyed as well as any host plants within 2 meters of the confirmed plant(s). For more information, go to the Scottish Government website at http://www.scotland.gov.uk/News/Releases/2008/01/10144052.

RESEARCH

Anacker, Brian L.; Rank, Nathan E.; Hüberli, Daniel; Garbelotto, Matteo; Gordon, Sarah; Harnik, Tami; Whitkus, Richard; and Meentemeyer, Ross. 2008. Susceptibility to *Phytophthora ramorum* in a key infectious host: landscape variation in host genotype, host phenotype, and environmental factors. New Phytologist 177: 756–766. DOI: 10.1111/j.1469-8137.2007.02297.x.

DiLeo, M.V.; Bienapfl, J.C.; and Rizzo, D.M. 2008. *Phytophthora ramorum* infects hazelnut, vine maple, blue blossom, and manzanita species in California. Online. Plant Health Progress DOI: 10.1094/PHP-2008-0118-02-BR.

Frankel, Susan J. 2007. Sudden oak death and *Phytophthora ramorum* in the USA: a management challenge. Australasian Plant Pathology, 37, 19–25.

Grünwald, N.J.; Goss, E.M.; Larsen, M.M.; Press, C.M.; McDonald, V. T.; Blomquist, C.L.; and Thomas, S.L. February 2008. First Report of the European Lineage of *Phytophthora ramorum* on *Viburnum* and *Osmanthus* spp. in a California Nursery. Disease Notes Volume 92, Number 2, Page 314. DOI: 10.1094/PDIS-92-2-0314B.

Grünwald, N.J.; Kitner, M.; McDonald, V.; and Goss, E.M. 2008. Susceptibility in *Viburnum* to *Phytophthora ramorum.* Plant Disease 92:210-214.

Linderman, R.G. and Davis, E.A. January–March 2008. Eradication of *Phytophthora ramorum* and Other Pathogens from Potting Medium or Soil by Treatment with Aerated Steam or Fumigation with Metam Sodium. HorTechnology 18(1), Pages 106-110.

Vettraino, A.M.; Huberli, D.; and Garbelotto, M. 2008. *Phytophthora ramorum* infection of coast live oak leaves in Californian forests and its capacity to sporulate *in vitro.* Australasian Plant Pathology 37, 72–73.

DEFRA's CSL has issued their "Investigation of Alternative Eradication Control Methods (Heat Treatment) for *P. ramorum* and *P. kernoviae* on/in Plants." It can be found on the DEFRA website at http://www.defra.gov.uk/planth/ramorum/phe2122reports.pdf.

In Brief: Wet and dry heat treatments were investigated for the eradication of *P. ramorum* and *P. kernoviae* on *Camellia*, *Rhododendron*, and *Viburnum* plants. Initial experiments determined the lethal threshold temperature and exposure times for three isolates of each *Phytophthora* species using wet (hot water) and dry-heat treatments against mycelium and sporangia.

Overall, wet heat treatments were more effective than dry heat treatments and *P. kernoviae* was consistently more temperature sensitive than *P. ramorum*. Mycelia of both *Phytophthora* species were more sensitive to wet heat treatment than sporangia, whereas sporangia were more sensitive to dry heat treatments than the mycelium.

DEFRA's CSL an "Epidemiology of natural outbreaks of *Phytophthora ramorum* Final Report," has been posted to the DEFRA website at http://randd.defra.gov.uk/Document.aspx?Document=Ph0195_6395_SD5.pdf.

In Brief: Since the first finding in a UK nursery in 2002, over 150 outbreaks of *P. ramorum* have occurred in managed gardens, woodland, or wild planting areas in England and Wales. Three of the large managed gardens with outbreaks were selected for intensive study, as were further outbreak sites. The progress of existing infections and the development of new infections were monitored at each site.

Overall, study results indicate that a strategy of early removal of infected plants and surface leaf litter has been successful in reducing inoculum and preventing further disease spread. However, residual levels of contamination remain in the soil, leaf litter, and watercourses. The risk of these residual levels providing inoculum for further disease outbreaks remains unknown. These results are in agreement with latest findings from monitoring of *P. ramorum* outbreaks in the United States. Ongoing monitoring of the UK sites during 2006/07 will continue to assess the outbreak situations and provide additional epidemiological information for the development of strategies for the eradication and containment of *P. ramorum*.

A summary table of *P. ramorum* isolates is now available online at http://www.jki.bund.de/cln_045/nn_932586/SharedDocs/12__G/Publikationen/phytophthora/Phytophthoraramorum__isolatelist.pdf.html. Summary details include the country and institute that originally isolated the strain, as well as information on the host plant from which it was isolated.

To add a new isolate or information on an isolate already included in the report, contact Sabine Werres at Sabine.Werres@jki.bund.de.

The following five papers on remote sensing, modeling, and spatial-temporal mortality patterns have been published by Maggi Kelly, UC Berkeley and associates.

Guo, Q.C.; Kelly, M.; Gong, P.; and Liu, D. 2007. An object-based classification approach in mapping tree mortality using high spatial resolution imagery. GIScience and Remote Sensing 44(1): 24-47.

Kelly, M.; Guo, Q.; Liu, D.; and Shaari, D. 2007. Modeling the risk of a new invasive forest disease in the United States: an evaluation of five environmental niche models. Computers, Environment and Urban Systems 31(6): 689-710.

Liu, Desheng; Kelly, Maggi; Gong, Peng; and Guo, Qinghua. December 15, 2007. Characterizing spatial-temporal tree mortality patterns associated with a new forest disease. Forest Ecology and Management, Volume 253, Issues 1-3, Pages 220-231. doi:10.1016/j.foreco.2007.07.020.

Pu, R.; Kelly, M.; Anderson, G.L.; and Gong, P. 2008. Spectroscopic determination of health levels of coast live oak (*Quercus agrifolia*) leaves. GeoCarto International 23 (1): 3-20.

Pu, R.; Kelly, M.; Anderson, G.L.; and Gong, P. In Press. Using CASI hyperspectral imagery to detect mortality and vegetation stress associated with a new hardwood forest disease. Photogrammetric Engineering & Remote Sensing.

REGULATIONS

Corylopsis spicata* (spike witch hazel - Hamamelidaceae) and *Physocarpus opulifolius (ninebark - Rosaceae) were added to the list of federally regulated associated host plants in December 2007. The CFIA found both plants naturally infected in a British Columbia, Canada nursery. Spike witch hazel symptoms were identified as leaf necrosis, and ninebark symptoms included leaf necrosis and dieback.

USDA APHIS has posted a new protocol for retail nurseries found infested with *P. ramorum*, "Official Regulatory Protocol for Retail Nurseries Containing Plants Infected with *Phytophthora ramorum*," to their website at http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/downloads/pdf_files/rCNP_12-19-07r.pdf.

The USDA APHIS "Notice of Request for Approval of an Information Collection; *Phytophthora Ramorum* Surveys and Data Collection Form" has been published in the Federal Register and is open for public comment through February 8, 2008.

APHIS has developed a questionnaire for property owners and managers where *P. ramorum* is found and in areas where surveys are being conducted. The surveys would help determine the

infection source/origination. They have also developed a data collection form to assist in determining how the pathogen is spreading. APHIS is asking the Office of Management and Budget to approve these activities for 3 years.

For more information, go to http://www.regulations.gov/search/index.jsp. Using the "Search for Documents Open for Comment" function, select "Animal and Plant Health Inspection Service" from the agency drop-down menu, then "Submit." In the Docket ID column, select APHIS 2007-0137 to submit or view comments and to view supporting and related materials. You may also contact Jonathan Jones at (301) 734-8247.

In December 2007, the CFIA published amendments to the "*Phytophthora Ramorum* Compensation Regulations." The amendments promote timely compensation payments to individuals and nursery producers who incurred losses as a result of activities required by CFIA to eradicate *P. ramorum*.

Compensation is intended to cover costs to Canadian nursery owners as well as landscapers and private property owners for disposal of infected plant material and soil, and loss of intended use for the plant material. Compensation payments will support the purchase of replacement plants as appropriate. The provision of compensation is in keeping with CFIA's overall strategy to promote early reporting when pests are found and to assist producers in complying with their obligations to carry out eradication and control activities.

The *Phytophthora ramorum* Compensation Regulations came into effect in June 2007, and cover activities from 1/1/03 to 12/31/08. Applications for compensation must be submitted on or before December 31, 2010. For more information on *P. ramorum* and on how to apply for compensation, visit the CFIA's website at www.inspection.gc.ca or contact Shane Sela at (250) 363-3432.

COMTF-WIDE MEETING

The "Sudden Oak Death: A Decade of Management Challenges" 2008 COMTF-wide annual meeting will be held in San Rafael at the Marin Center, April 15 – 17, 2008. On April 15th, an afternoon field trip will be provided for attendees interested in seeing Sudden Oak Death after 10 years in Marin County. On 4/16, presenters at the COMTF meeting will provide general nursery, wildland, and regulatory updates as well as the latest management and research information available and challenges being faced. The Nursery Committee (open to all interested parties) will wrap up the meeting on 4/17, with a half-day session focusing on nursery-related research, management and regulation issues.

EDUCATION AND OUTREACH

Sudden Oak Death Treatment Workshops, sponsored by UC Cooperative Extension, UC Berkeley, the US Forest Service, Pacific Southwest Research Station, and the COMTF, are being offered once a month from March to July in 2008 at Tolman Hall "Portico," UC Berkeley campus. Each free 2-hour field workshop will provide basic information on SOD/*P. ramorum*, integrated pest management approaches to managing SOD, how to select candidate trees for

treatment, and proper treatment application. DPR and ISA Credits have been applied for (2.0 units).

RESOURCES

Forest stewardship leaflet series on the Internet: The UC Cooperative Extension Forestry Program and the UC Center for Forestry have released a 24-part Forest Stewardship leaflet series. Although designed for California landowners, people in other regions may find it helpful. To download the leaflets, go to http://anrcatalog.ucdavis.edu and type "forest stewardship" into the search box.

The COMTF 2007 Sudden Oak Death Education and Outreach Accomplishment Report is now available on the Task Force website.

CALENDAR OF EVENTS

2/12 –SOD Community Meeting; Burlingame, CA

MARCH

REGULATIONS

In 2006 and 2007 the extent of Sudden Oak Death increased considerably in Oregon, probably due to consecutive years of unusually wet spring and early summer weather, which appears to favor long distance spread of *P. ramorum.* In 2007, 60 new infested sites (55 acres total) were discovered. Six of these sites occurred outside of the quarantine area, and several of them were two or more miles from the nearest infested site. Most of the other new sites were small (less than 1 acre) and scattered near the center of the Oregon quarantine zone.

As a result of this disease expansion, Oregon's Curry County quarantine area was officially expanded to 162 square miles in January 2008, following the State's amendment to its *P. ramorum* quarantine. For the first time, nurseries and a lumber mill are located within the quarantine area. The Oregon Department of Agriculture is working with affected businesses to set up the compliance agreements and inspection schedules necessary to meet federal interstate shipping requirements.

The eradication program will remain ongoing in Oregon as long as funding continues. However, if the disease continues to expand as it did in 2007, finding funds to support the program will become challenging. In 2007, 720 acres were identified for treatment (infection zones and buffer areas). Approximately 420 acres have been treated; treatment of the remaining 300 acres is in progress and will be completed in early 2008 upon receipt of additional funding.

USDA APHIS intends to add five new species or hybrids of *Magnolia* to the *P. ramorum* host list in the near future. The impetus for these additions is positive confirmations for the pathogen in United Kingdom gardens and a nursery in British Columbia, Canada. Symptoms found on the Magnolias included leaf necrosis, stem dieback, and one stem canker.

The Norwegian Food Safety Authority implemented updated *P. ramorum* regulations on 2/15/08. Norway's new regulations can be found at http://www.mattilsynet.no/english/plant_health/regulations_on_measures_against_phytophthora_ramorum_have_been_amended_55856.

NURSERIES

A Florida nursery was found to have *P. ramorum*-positive *Camellia sasanqua* at two of its facilities in January. Both sites were found positive for the pathogen in 2007. The USDA CNP is underway at both locations.

California had three *P. ramorum*-positive nursery confirmations in February. A Los Angeles County production nursery was found to have a *P. ramorum*-positive *Camellia sinensis* plant during a compliance agreement renewal inspection. Other sample results for this nursery are pending. This nursery's compliance agreement has been suspended. The CNP is underway. A production/retail nursery in Los Angeles County had one positive *Camellia japonica* 'Kramer's Supreme' plant confirmed as a result of a compliance agreement renewal inspection. Other sample results for this nursery are pending. This nursery's compliance agreement has been suspended. The CNP is underway.

A retail nursery in Humboldt County had soil samples confirmed positive for *P. ramorum* as a result of a soil delimitation sampling following a 2007 positive. Since the nursery does not ship plants, it is not under a compliance agreement. Soil samples have been collected in an effort to determine where treatments (paving) should be focused.

