CALIFORNIA OAK MORTALITY TASK FORCE REPORT
NOVEMBER 2005

MONITORING

A new *Phytophthora ramorum*-infested site in Humboldt County has been confirmed 6 miles north of the Garberville/Redway area on Humboldt Redwoods State Park property along the Avenue of the Giants. The site features a moderately steep hillside dissected by ephemeral drainages running directly into the South Fork Eel River. Old-growth redwood, in places with an understory of nearly pure California bay laurel, grows on the site's lower slopes; the stand grades into a Douglas-fir/tanoak and madrone mix on upper slopes. Symptoms are found in both forest types.

A tree inspector for Western Environmental Consultants International (WECI - a contractor to PG&E's vegetation management program) identified the presence of bleeding cankers on numerous tanoak trees and notified University of California Cooperative Extension (UCCE), Humboldt County staff, who sampled tanoak shoots and bark as well as California bay laurel leaves from the site. All three kinds of samples yielded *P. ramorum* at the UC Davis Rizzo lab. Numerous symptomatic hosts, including California black oak, madrone, and Douglas-fir, have since been observed on the site and sampled; results are pending. UCCE Humboldt County and the California Department of Forestry and Fire Protection (CDF) have proposed to California State Parks that an adaptive management trial designed to reduce *P. ramorum* inoculum and slow pathogen spread to adjacent sites be implemented. State Parks has begun the review process for the project.

The 2005 National *P. ramorum* Survey of Forest Environments debriefing was held October 25 - 26 in Atlanta, GA following the completion of the field work for the 39 participating states. Twenty-six region representatives, including state field cooperators, lab managers, and regional coordinators, were in attendance to discuss year-end results and next year's program. Twelve states have submitted their final field data spreadsheets, though many PCR results are still pending. The 2005 survey results to date include 519 nursery perimeter locations and 472 forest locations. Of those areas surveyed, 2,038 samples were submitted. Sixty-two percent of the submitted samples have completed PCR testing and, as of the end of October, all samples have been negative for *P. ramorum*.

So far, there are nearly twice as many forest locations surveyed in 2005 as in 2004, and about 25 percent fewer nursery perimeter survey locations. This reflects the priorities identified at the beginning of the year to target approximately one third of locations in the highest risk forest settings and the remaining two-thirds on nursery perimeters, beginning with *P. ramorum*-confirmed trace-forwards and unconfirmed trace-forwards with high-risk attributes. While the total number of locations surveyed to date is similar to 2004, the total number of samples submitted is much smaller due to changes in the protocol. These numbers will increase as states report their final totals.

Cumulative forest survey totals from 2003 to date include 1,254 nursery perimeter locations and 856 forest locations, with 7,671 samples having been submitted. To date, the only *P. ramorum*-positive PCR results that have been obtained through the survey were from San Francisco County, CA in 2004.

Results of the pilot stream sampling in western North Carolina for *Phytophthora* spp. with rhododendron baits (wounded short exposure and unwounded long exposure) and filtering conducted by Jaesoon Hwang and Steve Jeffers (Clemson University) and Steve Oak (USDA Forest Service) were presented at the debriefing. Fifteen different *Phytophthora* species were detected in monthly samplings between April and August 2005. *P. ramorum* was not detected, although sampling will continue through November. A monthly stream baiting pilot project was also conducted in 2005 by Dan Omdal in 10 Washington state streams, with no *P. ramorum*

detected. A stream sampling meeting will be held in Portland, OR on 12/7 in an effort to gain consensus on a protocol for an expanded stream sampling pilot project as part of the 2006 survey.

The 2006 National *P. ramorum* Survey of Forest Environments is funded at a level similar to the 2005 survey, with site selection priorities the same as the 2004 survey. The largest change in the protocol for next year will be to permit both nested and real-time PCR diagnostics.

For more information on the 2005 National Survey of Forest Environments or the upcoming 2006 survey, contact Steve Oak, Forest Pathologist, USDA Forest Service, at: soak@fs.fed.us.

In spring of 2005, the Oregon Department of Agriculture surveyed Christmas tree plantations planted in *Abies* spp. and *Pseudotsuga menziesii* for *Phytophthora ramorum*. Christmas tree plantations in Benton, Clackamas, Clatsop, Columbia, Coos, Douglas, Hood River, Jackson, Josephine, Lane, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Umatilla, Union, Wallowa, Wasco, Washington, and Yamhill Counties were surveyed. The number of plantations surveyed in each county varied depending upon the total acreage of Christmas trees grown within the county. The goal of the survey was to maintain a *P. ramorum*-free status for Oregon-grown Christmas trees.

A total of 103 plantations were visually inspected according to the standards set forth in the 2005 USDA National Nursery Survey Protocol for *P. ramorum*, with 4,190 samples collected (approximately 41 samples per plantation). Using the USDA-approved ELISA and nested PCR tests, *P. ramorum* was not detected in any of the samples, nor was any other *Phytophthora*. This is the fourth year in a row that no *P. ramorum* has been found in Oregon Christmas tree plantations. Based on these results, Christmas tree plantations in all counties surveyed are officially declared *P. ramorum*-free for 2005.

As of 9/13/05, the United Kingdom (UK) has found *Phytophthora ramorum* in rivers and streams near some outbreak sites, as well as at 475 sites in England and