MONITORING

Point Reyes National Seashore has issued "Spatial distribution and impacts of *Phytophthora ramorum* and Sudden Oak Death in Point Reyes National Seashore," by Max Mortiz, UC-Berkeley, and others. Based on the proportion of randomly located plots infected with *P. ramorum*, the following findings were reported:

- As much as 63% of redwood forests, 45% of coast live oak forests, and 24% of Douglas-fir forests at Point Reyes may be infected.
- There were no confirmations of *P. ramorum* on the west side of Inverness Ridge.
- Tanoak comprised approximately 30% of the basal area in the forests studied. In diseased areas, approximately 75 - 95% of the tanoak is dead (in terms of basal area).
- Diseased redwood plots had fuel loadings in excess of 80 tons per acre, compared to approximately 50 tons per acre in healthy redwood plots.
- Douglas-fir plots actually had higher fuel loading in healthy plots than in diseased plots due to more fuels in the duff layer.
- Within the Point Reyes National Seashore area, centers of infection were determined to be Bolinas Ridge, Bear Valley/Limantour Road, and Five Brooks areas.

For a copy of the complete report, or for more information, contact Alison Forrestel at alison_forrestel@nps.gov.

RESEARCH

Linderman, R.G. and Davis, E.A. 2008. Evaluation of chemical agents for the control of *Phytophthora ramorum* and other species of *Phytophthora* on nursery crops. Online. Plant Health Progress. DOI: 10.1094/PHP-2008-0211-01-RS.

Schena, L.; Duncan, J.M.; and Cooke, D.E.L. 2008. Development and application of a PCR-based 'molecular tool box' for the identification of *Phytophthora* species damaging forests and natural ecosystems. Plant Pathology 57, 64–75. DOI: 10.1111/j.1365-3059.2007.01689.x.

Tjosvold, S.A.; Koike, S.T.; and Chambers, D.L. 2008. Evaluation of fungicides for the control of *Phytophthora ramorum* infecting *Rhododendron, Camellia, Pieris*, and *Viburnum*. Online. Plant Health Progress DOI: 10.1094/PHP-2008-0208-01-RS.

Tooley, P.W.; Browning, M.; and Berner, D. 2008. Recovery of *Phytophthora ramorum* following exposure to temperature extremes. Plant Disease 92:431-437.

Warfield, C.Y.; Hwang, J.; and Benson, D.M. 2008. Phytophthora blight and dieback in North Carolina nurseries during a 2003 survey. Plant Disease 92:474-481.

RESOURCES

A plant disease lesson on *P. ramorum* has been posted to the American Phytopathological Society Education Center website at http://apsnet.org/education/LessonsPlantPath/SuddenOakDeath/default.htm. The lesson, authored by Jennifer Parke and Sunny Lucas of Oregon State University, includes information on symptoms, pathogen biology, the disease cycle and epidemiology, disease management, and its significance in the US, both to affected industries and natural ecosystems.

A summary handout of the Homeowner's Guide has been posted to the Task Force website. While similar to the Homeowner's Guide, the summary handout is condensed and without pictures, making duplication of large quantities quicker and more cost effective.

CALENDAR OF EVENTS

3/12 - SOD Treatment Workshop; UC Berkeley Campus

APRIL

RESEARCH

Failure rates for trees with Sudden Oak Death are found to be up to 20 percent greater than in trees without Sudden Oak Death, according to the 2006/07 Annual Report on "*Phytophthora ramorum* canker (Sudden Oak Death) in coast live oak and tanoak, 2000-2006: factors affecting disease risk, disease progression, and failure potential" by Swiecki, T.J. and Bernhardt, E.A., Phytosphere Research. The following highlights are based on seven years of observations at 12 locations in Marin, Sonoma, and Napa Counties:

- The overall percentage of coast live oaks with *P. ramorum* canker symptoms increased from 23% in 2000 to 30% in 2006.
- Between 2000 and 2006, tanoak disease incidence increased from 31% to 46%.
- Among live trees that had *P. ramorum* canker symptoms in 2000, 63% of tanoaks and 32% of coast live oaks had died by 2006.
- Among plots with *P. ramorum*-related coast live oak mortality, 41% showed reductions in plot canopy cover between 2001 and 2006, compared to 14% of plots without *P. ramorum*-related mortality.
- Between 2000 and 2006, the failure rate of trees that had SOD symptoms in 2006 (34%) was about 10 times that of trees that remained free of *P. ramorum* canker symptoms (3.5%). The failure rate among tanoaks that developed *P. ramorum* canker symptoms by 2006 was 26%, compared with a 3% failure rate in tanoaks that were asymptomatic in 2006.
- In 2006, all tanoak plots that had *P. ramorum*-related mortality had tanoak seedlings present. Among plots with *P. ramorum*-related coast live oak mortality, only 6% lacked coast live oak seedlings.

For a copy of the complete report, go to http://phytosphere.com/publications/Phytophthora_case-control2006-2007.htm.

Ufer, T.; Werres, S.K.; Posner, M.; and Wessels, H.P. 2008. Filtration to eliminate *Phytophthora* spp. from recirculating water systems in commercial nurseries. Online. Plant Health Progress DOI: 10.1094/PHP-2008-0314-01-RS.

REGULATIONS

Effective April 1, 2008, the following five species of Magnolia will be regulated by USDA APHIS for *P. ramorum*: *Magnolia denudata x salicifolia* (Magnolia), *Magnolia kobus* (Kobus magnolia), *Magnolia salicifolia* (Anise magnolia), *Magnolia x thompsoniana* (Magnolia), and *Magnolia liliiflora* (Purple magnolia). All species but Purple magnolia were found in the UK infected with the pathogen. Purple magnolia was found positive for *P. ramorum* in Canada. For more information, contact Jonathan Jones at (301) 734-5038 or Jonathan.M.Jones@aphis.usda.gov.

FUNDING

A new State Centre of Excellence on Climate Change and Woodland and Forest Health is planned to be up and running by July 2008 under the direction of Giles Hardy at Murdoch University, Western Australia. The Centre will be funded over five years with $2.3 million from the Western Australian Government, $2.49 million from Australian industry, and $7.77 million in-kind support. The Centre will be working with collaborators in China, Canada, South Africa, and Italy. For more information, contact Giles Hardy at G.Hardy@murdoch.edu.au.

EDUCATION AND OUTREACH

The COMTF is offering two, one-day Sudden Oak Death wildland training sessions, one on 4/22 at the Sonoma Development Center in Eldridge (near Glen Ellen) and the other on 5/8 at Thomas Fogarty Winery in Woodside. New this year is an afternoon field station specifically addressing bay pruning and other horticultural activities to keep oak trees healthy. Both sessions

are free of charge and open to all interested parties. Continuing education units will be available at each of the sessions.

RELATED RESEARCH

Cline, E.T.; Farr, D.F.; and Rossman, A.Y. 2008. A synopsis of *Phytophthora* with accurate scientific names, host range, and geographic distribution. Online. Plant Health Progress DOI: 10.1094/PHP-2008-0318-01-RS.

Schwingle, B.W. and Blanchette, R.A. 2008. Host range investigations of new, undescribed, and common *Phytophthora* spp. isolated from ornamental nurseries in Minnesota. Plant Dis. 92:642-647.

RESOURCES

The COMTF *P. ramorum* Nursery Training has been posted to the Task Force website at http://nature.berkeley.edu/comtf/html/p__ramorum_trainings.html#CA. The training includes a sample agenda, pertinent handouts, and a PowerPoint presentation. The presentation covers key nursery issues, including regulations, best management practices, symptoms, and research findings. Funding for the training CD was provided by USDA APHIS.

An updated "Data Sheet for *Phytophthora ramorum*" has been issued by UK's CSL. Pathogen symptoms, biology, and socioeconomic and environmental impacts to the UK are summarized in this document, which will be used, along with findings of the European Union Risk Analysis for *P. ramorum* project, to develop the new *P. ramorum* Pest Risk Analysis for the EU. To access the report, go to http://www.defra.gov.uk/planth/pra/pram.pdf.

A Revised Summary Pest Risk Analysis for *Phytophthora kernoviae* has been issued by the UK's CSL. Information provided includes taxonomy, current status of the disease, pathogen history, known susceptible hosts, potential impacts, pathogen distribution, risks, management options, and research findings. To access the report, go to http://www.defra.gov.uk/planth/pra/pker.pdf

CALENDAR OF EVENTS

4/9 – SOD Treatment Workshop; UC Berkeley Campus
4/15 – 17 - "Sudden Oak Death: A Decade of Management Challenges" COMTF 2008 Meeting; San Rafael
4/22 – COMTF SOD/*P. ramorum* Wildland Training; Eldridge

MAY

MONITORING

Multiple *P. ramorum*-positive plant samples have been confirmed outside of a Jackson, MS nursery. The samples were taken on two different dates, from three different host genera. An Emergency Action Notification has been issued; however, due to possible surface contamination

of the samples by silt from flooding prior to collection, further regulatory action has not yet been taken. Follow-up sampling is being conducted to determine the presence or absence of the pathogen in other vegetation near the original positive plants.

The nursery adjacent to this site was first determined as positive for *P. ramorum* June 7, 2006, with a positive *Camellia* sp. Water samples from the nursery were positive for *P. ramorum* on December 17, 2006; January 16, 2007; March 29, 2007; and April 18, 2007. Plants were once again determined as positive for *P. ramorum* on March 23, 2007 (*Camellia japonica* 'Debutante'). The first PCR *P. ramorum*-positive sample taken off nursery property was a stream bait obtained in March 2008 from a ditch receiving nursery runoff (The ditch traverses private land, and then empties into Hog Creek, a small tributary of the Pearl River.); however, isolations were negative. Follow-up monitoring efforts were implemented, including monthly baiting of the ditch and Hog Creek through March 2008 and vegetation surveys of the ditch environs in spring 2007 and March 2008.

The first follow-up vegetation survey of the ditch was conducted in May 2007, a time of the year when environmental conditions were not conducive to pathogen recovery. The results were negative. Monthly water baiting surveys conducted from May through November 2007 were also negative. In December, water baiting efforts resulted in a nested and real-time PCR positive, which led to a supplemental vegetation survey of the ditch vicinity. Symptomatic willow foliage was collected during the supplemental survey. The samples yielded nested and real-time PCR positives. Water bait PCR positives followed in January, February (both in the ditch and in Hog Creek), and March 2008 (ditch only); some of these bait positives also yielded *P. ramorum* cultures.

The December 2007 willow positive was followed by a February 2008 survey which tracked the detection and destruction of infected magnolia plants in the nursery that month. The survey also included soil samples from inside and outside the nursery; water from the ditch inside and outside the nursery, and from Hog Creek; and vegetation samples from the ditch vicinity. Vegetation samples were sent to Clemson University (CU) for culturing with replicates to the Mississippi State University (MSU) clinic for ELISA screening. MSU reported ELISA positives for multiple vegetation samples from outside the nursery, and extracted DNA for APHIS diagnostics. APHIS reported PCR positives from multiple vegetation samples (*Quercus* and *Rubus* foliage). CU reported negative isolation results from replicate samples of the same genera, and positive water samples by filtration and culturing from both inside and outside the nursery. In one water sample, CU reported that *P. ramorum* propagule counts were exceeded only by those obtained from known positive California streams in infested areas.

A survey was conducted on April 1, 2008 and included water samples from inside and outside the nursery as well as natural landscape vegetation samples from outside the nursery. The area adjacent to the ditch with the previously identified positive willow was unavailable for sampling due to flooding of Hog Creek; consequently, samples were taken from higher ground proximal to the ditch and Hog Creek. All vegetation samples collected were negative. Water samples collected from the ditch on nursery property were positive. Another survey of the ditch was

conducted April 29, 2008. Results from the survey are pending. For more information, contact Jonathan Jones at Jonathan.M.Jones@aphis.usda.gov.

REGULATIONS

***Cercis chinensis* (Chinese redbud) and *Magnolia* (*Michelia*) *figo* (banana shrub) have both** been reported positive for *P. ramorum*. USDA APHIS is reviewing the findings, and plans to add each species to the list of hosts regulated for *P. ramorum* in early May. *Cercis chinensis* was found positive at a previously positive British Columbia nursery on November 16, 2007. Other genera found positive at the facility included *Magnolia*, *Salix*, *Rhododendron*, and *Vaccinium*. The nursery was also found to have an infested irrigation pond. Canadian regulatory officials suspect that the infected plants were the result of overhead irrigation using the infested pond water. The nursery is currently under aggressive eradication orders. The *Magnolia figo* was found during a compliance agreement inspection at a Contra Costa County, CA nursery.

USDA APHIS, in cooperation with industry representatives and state regulatory agencies, has been exploring alternative real-time PCR diagnostics for *P. ramorum* testing based on a different genetic locus than the ITS region currently targeted. After extensive testing, new-to-the-program real-time PCR tests will be supported which combine use of the current ITS real-time PCR, CFIA's Elicitin/5.8S (IC), and ARS's Cox real-time PCR assays. Labs participating in the National Plant Protection Laboratory Accreditation Program are expected to have suitable sensitivity and selectivity for incorporating the new diagnostics into their programs. Confirmation laboratories will retain conventional PCR assays (nested-PCR and other multiplex) for resolution of inconclusive samples. USDA APHIS is using the new diagnostics, and expects to post the protocols in May. For more information, contact Jonathan Jones at Jonathan.M.Jones@aphis.usda.gov.

NURSERIES

ODA began inspections and testing for the 2008 USDA APHIS Annual Certification Survey in March. As of April 29th, testing has been completed on 6,279 samples collected from 153 nursery growing areas. *Phytophthora* species have been detected at 60 percent of the sites surveyed, a 12 percent increase over last year. The number of *Phytophthora*-infected samples has also increased from 6 percent in 2007 to 9 percent in 2008. Oregon has been experiencing a long, cool, wet spring which may be contributing to the increased presence of *Phytophthora*. *P. ramorum* has been found infecting *Rhododendron* plants at three nurseries, one in Clackamas County and two in Washington County. *P. ramorum* had previously been detected at the Clackamas County nursery in 2005 and in one of the Washington County nurseries in 2006 and 2007. The USDA CNP has been enacted at both nurseries.

ODA has also been busy recruiting nurseries to participate in the Grower Assisted Inspection Program (GAIP), which is intended to assist nurseries in identifying and implementing site-specific appropriate best management practices in an effort to minimize nursery-related *Phytophthora* disease issues. Funding for this project has been provided by the USDA Natural Resources Conservation Service. To date, 17 nurseries have volunteered to join the program.

CA has had eleven positive nurseries (four producers, two wholesalers/producers, one production/retail, and four retailers) confirmed *P. ramorum*-positive in 2008. Four of the positive nurseries were located in Los Angeles (2), San Diego, and Santa Barbara Counties and five were located in the quarantined counties of Contra Costa (2), San Mateo, Alameda, and Humboldt. Five of the nine nurseries have been positive in previous years, and one ships interstate. There was also a nursery in Riverside County with one PCR positive identified during a compliance agreement sampling. The positive lot is being held and resampled as outlined in the recently amended USDA Potentially Actionable Suspect Sample Policy. This nursery will not be considered positive unless another sample is determined positive for *P. ramorum*.

RESEARCH

Dodd, Richard S.; Hüberli, Daniel; Mayer, Wasima; Harnik, Tamar Y.; Afzal-Rafii, Zara; and Garbelotto, Matteo. 2008. Evidence for the role of synchronicity between host phenology and pathogen activity in the distribution of sudden oak death canker disease. New Phytologist. DOI: 10.1111/j.1469-8137.2008.02450.x.

Frankel, Susan J.; Kliejunas, John T.; and Palmieri, Katharine M., technical coordinators. 2008. Proceedings of the sudden oak death third science symposium. Gen. Tech. Rep. PSW-GTR-214. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 491 p. Available online at: http://www.fs.fed.us/psw/publications/documents/psw_gtr214/.

Jiang, Rays H.Y.; Tripathy, Sucheta; Govers, Francine; and Tyler, Brett M. 2008. RXLR effector reservoir in two *Phytophthora* species is dominated by a single rapidly evolving superfamily with more than 700 members. Proceedings of the National Academy of Sciences Vol. 105 No. 12: 4874–4879.

Kaminski, K. and Wagner, S. 2008. In vitro Inoculation Studies for Estimating the Susceptibility of Ornamental Plants to *Phytophthora ramorum*. J. Phytopathology. DOI: 10.1111/j.1439-0434.2008.01399.x.

Waring, Kristen M. and O'Hara, Kevin L. 2008. Redwood/tanoak stand development and response to tanoak mortality caused by *Phytophthora ramorum*. Forest Ecology and Management 255 (2008) 2650–2658. Available online at www.sciencedirect.com.

RELATED RESEARCH

Wickland A.C.; Jensen C.E.; and Rizzo, D.M. 2008. Geographic distribution, disease symptoms and pathogenicity of *Phytophthora nemorosa* and *Phytophthora pseudosyringae* in California, USA. Forest Pathology DOI: 10.1111/j.1439-0329.2008.00552.x.

RESOURCES

OSU's Extended Campus (Ecampus), in partnership with ODA, has launched an online *Phytophthora* course that provides training to nursery growers about *Phytophthoras*. The free course includes three modules: biology, symptoms, and diagnosis; disease management; and *P. ramorum*. For an optional $100 fee, nursery growers can earn a Certificate of Mastery after successfully completing an online exam. A Spanish version of the online course will also be

launched soon. To access the Ecampus "*Phytophthora* Online Course: Training for Nursery Growers," visit http://ecampus.oregonstate.edu/phytophthora. Jennifer Parke, Jay Pscheidt, and Richard Regan, OSU; Jan Hedberg, ODA; and Niklaus Grunwald, USDA ARS Horticultural Crops Research Lab authored the course.

"The Collection and Care of Acorns: A Practical Guide for Seed Collectors and Nursery Managers," written and compiled by Dr. Frank Bonner, is available on the USDA FS website at http://www.nsl.fs.fed.us/COLLECTION%20AND%20CARE%20OF%20ACORNS.pdf. The illustrated guide explains how to estimate seed crops; collect, clean, and store acorns; perform simple seed quality tests; and prepare acorns for planting.

CALENDAR OF EVENTS

5/4 – Bay Area Bringing Back the Natives Garden Tour; 3 SOD talks offered
5/8 – COMTF SOD/*P. ramorum* Wildland Training; Woodside
5/14 - SOD Treatment Workshop; UC Berkeley Campus

JUNE

MONITORING

On April 29th, additional foliage samples were taken for analysis from native trees and shrubs along the ditch outside of the nursery in Jackson, MS (reported in the May COMTF newsletter). Results from both isolation attempts and molecular tests on those follow-up foliage samples were negative for *P. ramorum*. Follow-up water samples collected on April 29th inside and outside the nursery perimeter also were negative for *P. ramorum*. To assure the absence of the pathogen in the natural environment, additional sampling will be conducted in the fall and following spring when conditions should be more conducive to its detection.

Follow-up plant samples taken from the adjacent nursery were also negative for *P. ramorum*; one additional soil sample, collected in mid-May, currently is being assayed. The USDA APHIS CNP is underway at the facility, and is expected to be completed soon. A post-eradication monitoring survey will be conducted within the nursery in the spring of 2009 and again in 2010. For more information, contact Jonathan Jones at Jonathan.M.Jones@aphis.usda.gov.

***P. ramorum* was confirmed in a landscape setting in Harris County, Texas in March, as** well as at a California nursery in April. The confirmations were made following trace-forward investigations resulting from a Southern California nursery found to have *P. ramorum*-positive *Camellia sinensis* in February. The S. CA nursery had shipped to nurseries and homeowners interstate. The positive *Camellia* sp. planted in the Texas yard was removed and destroyed as per the USDA APHIS "Official Regulatory Protocol for *Phytophthora ramorum* Detections in Landscaped Residential or Commercial Settings." All follow-up landscape soil sampling results to date at the Texas site have been negative for the pathogen. For more information, contact Jonathan Jones at Jonathan.M.Jones@aphis.usda.gov.

NURSERIES

***P. ramorum* was confirmed at one Mendocino County, CA retail nursery in May after being** self-reported by the nursery owner. This latest detection brings the total number of positive CA nurseries to 12 (four producers, two wholesalers/producers, one production/retail, and five retailers). Six of the positive nurseries are located in the regulated counties of Los Angeles (three), San Diego, San Joaquin and Santa Barbara. The remaining six nurseries are located in the quarantined counties of Alameda, Contra Costa (two), Humboldt, Mendocino and San Mateo. Six of the twelve nurseries have previously been positive for *P. ramorum*. One of the 12 nurseries has shipped plant product interstate.

As of May 23rd, the ODA Plant Health Laboratory has processed 10,090 samples from 247 grower sites in 2008. *Phytophthora* has been detected at 63.1% of the grower sites inspected and in 9.4% of the samples collected for testing. Compared to 2007, this represents a 16.8% increase in the number of nurseries with *Phytophthora* present and a 3.9% increase in the number of samples requiring PCR testing for *P. ramorum*. The extremely long, cool, wet spring appears to be the major factor contributing to these increases.

P. ramorum has been detected in three OR nurseries and one landscape site in 2008. At all sites, *P. ramorum* was initially detected on infected *Rhododendron*. During delimitation surveys in the nurseries, additional positives were found in the soil and potting media at one nursery and in the cull pile, soil beneath an infected block, and in a block of *Arctostaphylos uva-ursi* at the second nursery. No additional positives have been found in the third nursery, although soil and media samples are still pending. The delimitation surveys for the landscape site are underway. The infected plant at the landscape site was purchased from a positive Oregon nursery earlier this year.

FUNDING

The USDA-FS, PSW SOD/*P. ramorum* Research program is awarding approximately $1.5 million for 2008 research projects. The funded projects are being carried out at 15 research institutions in seven states, the United Kingdom, and Germany. To view funding for the 2008 PSW SOD/*P. ramorum* program, go to http://www.fs.fed.us/psw/programs/sod/funding/awards_08.shtml. For more information on the program and funded research, contact Susan Frankel at 510-559-6472 or sfrankel@fs.fed.us.

RESEARCH

Hansen, E.M. 2008. Alien forest pathogens: *Phytophthora* species are changing world forests. Boreal Environment Research 13:33-41.

Hansen, E.M.; Kanaskie, A.; Prospero, S.; McWilliams, M.; Goheen, E.M.; Osterbauer, N.; Reeser, P.; and Sutton, W. 2008. Epidemiology of *Phytophthora ramorum* in Oregon tanoak forests. Canadian Journal of Forest Research 38:1133-1143. DOI: 10.1139/X07-217.

Park, J.; Park, B.; Veeraraghavan, N.; Jung, K.; Lee, Y.-H.; Blair, J.E.; Geiser, D.M.; Isard, S.; Mansfield, M.A.; Nikolaeva, E.; Park, S.-Y.; Russo, J.; Kim, S.H.; Greene, M.; Ivors, K.L.; Balci, Y.; Peiman, M.; Erwin, D.C.; Coffey, M.D.; Rossman, A.; Farr, D.; Cline, E.;

Grünwald, N.J.; Luster, D.G.; Schrandt, J.; Martin, F.; Ribeiro, O.K.; Makalowska, I.; and Kang, S. 2008. *Phytophthora* Database: A forensic database supporting the identification and monitoring of *Phytophthora*. Plant Dis. 92:966-972.

LEARNING CURVE

While there is NO known cure for SOD, there is one preventative phosphonate treatment currently registered for use in California on individual tanoaks and susceptible oaks (coast live oak, Shreve's oak, CA black oak, and canyon live oak). Trees under consideration for treatment should be within a few miles of a known infestation. The treatment, called Agri-Fos®, can either be injected into the tree or it can be combined with the surfactant Pentra-Bark™ and applied to the trunk of the tree.

When deciding to inject or spray, there are pros and cons for each application method that should be considered. Benefits to choosing injection are: it is the most environmentally friendly, as the material is released directly into the tree; the surfactant is not needed; and moss removal on the tree is not necessary. Challenges faced with injections are: the treatment process is more complex, as the injection must be inserted to the right depth, and done on favorable weather days; the trunk of the candidate tree must be without flaws; and injection sites are drilled, creating wounds in the tree. Benefits to choosing spray applications are: treatments are easily accomplished with a sprayer and protective gear and can be done in all weather conditions but rain and wind; tree structure is not a concern; and there is no wounding of the tree. Challenges to consider before choosing to spray are: both the Agri-Fos® and Pentra-Bark™ products are needed; surrounding plants may be damaged/burned if the mixture is exposed to them; and moss must be removed from candidate trees before application for the product to be adequately absorbed.

If choosing to use the injection method for preventative treatment, necessary equipment includes protective equipment, a drill, positive-pressure injectors, and Agri-Fos®. Drilling must be done into the xylem of the tree and must be quickly followed by the insertion of the injector. Positive pressure must then be applied to allow the material to be absorbed into the tree. The rate at which the material will be absorbed will depend upon the weather and time of year, so try to inject on mild days whenever possible for better absorption. The number of injections per tree is based upon the circumference of the tree (see the product label for details). Injections should be staggered around the tree trunk.

If choosing to use the spray application method for preventative treatment, necessary equipment includes a sprayer; Agri-Fos®; Pentra-Bark™; and protective eyewear, gloves, and clothing. Before applying the mixture, put on protective gear, remove all moss from the trunk of the tree, and also be sure to tarp any surrounding plants. Spraying should only be done when it is not raining and there is no wind. When applying the material (per label mixture recommendations), cover the trunk of the tree from the base up to 12 – 15 feet until the material begins to drip.

Both application methods take four to six weeks for the material to be assimilated by the plant, so it is recommended that initial applications be applied either in the fall after temperatures drop (usually November to early December) or in the spring after new leaves emerge (late March to

April). The first year the treatments should be applied once in the fall and repeated again in the spring or vice versa. Every year thereafter the treatment should be administered in the fall (note: if the first treatment is administered in the fall and the second in the spring, the first follow-up annual treatment should begin in 1.5 years in the fall and then annually in the fall thereafter).

Always check the label before making any pesticide application. For labels and material safety data sheets on Agri-Fos® and Pentra-Bark™, go to the Garbelotto UC Berkeley Forest Pathology and Mycology laboratory website at http://www.cnr.berkeley.edu/garbelotto/downloads/agrifospentrabarklabel.pdf.

This treatment information is a summary of the treatment training sessions being offered by Matteo Garbelotto at the UC Berkeley campus.

NOTE: The recommendations above are based on the best science currently available. Studies conducted on the use of Agri-Fos® and Pentra-Bark™ against SOD are relatively new and ongoing; therefore recommendations are subject to change. Reference herein to these specific commercial products does not constitute or imply its endorsement by the COMTF.

EDUCATION AND OUTREACH

SOD Blitzes are underway this spring. To date, Blitzes have been conducted at the Santa Lucia Preserve as well as in Woodside and Portola Valley. Blitzes yet to come include the East Bay's Tilden, Wildcat Canyon, Redwood, and Briones Regional Parks, Mendocino County, and Humboldt County. Led by Matteo Garbelotto, UC Berkeley, and supported by the COMTF and participating UC Cooperative Extension Offices and County Departments of Agriculture, the Blitzes are intended to raise awareness of SOD as well as to determine the locations and boundaries of the disease in each of the areas.

SOD Blitz participants will be trained to identify disease symptoms, correctly sample symptomatic plants, and document sample locations. Samples will be collected at designated locations for each particular Blitz and taken to the UC Berkeley Garbelotto lab, where they will be analyzed to determine the presence or absence of *P. ramorum*. Laboratory results will be used to generate maps of disease distribution for each participating location. The maps developed for Mendocino and Humboldt Counties will then be used to assist the development of comprehensive management plans with cooperating landowners.

REGULATIONS

Correction to May Newsletter Entry Regarding PCR Diagnostics: In addition to accepting current conventional (nested-PCR and other multiplex) and Real-time PCR assays, USDA APHIS will also be accepting paired ITS and Elicitin/5.8S Real-time PCR assays.

RELATED RESEARCH

Fry, William. 2008. Plant diseases that changed the world, *Phytophthora infestans*: the plant (and Rgene) destroyer. Molecular Plant Pathology 9(3), 385–402. DOI: 10.1111/J.1364-3703.2007.00465.X.

Tyler, B.M. 2007. *Phytophthora sojae*: root rot pathogen of soybean and model oomycete. Molecular Plant Pathology 8(1), 1–8. DOI: 10.1111/J.1364-3703.2006.00373.X.

RESOURCES

Bennett, M. and Shaw, D. 2008. Diseases and Insect Pests of Pacific Madrone. Oregon State University Extension Service, EC 1619-E. Online at http://extension.oregonstate.edu/catalog/pdf/ec/ec1619-e.pdf.

CALENDAR OF EVENTS

6/7 - East Bay SOD Blitz
6/11 - SOD Treatment Workshop; UC Berkeley Campus
6/13 - Mendocino County SOD Blitz
6/14 - Humboldt County SOD Blitz

JULY

MANAGEMENT

The Basin Complex of fires in Big Sur is burning in areas with elevated fuels due to SOD mortality. To date, most of the burn area has contained older dead trees; however, the fire is moving north toward Palo Colorado Road and vicinity where more recent SOD mortality has occurred. The fine fuels from attached leaves on these recently killed trees can increase the difficulty of fire suppression. A map of the current fire perimeter and the location of 2003 – 2007 SOD tree mortality has been developed by USDA FS FHP.

An 80-acre fire along Saint Helena Road in Napa County ignited on 5/16 when the green stem of a coast live oak infected with the SOD pathogen fell onto a power line. Costing approximately $100,000 to suppress, the fire caused local power outages and disrupted commuter traffic; however, no homes were damaged.

The US Fish and Wildlife Service has pre-approved SOD eradication treatment (up to 250 acres per agency per year for the next 5 years) on US FS and BLM terrestrial TES habitat (northern spotted owl and marbled murrelet) lands in SW Oregon. This pre-approval will simplify the consultation process, allowing agencies to respond to infested sites more quickly, thereby maximizing eradication efforts. For more information on the agreement, contact Ellen Goheen at egoheen@fs.fed.us.

MONITORING

***P. ramorum* has been recovered from two Washington watersheds in 2008. WSDA** reconfirmed *P. ramorum* in the Sammamish River at the original 2007 positive site on 2/14/08 and 5/9/08, and in the Rosedale Stream (also found positive in 2007) on 4/18/08 at a new confluence in a field below a previously *P. ramorum*-positive nursery.

FUNDING

The Oregon legislature approved $427,000 in funding for efforts to eradicate SOD in Oregon. The funding is critically needed due to an expansion of the infested area in Oregon and a proposal by ODF and cooperators to intensify eradication efforts.

Senate Bill 1668 (Migden), which establishes the "Marin-Sonoma Sudden Oak Death Intervention and Assistance Act of 2008," has been approved by the California Senate. The Bill directs CAL FIRE to develop a focused program that would reduce SOD impacts in Marin and Sonoma Counties. It also authorizes the use of Proposition 84 funds for local research, public education, detection, treatment, and monitoring of the disease, and encourages Marin and Sonoma Counties to assist the state in developing a cost-share program to help landowners with the removal of dead or diseased trees in order to reduce fire risks. If passed, local governments could apply for Proposition 84 funding to help cover SOD-related activities. SB 1668 does not address SOD in the other 12 infested counties. It will be heard by the CA Assembly next.

FEATURED RESEARCH

The Potential of Commercial Algaecides to Manage *Phytophthora ramorum* in Waterways;
S. N. Jeffers & G. C. Colburn; Department of Entomology, Soils, and Plant Sciences; Clemson University; Clemson, SC 29634-0315

For many years, species of *Phytophthora* were thought to be true fungi and often are referred to as lower fungi and water molds. However, we have learned after studying these microorganisms for many years that species of *Phytophthora* have several characteristics that are quite different from true fungi. For example, they reproduce sexually by producing oospores; they reproduce asexually by releasing motile, biflagellate zoospores from sporangia; the nuclear state of the thallus is diploid; and cell walls are composed primarily of cellulose. In more recent years, we have learned through the use of molecular genetics that species of *Phytophthora* as well as other oomycetes belong to an entirely different kingdom of organisms than do true fungi and that they are more closely related to golden and brown algae than to true fungi. Consequently, we have initiated a project to determine if *P. ramorum* and other species of *Phytophthora* are sensitive to commercially available algaecides. If so, we will determine if algaecides can be used to manage *P. ramorum* and other species of *Phytophthora* that occur naturally in waterways.

Many commercial algaecides contain copper compounds as active ingredients. *Phytophthora* spp. and other oomycetes are known to be sensitive to copper-based fungicides, so it was logical to test the efficacy of copper-based algaecides against *Phytophthora* spp. that occur in waterways. Many of the commercially available algaecides are registered for use in diverse water environments, and water treated with these products may be used for swimming, fishing, watering livestock, and irrigating turf and ornamental plants immediately after treatment. Therefore, these algaecides appear to be relatively safe for people, animals, and the environment.

To date, we have tested the sensitivity of *P. ramorum* to two commercially available algaecides: Captain (which contains copper carbonate) and K-Tea (which contains elemental copper derived from copper-triethanolamine complex and copper hydroxide); both products are manufactured by SePRO Corporation in Carmel, IN. All experiments were conducted in the quarantine facility at

the USDA-ARS Foreign Disease and Weed Science Research Unit at Ft. Detrick in Fredrick, MD. Chlamydospores, sporangia, and zoospores from two isolates of *P. ramorum* (an A1 isolate from Europe and an A2 isolate from the USA) were exposed to the labeled rates of the algaecides for various lengths of time. Both isolates were equally sensitive to the two algaecides used in our experiments. Zoospores were most sensitive and were not recovered after exposure to the algaecides for 30 minutes. Likewise, sporangia were not recovered after 4 hours of exposure, and chlamydospores were not recovered after 8 hours of exposure. We are in the process of testing the sensitivity of other species of *Phytophthora* to these two algaecides under laboratory conditions. In the coming months, we will be testing the efficacy of algaecides to eliminate *P. ramorum* and other species of *Phytophthora* from naturally-infested water. In summary, algaecides appear to have good potential for managing *P. ramorum* in waterways.

NURSERIES

WSDA has completed sampling at 40% of Washington's 2008 USDA annual certification survey sites. *P. ramorum* has been found infecting *Viburnum tinus* plants at three nurseries, one in Snohomish County and two in Clark County. All three nurseries tested negative in previous years. The USDA CNP was enacted at each site; however, one of the Clark County sites was released when a delimiting survey failed to turn up additional PCR positive samples. Under the USDA Potentially Actionable Suspect Sample Policy, nurseries with only one PCR positive are not subject to the CNP. The nursery will be monitored for further symptoms, but is not under quarantine at this time. *P. ramorum* was confirmed at the second Clark County site on 5/20/08 at the outlet of a pond near the center of the retail nursery, as well as at a culvert under a nearby street just before the ditch passes under the road. The CNP is underway at the nursery, and follow-up monitoring of the ditch is under consideration. For more information, contact Brad White at bwhite@agr.wa.gov.

As of 6/27/08, ODA has inspected and processed 13,797 samples from 336 grower sites. *Phytophthora* continues to be detected at high levels within the industry this year, having been detected at 57.1% of sites surveyed and in 8.4% of samples tested. At this same point during the 2007 survey, *Phytophthora* had been detected at 42.1% of the grower sites surveyed and in 4.5% of the samples tested.

P. ramorum has been detected in four nurseries and in one landscape site so far. At four of the five sites, the infected host species was *Rhododendron*. At the fifth site, *P. ramorum* was detected in *Pieris* 'Japanese'. In the first positive nursery, additional *P. ramorum* positives were detected in the potting media and soil during delimitation surveys. In the second positive nursery, additional *P. ramorum* positives were detected in a cull pile, in the soil beneath an infected block, and in a block of *Arctostaphylos uva-ursi* during delimitation surveys. In the other two nurseries, no additional *P. ramorum* has been found, although soil samples remain in process from the latest site. A rhododendron from a fifth nursery tested PCR-positive for *P. ramorum*. As required by the USDA APHIS Potentially Actionable Suspect Sample (PASS) protocol, additional samples were collected from the nursery to verify the PCR-positive test result. All of these samples tested negative for *P. ramorum.* Per the PASS protocol, no regulatory action was taken at the nursery. All other *P. ramorum*-positive sites in Oregon have been positive by both PCR and culture plating.

In the landscape site, one soil sample was received from the positive location; no plant samples were collected because the site consisted of a single, infected rhododendron plant with no other susceptible plants nearby. For more information, contact Nancy Osterbauer at nosterba@oda.state.or.us.

RESEARCH

Brasier, C.M. 2008. The biosecurity threat to the UK and global environment from international trade in plants. Plant Pathology Letter to the Editor DOI: 10.1111/j.1365-3059.2008.01886.x.

Cushman, J. Hall and Meentemeyer, Ross K. 2008. Multi-scale patterns of human activity and the incidence of an exotic forest pathogen. Journal of Ecology 96, 766–776. DOI: 10.1111/j.1365-2745.2008.01376.x.

The following thirty-one abstracts on *P. ramorum* and related topics are being presented at the 2008 APS Centennial Meeting in Minneapolis, MN July 26-30th.

Overview Presentations:
Hansen, E. 2008. *Phytophthora* – A day late and a dollar short. Phytopathology 98:S187.

Hansen, E. 2008. A historical review of *Phytophthora* diseases. Phytopathology 98:S196.

Rizzo, D.M. 2008. *Phytophthora ramorum*: A recent discovery with a large impact. Phytopathology 98:S197.

***P. ramorum* - Diagnostics:**
Mavrodieva, V.A.; Negi, S.; Picton, D.; Levy, L.; Tooley, P.; Shishkoff, N.; and Luster, D. 2008. Development and validation of a tissue based panel for the *P. ramorum* proficiency testing program. Phytopathology 98:S100.

Schoedel, B. and Avila, F.J. 2008. Specific immunodetection of *Phytophthora ramorum* and *P. kernoviae*. Phytopathology 98:S141.

Sudarshana, P.; Shukla, R.; Abad, G.; Olson, B.R.; and Palm, M. 2008. A summary of diagnostics conducted by the USDA-APHIS-PPQ Molecular Diagnostic Laboratory. Phytopathology 98:S152.

Zeller, K.A.; DeVries, R.M.; and Levy, L. 2008. Head-to-head comparisons of sensitivity and specificity among 5 real-time PCR assays diagnostic for *Phytophthora ramorum*. Phytopathology 98:S179.

***P. ramorum* - Genetics:**
Goss, E.M. and Grunwald, N.J. 2008. Ancient isolation and independent evolution of the three clonal lineages of the sudden oak death pathogen *Phytophthora ramorum*. Phytopathology 98:S61.

***P. ramorum* – Nurseries:**
Grunwald, N.J.; Larsen, M.; and Goss, E.M. 2008. Genotypic diversity of *Phytophthora ramorum* in U.S. nurseries. Phytopathology 98:S63.

Parke, J.L.; Grunwald, N.; Lewis, C.; and Fieland, V. 2008. A systems approach for managing *Phytophthora* diseases in production nurseries. Phytopathology 98:S121.

Roubtsova, T.V. and Bostock R.M. 2008. Impact of episodic root stress on the susceptibility of *Rhododendron* sp. and *Viburnum tinus* to *Phytophthora ramorum*. Phytopathology 98:S136.

Shishkoff, N. 2008. Sporulation on plant roots by *Phytophthora ramorum.* Phytopathology 98:S145.

***P. ramorum* – Wildlands:**
Brennan, J.; Cummins, D.; Kearney, S.; Choiseul, J.; Cahalane, G.; and Nolan, S. 2008. Investigating the threat of *Phytophthora ramorum* to Ireland: The current situation. Phytopathology 98:S25.

Dileo, M.V.; Bostock, R.M.; and Rizzo, D.M. 2008. Ecophysiological factors mitigating *in planta* survival of *P. ramorum* in California bay laurel. Phytopathology 98:S46.

Fichtner, E.J.; Rizzo, D.M.; Kirk, S.; Whybrow, A.; and Webber, J. 2008. Root infections of *Phytophthora ramorum* and *Phytophthora kernoviae* in UK woodlands. Phytopathology 98:S53.

Jinek, A.; Simard, M.; Brière, S.C.; Watson, A.K.; Tweddell, R.J.; and Rioux, D. 2008. Susceptibility of six eastern Canadian forest species to *Phytophthora ramorum*. Phytopathology 98:S75.

Nagle, A.M.; Garbelotto, M.; and Bonello, P. 2008. Differences in constitutive and induced expression of two phenolic compounds in coast live oaks susceptible and resistant to infection by *Phytophthora ramorum*. Phytopathology 98:S111.

Parke, J.L.; Oguchi, A.; Fichtner, E.J., and Rizzo, D.M. 2008. Viability of *Phytophthora ramorum* after passage through slugs. Phytopathology 98:S121.

***P. ramorum* – Treatments:**
Colburn, G.C. and Jeffers, S.N. 2008. Toxicity of commercial algaecides to *Phytophthora ramorum*. Phytopathology 98:S40.

Other *Phytophthoras*:
Ahonsi, M.O.; Banko, T.J.; Doane, S.R.; Demuren, A.O.; Copes, W.E.; and Hong, C.X. 2008. *Phytophthora nicotianae* zoospores evade pressure and agitation stress but are completely destroyed by CO(2) injection. Phytopathology 98:S10.

Hwang, J.; Oak, S.W.; and Jeffers, S.N. 2008. Variation in population density and diversity of *Phytophthora* species in streams within a forest watershed. Phytopathology 98:S70.

Ivors, K.L. and Greene, M.D. 2008. Identifying *Phytophthora* species isolated from stream baits in North Carolina. Phytopathology 98:S72.

Kim, S.; Nikolaeva, E.V.; Park, S.; and Kang, S. 2008. First report of *Phytophthora hedraiandra* in Pennsylvania. Phytopathology 98:S82.

Kong, P. and Hong, C. 2008. Quorum sensing operates in *Phytophthora nicotianae.* Phytopathology 98:S85.

McLaughlin, I.M.; Jeffers, S.N.; and Waldrop, T.A. 2008. Long-term effects of fuel reduction treatments on the incidence of *Phytophthora* spp. in soil of a hardwood forest in the southern Appalachian Mountains. Phytopathology 98:S102.

Olson, H.A. and Benson, M. 2008. Characterization of *Phytophthora* in North Carolina greenhouse ornamentals. Phytopathology 98:S116.

Santamaria, L. and Mmbaga, M.T. 2008. A survey for Phytophthora diseases in mid-Tennessee nurseries: Identification and characterization. Phytopathology 98:S140.

Wang, S.; Lyles, L.; Garneni, S.; Carlos, W.J.; and McKie, P. 2008. *Phytophthora* species associated with silver maple bleeding canker in northern Nevada. Phytopathology 98:S166.

Weiland, J.E.; Nelson, A.H.; and Hudler, G.W. 2008. Aggressiveness of *Phytophthora cactorum* and *Phytophthora citricola* isolates on European beech and lilac. Phytopathology 98:S168.

Widmer, T.L. 2008. Comparing New Zealand and United Kingdom isolates of *Phytophthora kernoviae.* Phytopathology 98:S171.

Miscellaneous:
Levesque, C.A.; de Cock, A.W.A.M.; Robideau, G.; Desaulniers, N.; and Bala, K. 2008. The Oomycota. Phytopathology 98:S184.

The Ecological Society of America 93rd Annual Meeting will be held August 3 – 8, 2008 at the Midwest Airlines Center in Milwaukee, Wisconsin. The following five *P. ramorum* papers will be presented at the meeting:

Cobb, Richard C.; Lynch, Shannon C.; Metz, Margaret R.; Meentemeyer, Ross; and Rizzo, David M. 2008. Apparent competition among host species and feedbacks on disease severity in the sudden oak death pathosystem.

Ellis, Alicia M. and Meentemeyer, Ross K. 2008. Incorporating effects of landscape heterogeneity on pathogen dispersal into spatially-explicit disease models

Hall, Kim; Albers, Heidi J.; Collins, Brad; Guillozet, Kathleen; Haim, David; Martin, Danielle; Norlander, Daniel; Peterson, Ebba; Shaw, David; and Thompson, Matt. 2008. Ecological and economic impacts of Sudden Oak Death in Oregon with an emphasis on barrier zones and quarantines

Meentemeyer, Ross; Cunniffe, Nik J.; Hunter, Richard D.; Rizzo, Dave M.; Cook, Alex R.; and Gilligan, Christopher A. 2008. Spread of sudden oak death: Application of stochastic epidemic modeling to realistic landscapes

Metz, Margaret R.; Frangioso, Kerri M.; Wickland, Allison C.; Meentemeyer, Ross K.; and Rizzo, David M. 2008. Effects of sudden oak death on plant community structure and regeneration in the Big Sur ecoregion of California.

RELATED RESEARCH

Dobrowolski, M.P.; Shearer, B.L.; Colquhoun, I.J.; O'Brien P.A.; and StJ. Hardy, G.E. 2008. *Phytophthora cinnamomi* with prolonged use of fungicide. Plant Pathology DOI: 10.1111/j.1365-3059.2008.01883.x.

Durán, A.; Gryzenhout, M.; Slippers, B.; Ahumada, R.; Rotella, A.; Flores, F.; Wingfield, B.D.; and Wingfield, M. J. 2008. *Phytophthora pinifolia* sp. nov. associated with a serious needle disease of *Pinus radiata* in Chile. *Plant Pathology*. DOI: 10.1111/j.1365-3059.2008.01893.x.

RESOURCES

The COMTF has updated the Sudden Oak Death Guidelines for Arborists. To access this new information, go to http://nature.berkeley.edu/comtf/pdf/arborist_guidelines.pdf.

Chapter 3, "The Disease Cycle: Sources of inoculum, dispersal, infection, colonization, survival" in Sudden Oak Death and *Phytophthora ramorum*: A Summary of the Literature by John T. Kliejunas has been posted to the COMTF website. The chapter includes a diagrammatic disease cycle for *P. ramorum*, courtesy N. Ochiai, S. Lucas and J. Parke, Oregon State University. To access the new chapter, as well as prior chapters, go to http://nature.berkeley.edu/comtf/html/sod_literature_summary.html.

Frankel, Susan J.; Kliejunas, John T.; Palmieri, Katharine M., technical coordinators. 2008. Proceedings of the Sudden Oak Death Third Science Symposium. Gen. Tech. Rep. PSW-GTR-214, Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture. 491 p.

The Proceedings of the Sudden Oak Death Third Science Symposium are now available free of charge at http://www.fs.fed.us/psw/publications/documents/psw_gtr214/. To order a hard copy or CD, email your full mailing address in block form along with your preferred format of the Proceedings to rschneider@fs.fed.us. You can also mail your request to Richard Schneider, Publishing Services, Rocky Mountain Research Center, 240 West Prospect Road, Fort Collins,

CO 80526-2098, USA. There is a one book and one CD limit per person (at no charge). Financial support for this publication was provided by the USDA Forest Service, Pacific Southwest Research Station.

CALENDAR OF EVENTS

7/9 - SOD Treatment Workshop; UC Berkeley Campus

AUGUST

MONITORING

***P. ramorum* has been confirmed in the Little River at Van Damme State Park in** Mendocino County near the town of Mendocino. Taken from March water baiting samples, the positive cultures represent the northernmost detection of the pathogen in the County. Plans are underway to conduct ground surveys of the watershed for terrestrial symptoms. For more information, contact Kamyar Aram at kamaram@ucdavis.edu.

NURSERIES

A San Mateo County retail nursery was found to have several *P. ramorum*-positive species of plants during an annual inspection. The nursery is not under compliance for *P. ramorum* and does not ship out of the quarantined counties; therefore, it falls under CDFA's nursery stock standards of cleanliness for cleanup of infection. Upon notification of the positive plants, the nursery owner destroyed the required plants per CDFA's nursery stock standards of cleanliness and voluntarily destroyed the remainder of the plants in the lot even though they were not infected. Trace-back investigations are underway.

All three *P. ramorum* lineages (NA1, EU1, and NA2) were identified during isolate analysis. The shade house where the EU1 and NA1 lineages were detected was inspected, but no symptomatic plants were identified. No plants are currently in the areas that held infected plants. This nursery is not an interstate shipper and is not under the *P. ramorum* Nursery Compliance Program.

Numerous suggestions on best management practices to eliminate or reduce the pathogen levels in the nursery were made to the nursery owner. Continued surveillance and sampling will be carried out as per regulations. Further discussions are scheduled with the nursery owner to assist in development of plans to reduce *P. ramorum* in the nursery.

A small Oregon retail nursery in Tillamook County was found to have *P. ramorum*-positive *Pieris* sp. during a June 20th compliance inspection. The nursery does not ship out of state, and the retail CNP is underway.

A Kings County, Washington wholesale nursery was found to have *P. ramorum*-positive *Viburnum tinus* (Spring Bouquet) on June 9th during a nursery stock cleanliness inspection. The nursery had also been found positive for *P. ramorum* in 2007. CNP is underway.

A North Carolina retail nursery was found to have *P. ramorum*-infected *Rhododendron* sp., *R. catawbiense* (Slam Dunk), and *Kalmia latifolia* (Bulls eye) on June 6, 2008 as part of a Cooperative Agricultural Pest Survey (CAPS). The retail CNP is underway at the facility.

***P. ramorum*-infected *Rhododendron* sp. and *Kalmia* sp. were found at a South Carolina** retail nursery on July 14, 2008 as a result of a trace-forward investigation from the NC detection on June 6th. The retail CNP is underway at the facility. Neither this nursery nor the NC 6/6 nursery have previously been found positive for the pathogen.

Two Alameda County sites are under consideration for a mock nursery location. At a meeting with the Alameda County Board of Supervisors, Public Works Department, County Agricultural Commissioner, and CDFA, it was announced that the County is very eager to cooperate on the development of the mock nursery. The abandoned equestrian site previously under consideration may still be available if a plan to share the site with horses and riders can be arranged. An alternate location near the equestrian site has also been proposed by the Public Works Division. The next meeting with the County Agencies will include more of the affected parties (Fish and Game, Flood Control, etc.) and will include a visit to the newly proposed site. Hopes are to move this process along as quickly as possible, but some zoning and environmental impact issues must be addressed.

If implemented, the mock nursery would facilitate research necessary to more fully understand the epidemiology of *P. ramorum* in nurseries. For more information, contact Kathy Kosta at KKosta@cdfa.ca.gov.

FEATURED RESEARCH

Viability of *Phytophthora ramorum* after passage through slugs; Jennifer Parke[1]; Elizabeth Stamm[1]; Akiko Oguchi[2]; Elizabeth Fichtner[2]; and Dave Rizzo[2]; [1]Oregon State University and [2]University of California Davis

In western US forests where *P. ramorum* is found, chlamydospores are produced in abundance; however, their role in the disease cycle is uncertain because triggers for their germination are not known, and under lab conditions they germinate at a low or unpredictable frequency. In some *Phytophthora* species, the germination of oospores has been increased by passage through the alimentary canal of snails or treatment with snail enzymes. Consequently, we conducted experiments that demonstrated the viability of *P. ramorum* colonies after passage through the digestive tracts of two species of slugs: the banana slug (*Ariolimax columbianus*) and the gray garden slug (*Deroceras reticulatum*).

Slugs that ingested pure cultures of *P. ramorum,* and those that ate strawberries to which chlamydospores were applied, excreted feces with an abundance of chlamydospores. After passage through the slugs, many chlamydospores either germinated directly, often with multiple germ tubes, or indirectly to form sporangiophores. Feces plated on *Phytophthora*-selective medium yielded *P. ramorum* colonies, and when placed on tanoak or rhododendron leaves, banana slug fecal samples caused infection.

Experiments were also conducted to determine if banana slugs can acquire *P. ramorum* from infected plant sources. Pacific banana slugs were placed in lidded tubs containing artificially infested "litter" (a mixture of inoculated bay, tanoak, and rhododendron leaves with *P. ramorum* lesions) as well as in control tubs with non-infested "litter." Slugs in both containers did not eat the leaves, but rather they appeared to graze the leaf surfaces. After transferring slugs to clean, empty tubs, feces excreted within the first 24 - 48 hours were collected and examined microscopically. Numerous chlamydospores were found present in slug feces from *P. ramorum*-infested "litter," but not from non-infested "litter." Banana slugs allowed to feed on *P. ramorum* cultures and subsequently placed in containers with tanoak logs transmitted disease to 2 of 9 logs. Wounding of the bark was not necessary for lesion development.

These observations have led us to consider the possible role of banana slugs in chlamydospore germination and disease transmission. Funding is currently being pursued for more thorough investigations using *Ariolimax columbianus* (Pacific banana slug) and *Ariolimax californicus* (California banana slug). Banana slugs are chosen for the study because of their preferred habitat, geographic range, pattern of seasonal activity, and demonstrated role as vectors of fungal spores. They primarily eat herbaceous plants, fungi, and lichens, consuming up to their body weight in food daily. They live on the forest floor and in trees up to 20 m above the ground, and can move 10 m in a 24-hr period. Requiring high moisture for producing slime used for locomotion, navigation, mating, and self-defense, they are most active during the rainy season when temperatures are mild, burrowing into soil during harsher summer and winter months. A 5-year study of *A. dolichophallus* (slender banana slug) in Big Basin State Park (CA) showed that they are most active during April-June, with a second peak of activity in November.

Banana slugs have an important role in decomposition in our forests. Slug findings to date have only been performed under lab conditions; therefore, results may not reflect their food preferences and feeding behavior in nature. There is currently no evidence that slugs actually transmit disease under field conditions. Any potential role of slugs in transmission of *P. ramorum* is likely to be very small compared to transmission by aerial propagules dispersed by wind or rain, which have been demonstrated to occur in infested forests.

RESEARCH

Davidson, J.M.; Patterson, H.A.; and Rizzo, D.M. 2008. Sources of inoculum for *Phytophthora ramorum* in a redwood forest. Phytopathology 98:860-866.

Hong, C.; Richardson, P.A.; and Kong, P. 2008. Pathogenicity to ornamental plants of some existing species and new taxa of *Phytophthora* from irrigation water. Plant Disease 92:1201-1207.

Mascheretti, S.; Croucher, P.J.P.; Vettraino, A.; Prospero, S.; and Garbelotto, M. 2008. Reconstruction of the Sudden Oak Death epidemic in California through microsatellite analysis of the pathogen *Phytophthora ramorum*. Molecular Ecology 17, 2755–2768.

Meentemeyer, Ross K.; Anacker, Brian L.; Mark, Walter; and Rizzo, David M. 2008. Early Detection of Emerging Forest Disease using Dispersal Estimation and Ecological Niche Modeling. Ecological Applications, 18(2). pp. 377–390.

Reeser, P.W.; Sutton, W.; and Hansen, E.M. 2008. *Phytophthora* Species Causing Tanoak Stem Cankers in Southwestern Oregon. Plant Disease. Disease Notes Vol. 92 No. 8 pg. 1252. DOI: 10.1094/PDIS-92-8-1252B.

Vincelli, Paul and Tisserat, Ned. 2008. Nucleic Acid–Based Pathogen Detection in Applied Plant Pathology. Plant Disease Vol. 92 No. 5. pp. 660 – 669. DOI: 10.1094/PDIS-92-5-0660.

RELATED TOPICS

Some oaks are losing leaves early this year as a result of the drought. In areas such as the Sierra Nevada foothills, blue oaks have begun changing color and dropping leaves. When faced with low soil moisture, trees either keep their foliage and continue losing water through the leaf pores, or drop their leaves and conserve moisture.

Drought does stress trees, causing slower growth rates and greater susceptibility to insects and diseases. While long-term consequences of repeated droughts may be harmful, it is anticipated that most of the trees affected this year will likely recover during the winter and leaf out normally next spring. Early leaf loss may actually be more harmful to the ecosystem than to individual trees. Loss of leaves can hamper acorn development and maturity, reducing the number of acorns that will germinate and develop into seedlings. Additionally, reduced acorn production adversely affects the many wildlife species that rely heavily on them for food. For more information, contact Doug McCreary at mccreary@nature.berkeley.edu.

RESOURCES

USDA APHIS has posted Version 2.1 of the "Trace Forward Protocol for Nurseries that Received Plant Material Shipped from a Confirmed *Phytophthora ramorum* Infested Nursery" to its website. To access the June 6, 2008 document, go to http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/downloads/pdf_files/traceforwardprotocol.pdf. This version updates the definition and provides much more detailed and clearly written procedures to follow in the event that a nursery determined to be infested has shipped nursery stock to another nursery.

USDA APHIS updated the CNP Version 8 on June 26, 2008. The updated document can be found on the APHIS website at http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/downloads/pdf_files/CNPv8.0-7-20-07.pdf. The updates are limited to the Appendices 1, 3, 6, and 7. This provides updated host information, contact information, soil and growing media detection procedures, and water sampling procedures.

SEPTEMBER

NURSERIES

A British Columbia (BC) production nursery was found to have *P. ramorum*-positive plants, including *Viburnum bodnantense*, *V. burkwoodii*, *V. carlesii*, and *Cornus kousa*. This nursery is undergoing eradication per the CFIA nursery eradication protocol. Seven nurseries in the state of Washington received shipments from this nursery. Four of the seven sites have been inspected to date. At those four sites, no symptoms were observed.

Kousa dogwood (*Cornus kousa*) was also found *P. ramorum* positive at the BC nursery, approximately 50 – 100 meters from the *Viburnum* plants. Symptoms included defoliation and leaf spots. Symptomatic leaves displayed brown tips and edges surrounded by a diffused black margin. Many of the leaves also displayed curling. This is the first time this species has been found infected; however, *Cornus kousa x Cornus capitata* was found infected with *P. ramorum* in the United Kingdom in 2006. USDA APHIS is reviewing the CFIA findings, and anticipates adding this species to the federal list of hosts regulated for *P. ramorum* in September.

In mid-June 2008, a retail nursery in the greater-Charlotte area of North Carolina was found to have *P. ramorum* on two species of container-grown plants. Subsequently, a small retail nursery in the Greenville area of South Carolina was identified as a recipient of potentially infected plants as part of the trace-forward effort to locate plants that left the NC nursery. The SC nursery was surveyed in late June by staff from the SC Department of Plant Industry. *P. ramorum* was detected by PCR in DNA samples from one *Rhododendron* sp. and one *Kalmia* sp. All isolations from these and other plant samples were negative for *P. ramorum*, although other species of *Phytophthora* were recovered from some samples.

In mid-July 2008, a delimitation survey was conducted at the SC nursery by federal, state, and university personnel in a collaborative effort to determine the extent of infection and infestation by *P. ramorum*. Samples were collected from all host and associated plants, container mix from the pots in which these plants were growing, field soil from around the containers of host and associated plants, and water in and around the nursery. To date, *P. ramorum* was recovered only from plant samples and not from container mix, soil, and water samples. *P. ramorum* was isolated on selective medium from composite samples collected from cold hardy Azalea plants (*Rhododendron* hybrid cvs. Olga Mezitt and Aglow) and Pieris plants (*Pieris japonica* cv. Mountain Fire). It also was detected by PCR in a DNA sample extracted from *Kalmia latifolia*. Host and associated plants around *P. ramorum*-positive plants have been destroyed following APHIS protocols. Follow-up surveys will be conducted.

***P. ramorum* has been detected at five Oregon nurseries and one landscape site in 2008. The** most recent detection was made in early August at a retail nursery in Marion County, where the pathogen was detected by PCR infecting a *Rhododendron* and a *Corylopsis spicata*. No cultures were recovered from the plants; however, because two PCR-positive plants were found, the USDA CNP was enacted at the nursery. During delimitation, additional PCR positives were found on another *Rhododendron* and a *Rhododendron* 'Cunningham's White'. Soil samples are

still being processed. The USDA CNP has been completed at one nursery, and the USDA Residential and landscape protocol has been completed at the landscape site.

Twenty nurseries have volunteered to participate in Oregon's Grower Assisted Inspection Program. Participation in the program requires nurseries to develop mitigation manuals that describe the best cultural practices and standard operating procedures they will use to mitigate the risk of introducing *Phytophthora* into their production systems. Several nurseries have already submitted drafts of their manuals for review. The deadline for submission of the draft manuals is September 19, 2008.

REGULATIONS

China's General Administration of Quality Supervision, Inspection, and Quarantine (AQSIQ) plans to implement "Phytosanitary Requirements for the Import of Host Plants of *Phytophthora ramorum* from Regulated Areas" on October 15, 2008. Countries impacted by the new requirements would include Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Lithuania, Netherlands, Norway, Poland, Slovenia, Spain, Sweden, Switzerland, United Kingdom, and United States.

Under the proposed regulation, regulatory agencies for the exporting countries will have to provide AQSIQ with a list of approved registered nurseries. The new requirements include assuring all *P. ramorum* host plants are from nurseries free of the pathogen and that they are laboratory tested by regulatory agencies prior to host exportation to ensure absence of the pathogen. Host plant growing media will also be subject to disinfection treatment measures such as heat treatment prior to exportation to China.

RESEARCH

The 3rd International *Phytophthora* and *Pythium* Workshop, "Integration of Traditional and Modern Approaches for Investigating the Taxonomy and Evolution of *Phytophthora*, *Pythium* and Related Genera" was held in Turin, Italy August 23-24, 2008. Presentation and poster topics at the workshop included systematics and phylogenetics; evolution and population genetics; nomenclature of present taxa and putative new species; morphological and molecular taxonomic methods; ecology, biogeography, and epidemiology; advances in systems for identification and diagnostics; and integrating morphological and molecular tools for a unified phylogeny and classification. To access the agenda in its entirety as well as the list of presented posters, go to the workshop website at http://www.icpp2008.org/pdf/3rd_Int_Phytophthora_and_Pythium_Workshop_%20draft%20_Programme_7.29.08.pdf. The workshop was held in conjunction with the 9th International Congress of Plant Pathology (http://www.icpp2008.org/).

Garbelotto, M.; Harnik, T.Y.; and Schmidt, D.J. 2008. Efficacy of phosphonic acid, metalaxyl-M and copper hydroxide against Phytophthora ramorum in vitro and in planta. Plant Pathology. DOI: 10.1111/j.1365-3059.2008.01894.x.

Grünwald, N.J.; Goss, E.M.; and Press, C.M. 2008. Pathogen profile: *Phytophthora* *ramorum*: a pathogen with a remarkably wide host range causing sudden oak death on oaks and

ramorum blight on woody ornamentals. Molecular Plant Pathology 9(5), 000–000. DOI: 10.1111/J.1364-3703.2008.00500.X.

Inghelbrecht, S.; Heungens, K.; De Wael, L.; and Maes, M. 2008. Results and experiences from the first EU proficiency test for the detection of *Phytophthora ramorum.* OEPP/EPPO Bulletin 38, 187–191.

Ioos, R. and Iancu, G. 2008. European collaborative studies for the validation of PCR-based detection tests targeting regulated fungi and oomycetes. OEPP/EPPO Bulletin 38, 198–204.

Moralejo, E.; Pérez-Sierra, A.M.; Álvarez, L.A.; Belbahri, L.; Lefort, F.; and Descals, E. 2008. Multiple alien *Phytophthora* taxa discovered on diseased ornamental plants in Spain. Plant Pathology. DOI: 10.1111/j.1365-3059.2008.01930.x.

EDUCATION AND OUTREACH

Preventative treatment training sessions will be offered to all interested parties once a month this fall from September to December at the Berkeley campus. Each two-hour session will cover basic SOD information, integrated pest management approaches to managing SOD, how to select candidate trees for treatment, and proper preventative treatment application. Pre-registration is required for these free sessions as space is limited to 40 people. CEU credits will be offered for DPR, ISA, SAF, and California Urban Forestry Council.

The COMTF will be holding several community meetings this fall to provide interested parties with information on SOD, preventative treatment options, and information on how to remove and dispose of infested material properly. Time will also be allotted for open panel discussions, during which community members can ask questions, express their concerns, and brainstorm options for proactive community activities and management strategies. Tentative locations for the meetings include Humboldt, Sonoma, Santa Cruz, and Monterey Counties. Additional details will be posted to the Task Force website as soon as they are available. For more information, contact Janice Alexander at (415) 499-3041 or JAlexander@co.marin.ca.us or Katie Palmieri at (510) 847-5482 or palmieri@nature.berkeley.edu.

NEW AND NOTEWORTHY – THOUSAND CANKERS DISEASE

A decline of black walnut (*Juglans nigra*) has been observed in New Mexico; Arizona; Chihuahua, Mexico; Colorado; Utah; Idaho; Oregon; and several California counties within the past decade. Trees often are killed within three years after initial symptoms, which include a yellowing and thinning of the upper crown that progresses to larger branches. During the final stages of disease progression, foliage may also wilt rapidly. Tree mortality is caused by the walnut twig beetle (*Pityophthorus juglandis*) and subsequent canker development around beetle galleries caused by a fungus (*Geosmithia* sp.) associated with the beetle. A second fungus (*Fusarium solani*) is also associated with canker formation on the trunk and scaffold branches. The proposed common name for this disease complex is “thousand cankers.” For more information on the walnut twig beetle and the thousand cankers disease of walnut, contact Whitney Cranshaw at whitney.cranshaw@colostate.edu or Ned Tisserat at ned.tisserat@colostate.edu.

CALENDAR OF EVENTS
9/10 - SOD Treatment Workshop; UC Berkeley Campus

OCTOBER

MONITORING
As of 10/6, Oregon's 2008 summer SOD aerial survey has identified 67 new dead or dying tanoak trees between Gold Beach and the California border (the 2007 summer survey detected 154 dead tanoaks). Sixty-four of the 67 dead trees have been checked and sampled by ground crews. The 3 remaining trees will be checked in late October. The fall aerial survey is now underway. Summer survey highlights are as follows:

- There are several new positive trees near previously known sites close to the center of the generally infested area. These finds were anticipated due to the suspension of eradication treatments between January and May, 2008.

- A couple of new and expanding spots were found at the northern edge of the western side of the eradication, very close to a previously treated infestation. Treatment is in progress on these high-priority sites.

- Two new spots were found on the south bank of the Chetco River, very close to the water and other infested sites. These discoveries add to the slow increase of new sites on the south bank of the Chetco during 2007-2008.

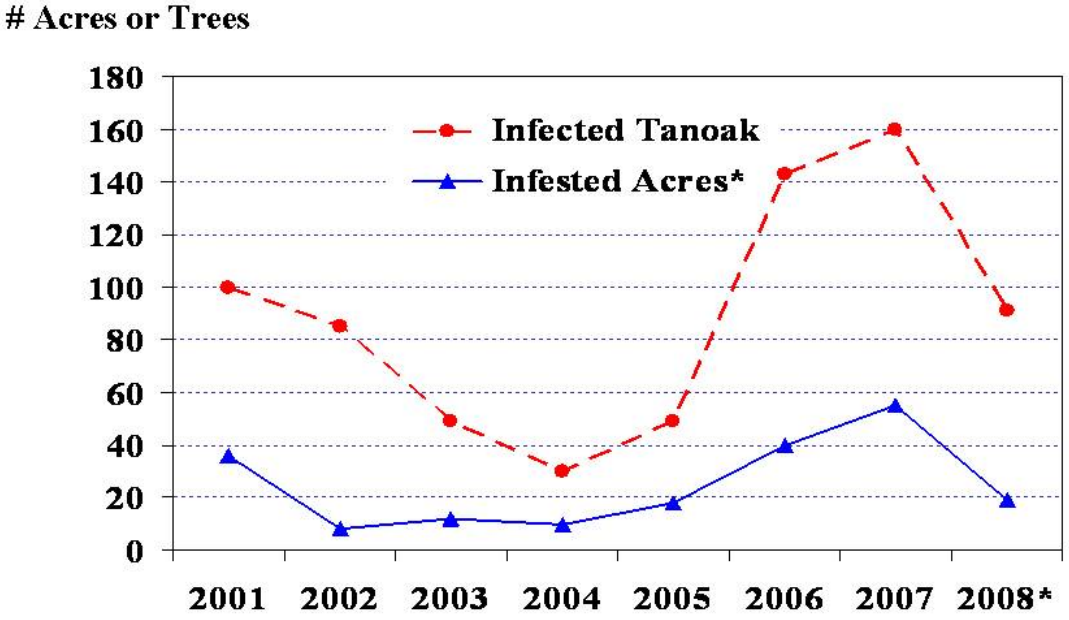
- The most noteworthy new site is on USFS land along Emily creek. This site is 2 miles east of the redwood trail site (the nearest known infestation) and 1.25 miles inside of the eastern quarantine boundary. The pathogen does not appear very active at this site. Treatment is underway.

- No new sites have been found north of the 2007 quarantine boundary. Landowner cooperation has been good, and state and federal funding is sufficient to continue the current SOD program into 2009.

NOTE - We must complete ground-checking and delimitation surveys before we can make confident statements about trends and status for the entire year.

Sudden Oak Death in Oregon Forests

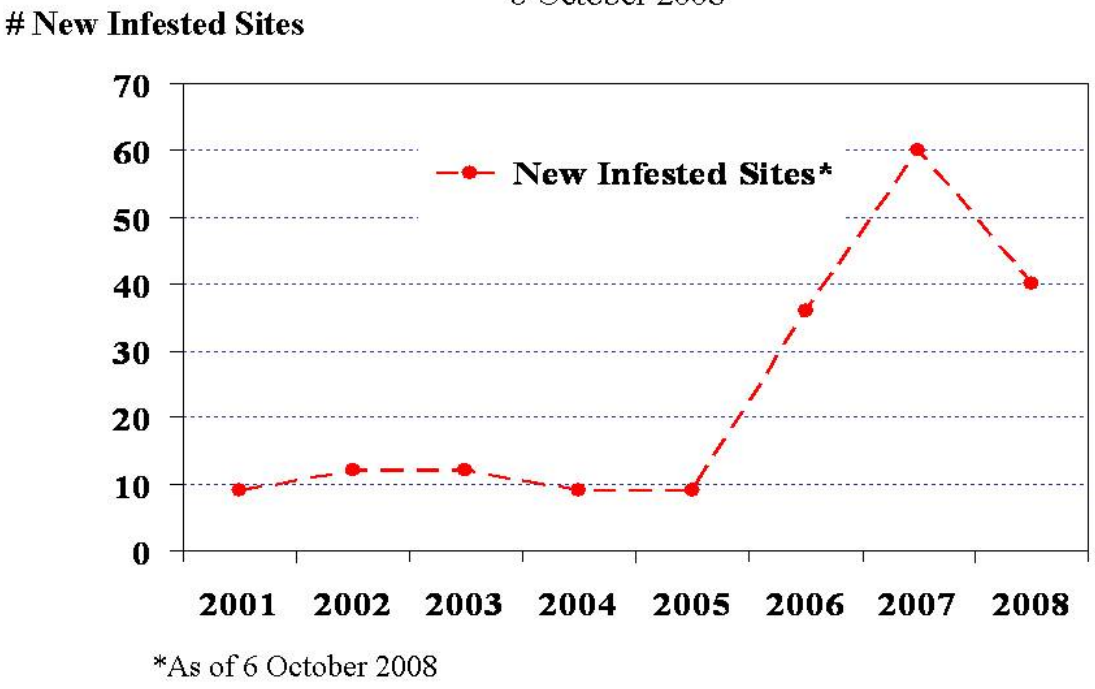
6 October 2008



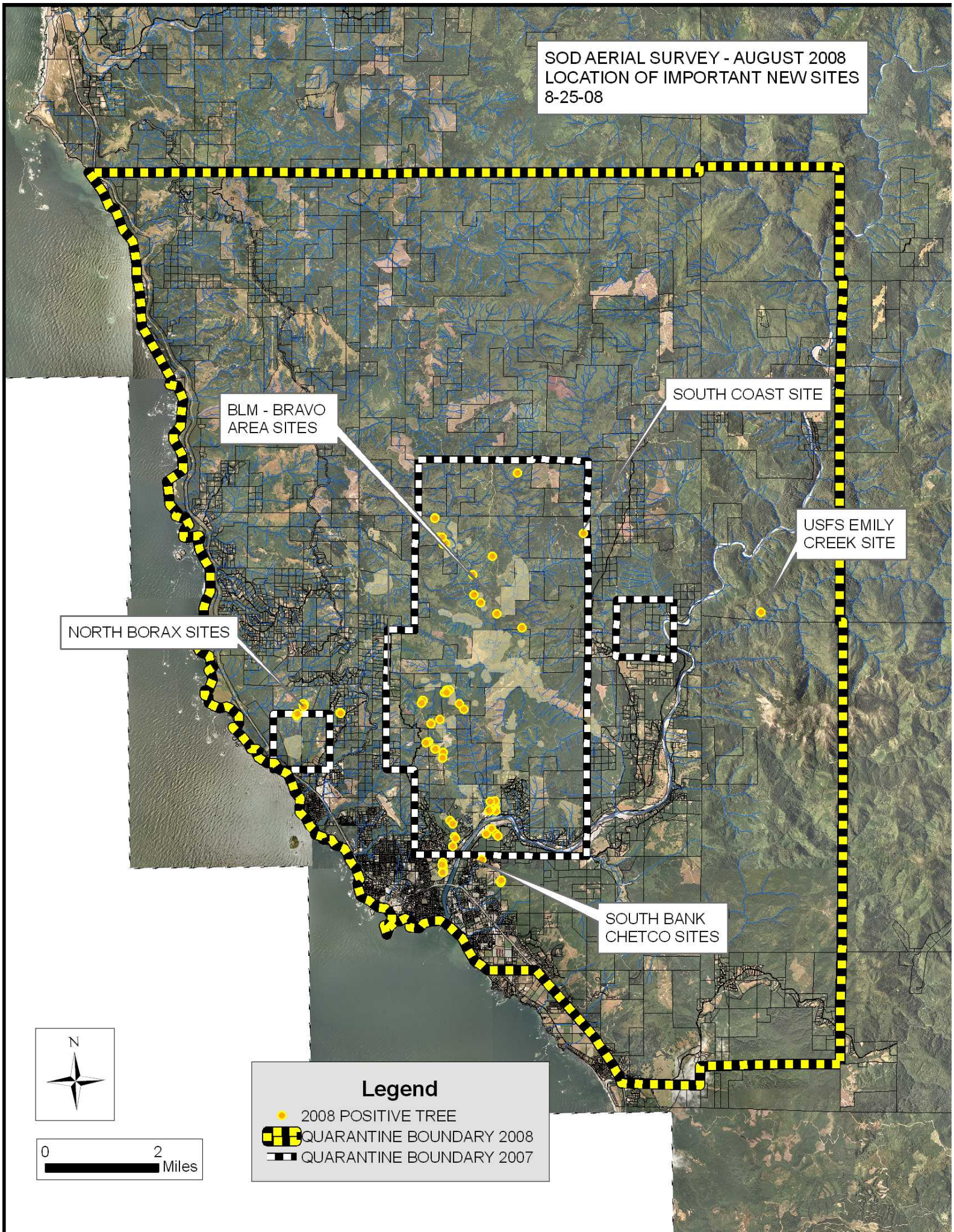
*Data as of 10-6-08; surveys not complete. Area estimate includes new infested sites plus expansion of existing infested sites

Sudden Oak Death in Oregon Forests

6 October 2008



*As of 6 October 2008


SOD AERIAL SURVEY - AUGUST 2008
LOCATION OF IMPORTANT NEW SITES
8-25-08
BLM - BRAVO AREA SITES
SOUTH COAST SITE
USFS EMILY CREEK SITE
NORTH BORAX SITES
SOUTH BANK CHETCO SITES
N
0
2
Miles
Legend
2008 POSITIVE TREE
QUARANTINE BOUNDARY 2008
QUARANTINE BOUNDARY 2007

California's northern Sierras 2008 *P. ramorum* stream-based detection survey was conducted in the counties of Butte, Yuba, Nevada, Placer, and El Dorado. A total of 31 watercourse sites in the Feather, Yuba, Bear, American, and Consumnes Rivers were surveyed during May and June using rhododendron leaves as bait for *Phytophthora* spp. This produced 118 sets of baits that were cultured for the presence of *P. ramorum*. The pathogen was not detected in any of the samples, although other *Phytophthora* spp. were recovered. For more information, contact Don Owen at Don.Owen@fire.ca.gov.

MANAGEMENT

As a result of the Oregon Emily Creek find, the USFS will implement a 28-acre three-phase eradication effort. Phase I will encompass killing all >1-inch diameter tanoak within the 28 acres surrounding the known infected tree and within 100 ft. of Emily Creek. This will be accomplished through glyphosate herbicide injections, which will greatly inhibit re-sprouting potential. Additionally, by eliminating a large area of tanoak surrounding the infected tree, a host barrier will be created to inhibit movement of the pathogen into adjacent stands.

Phase II of the eradication effort will focus on the elimination of infected and/or exposed host material within the eradication circle. All tanoak, Pacific rhododendron, and evergreen huckleberry plants within the ~6.5 acre circle will be cut down. Additionally, Oregon myrtle (also known as California bay laurel) as well as any other plant found *P. ramorum*-positive will be cut. After felling of host plants within the core circle is complete, cut plant materials <8 inches in diameter will be stacked and burned. Burning will be conducted simultaneously with stacking if weather permits, or as soon as possible thereafter. Stem wood larger than 8 inches will be left in place. Host leaf litter and other fine plant material lying on the ground will be raked into piles and burned.

Phase III of the project will focus on conifer reforestation. It is anticipated that adequate regeneration will occur naturally; however, to ensure that the conifer reforestation level is adequate, an inventory of conifer regeneration and survival will be conducted for three growing seasons following completion of the eradication phases. If it is found that the density of young conifers averages less than 150 trees per acre, planting will be prescribed to increase conifer stocking. Douglas-fir seedlings would be planted throughout the 28-acre area to achieve these minimum stocking objectives. For a period of at least two years following project completion, the treatment site will be inspected to determine whether *P. ramorum* re-emerges. Should *P. ramorum* be confirmed, further eradication actions will take place. Burn pile sites in the core eradication circle will also be surveyed for invasive plants. Should any be found, actions will be taken to eliminate them as well. For more information, contact Ellen Goheen at Egoheen@fs.fed.us.

RESEARCH

Gallegly, Mannon E. and Hong, Chuanxue. 2008. *Phytophthora*: Identifying Species by Morphology and DNA Fingerprints; 168 pages; APS Press. ISBN 978-0-89054-364-1.

Hüberli, D.; Lutzy, B.; Voss, B.; Calver, M.; Ormsby, M. and Garbelotto, M. 2008. Susceptibility of New Zealand flora to *Phytophthora ramorum* and pathogen sporulation potential: an approach based on the precautionary principle. Australasian Plant Pathology 37. Pages 615–625.

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Monahan, William B.; Koenig, Walter D.; Tse, Justin; Garbelotto, Matteo. 2008. Preserved specimens suggest non-native origins of three species of *Phytophthora* in California. Mycological Research 112. Pages 757 – 758. DOI: 10.1016/j.mycres.2008.05.001.

Moralejo, E.; Belbahri, L.; Calmin, G.; García-Muñoz, J.A.; Lefort, F.; and Descals, E. 2008. Strawberry Tree Blight in Spain, a New Disease Caused by various *Phytophthora* Species. Journal of Phytopathology Volume 156, Issue 10.

FUNDING

Applications are being accepted for funding to facilitate cooperative international research and management of plant diseases with an emphasis on *Phytophthoras* through the American Phytopathological Society, John and Ann Niederhauser Endowment (JANE). Applications are due December 15, 2008. The endowment will likely support one award up to $10,000 or two awards up to $5,000 each for projects beginning June 1, 2009. Details and submission guidelines can be found online at http://www.apsnet.org/foundation/JANEApplication.asp.

NEW AND NOTEWORTHY – LAUREL WILT

Fraedrich, S.W. 2008. California Laurel Is Susceptible to Laurel Wilt Caused by *Raffaelea lauricola*. Plant Disease, Disease Notes. Vol. 92, No. 10. Page 1469. DOI: 10.1094/PDIS-92-10-1469A. Available online at http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-92-10-1469A.

CALENDAR OF EVENTS

10/9 – SOD Prevention Strategy Informational Meeting; Scotts Valley
10/22 – SOD Prevention Strategy Informational Meeting; Sonoma

NOVEMBER

RESEARCH

Daniel Hüberli of Murdoch University, Australia has implemented a "Fishing for *Phytophthora*" project in Western Australia, from the northeast to the southwest, covering more than 1300 miles. The intent of the project is to catalog which

Phytophthora species are present in Western Australia's southwestern waterways. To date, fifteen volunteers have deployed 111 "fishing kits" in 100 locations and submitted 107 leaf samples. Of those samples submitted, there have been 12 positive *Phytophthora* confirmations, with some sites having up to eight different species. The project began in September 2008. Due to funding limitations, it is scheduled to continue until early January 2009.

Tjosvold, S.A.; Chambers, D.L.; Koike, S.T.; and Mori, S.R. 2008. Disease on nursery stock as affected by environmental factors and seasonal inoculum levels of *Phytophthora ramorum* in stream water used for irrigation. Plant Disease 92:1566-1573.

RELATED RESEARCH

Ahrens, G.R. and Newton, M. 2008. Root dynamics in sprouting tanoak forests of southwestern Oregon. Canadian Journal of Forest Research 38: 1855-1866. DOI: 10.1139/X08-022.

Balci, Y.; Balci, S.; MacDonald, W.L.; and Gottschalk, K.W. 2008. Foliar susceptibility of eastern oak species to *Phytophthora* infection. Forest Pathology 38:320–331. DOI: 10.1111/j.1439-0329.2008.00548.x.

Lang, J.M.; Rebits, B.; Newman, S.E.; and Tisserat, N. 2008. Monitoring mortality of *Pythium* zoospores in chlorinated water using oxidation reduction potential. Online. Plant Health Progress DOI: 10.1094/PHP-2008-0922-01-RS.

REGULATIONS

As of November 24th, states will be able to submit special needs requests to USDA APHIS if they need greater interstate restrictions than APHIS rules require on items that pose plant health risks. Requests must be based on sound scientific data and must include a thorough risk assessment proving that the biological control organism, noxious weed, or plant pest does not currently exist in the state and could cause economic or environmental harm. For more information, go to http://www.aphis.usda.gov/newsroom/content/2008/10/specneed.shtml.

The APHIS Select Agents final rule was published 10/16/08. *Phytophthora* *kernoviae*, while initially proposed to be listed as a select agent, is not included in the final rule as a result of the comments received and further consideration. While it was initially included on the list due to its perceived potential threat to the nursery industry and woodland areas, it has since been concluded that current regulatory systems and surveys for *P. ramorum* could be effectively applied toward the surveillance for *P. kernoviae*. APHIS believes that this consideration, along with a clearer understanding of the epidemiology of *P. kernoviae*, supports the decision not to add this pathogen to the select agent list. However, it will remain a reportable and actionable pest; therefore, if it is detected in an import shipment, entry of the shipment will be refused, and either returned, treated (if it can effectively eliminate the pathogen), or destroyed. The APHIS PPQ Select Agent designation requires government agencies, universities, research

institutions, and commercial entities that possess, use, or transfer the listed pathogen to register with APHIS, facilitating PPQ oversight of activities pertaining to the select agent.

NURSERIES

Oregon's 2008 Annual Nursery Certification and high-risk surveys are nearing completion. Sample results are still pending for 13 nurseries. To date this year, *P. ramorum* has been detected at five Oregon nurseries and in one landscape. All five nursery detections were made during Annual Certification surveys. The pathogen was detected 11 times on *Rhododendron*, once on *Pieris*, and once on *Corylopsis*. During delimitation surveys, additional positives were found in soil, potting media, and neighboring blocks of plants (*Arctostaphylos uva-ursi* and *Rhododendron*). Only one of the five positive nurseries did not have additional positives found during delimitation. The landscape site was a trace forward from a positive Oregon nursery. No additional positives were found during delimitation of the landscape site. The USDA CNP has been completed at two of the positive nurseries and the USDA Residential and Landscape Protocol has been completed at the landscape site. For more information, contact Nancy Osterbauer at nosterba@oda.state.or.us.

NEW AND NOTEWORTHY – GOLDSPOTTED OAK BORER

Over the past five years, extensive oak mortality has occurred east of San Diego on the Cleveland National Forest and in other areas of southern California. The cause of the die-off of mature coast live oak (*Quercus agrifolia*), canyon live oak (*Quercus chrysolepis*), and CA black oak (*Quercus kelloggii*) has been attributed to the goldspotted oak borer (*Agrilus coxalis*). Identified by USDA FS entomologist Tom Coleman, *A. coxalis* was found associated with dead and dying trees on federal, state, county, tribal, and private land. The presence of *A. coxalis* in southern California may represent a new introduction or range expansion from Mexico or southeastern Arizona. Damage or mortality from *A. coxalis* has never been reported in its native region, and very little information is known about this new emerging pest in California. Larval galleries are abundant on the sapwood surface of oak species. Larval feeding can patch kill areas of the cambium and result in external staining along the main stem. Thinning crowns, D-shaped exit holes, and woodpecker foraging are also frequently observed on infested oaks. Research is ongoing to fully understand the biology, impact, and movement of *A. coxalis*. Additional studies are assessing the possible link between *A. coxalis* and root pathogens. For additional information, go to http://www.fs.fed.us/r5/spf/fhp/ or contact Tom Coleman at twcoleman@fs.fed.us.

WWW.SUDDENOAKDEATH.ORG

A "Native Plants and Tribal Resources" page has been posted to the COMTF website. Information on the page includes gatherer guides and frequently asked questions by Native Americans. There is also a slideshow of symptoms on native plants and a series of handouts that highlight how *P. ramorum*-host plants are commonly used by tribes in California. As this information is intended to be a useable resource for tribal members and all those concerned with California's native plant communities, suggested improvements are welcome and should be directed to Janice Alexander at jalexander@ucdavis.edu.

CALENDAR OF EVENTS
11/12 - SOD Treatment Workshop; UC Berkeley Campus
11/13 - SOD Prevention Strategy Informational Meeting; Carmel

DECEMBER

RESEARCH
A new *Phytophthora* species was found in Alaska during riparian *Phytophthora* surveys and confirmed in November 2008. After sequence analysis, the isolate appears to be a new member of Clade 8C, the *P. ramorum*/*P. lateralis* clade. The discovery may add to our understanding of the genetic origins of *P. ramorum* and *P. lateralis*, which will assist with risk assessment determinations of these invasive forest pathogens. The host range of this new *Phytophthora* species in Alaska is unknown because it was found through soil baiting with rhododendron leaves. Rhododendrons, however, are not native in Alaska and thus further study on potential hosts within Alaska is needed.

Three new *P. alni* subsp. *uniformis* isolates were also discovered in late October 2008 during sequencing of baited soil samples taken in 2007-08 from across south-central and interior Alaska. The surveys were initiated due to growing concern of possible cryptic invasion by the *Phytophthora* that devastates alder in Europe. *Phytophthora* species were baited and trapped from roots, soils, and water sources using rhododendron leaves (*Azalea* spp.), bearberry leaves (*Arctostaphylos uva-ursi)*, and alder twigs (*Alnus incana* subsp. *tenuifolia*).

With six isolates now available for analysis, researchers can compare American strains to European strains using AFLP analysis, microsatellites, or other methods. Such comparisons will help determine whether the organism is native or introduced. Studies to date concerning the distribution of *P. alni* subsp. *uniformis* are suggestive of an extensive, though possibly sporadic, distribution from the banks of the Kenai River on the Kenai Peninsula to Healy, Alaska, 300 miles north.

For more information, contact Lori Trummer, Pathologist, south-central and interior Alaska, at ltrummer@fs.fed.us or (907) 743-9460 or Gerard Adams, Michigan State University, at gadams@msu.edu.

REGULATIONS
The Environmental Protection Agency has approved Ultra Clorox® Brand Regular Bleach for use in controlling the spread of *P. ramorum* in forests. The label covers use of bleach to disinfect water which may be used for drafting from streams and ponds within forested areas to use in dust abatement on forest roads, equipment cleaning, and fire suppression. Use directions are: "Add 1 gallon of this product to 1,000 gallons (~50 ppm available chlorine) of drafted water. Prepare the mixture at least 5 minutes prior to application for dust abatement, fire suppression, and cleaning vehicles and lodging, road building, and maintenance equipment." The Clorox® Company plans to apply to the

California Department of Pesticide Regulations (CDPR) for approval next. CDPR must review and approve the data support following the Fed EPA approval before Clorox® can be used for controlling *P. ramorum* spread in California.

FUNDING

The USDA Forest Service, Pacific Southwest Region, State and Private Forestry, Forest Health Protection program has issued its 2009 *P. ramorum* Request for Proposals (RFP) for management projects. Approximately $500,000 in grants is available in federal fiscal year 2009 (ends September 30, 2009). Proposals should focus on management activities that could limit the impact of Sudden Oak Death in California or SW Oregon, and extension activities to promote relevant information on this pathogen to a broad spectrum of interested stakeholders. In general, proposals should be for grants of between $5,000 and $100,000 per year. Multi-year, collaborative projects are encouraged. The submission deadline is February 20, 2009. For a copy of the announcement or for questions, contact Phil Cannon at pcannon@fs.fed.us or (707) 562-8913.

The USDA Forest Service, Pacific Southwest Research, Sudden Oak Death Research program will not be issuing a Request for Proposals for research in FY2009, since current funding is allocated for continuing projects. For questions on the USDA Forest Service Sudden Oak Death Research Program, contact Susan Frankel at sfrankel@fs.fed.us.

NURSERIES

A Washington wholesale production nursery in Thurston County was confirmed to be *P. ramorum* positive on November 5, 2008. Positive plants included *Rhododendron* Sp. 'Purpureum Elegans' and *Rhododendron* Sp. 'Roseum Elegans.' This is the first time plants in this nursery have been found positive for the pathogen.

RELATED RESEARCH

van Poppel, Pieter M.J.A.; Guo, Jun; van de Vondervoort, Peter J.I.; Jung, Maartje W.M.; Birch, Paul R.J.; Whisson, Stephen C.; and Govers, Francine. 2008. The *Phytophthora infestans* Avirulence Gene *Avr4* Encodes an RXLR-dEER Effector. Molecular Plant Microbe Interactions Vol. 21, No. 11. pp. 1460–1470. DOI: 10.1094.

Vettraino, A.M.; Jung, T.; and Vannini, A. 2008. Disease Notes: First Report of *Phytophthora cactorum* Associated With Beech Decline in Italy. Plant Disease Volume 92, Number 12. Page 1708. DOI: 10.1094/PDIS-92-12-1708A. Online at: http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-92-12-1708A.

OUTREACH AND EDUCATION

Sonoma County University of California Cooperative Extension is featuring a 30- minute presentation on *P. ramorum* biology, spread, and treatment on its website. To access the presentation originally given by Dave Rizzo at a 2007 outreach meeting in Santa Rosa, go to http://cesonoma.ucdavis.edu/Custom_Program193/. Parties interested in streaming the presentation from their website should contact Lisa Bell at (707) 565-2050 or lkbell@ucdavis.edu for the code.

The OakMapper website has been updated. Version 2.0 improves upon the website's prior version with increased functionality and additional tools within an easily navigated interface. Launched by the UC Berkeley Kelly lab in October, OakMapper 2.0 makes it easier for users to explore data, download maps, look at images of oak mortality, and submit suspected locations of oak mortality that may be associated with SOD. The new interface utilizes the familiar background layers and navigation tools from Google Maps. Users are able to draw points and polygons directly on the map as well as attach photos to specific points. The Kelly lab encourages the public to use this site to map suspected cases of SOD and to track their submission by signing up for an account with OakMapper. Registered users of the site can update their information and make comments on other users' points. Official confirmations of *P. ramorum* are clearly separated from community-submitted points and either set of points can be filtered out. For more information, contact Maggi Kelly at oakmapper@nature.berkeley.edu.

CALENDAR OF EVENTS

12/10 – SOD Treatment Workshop; UC Berkeley Campus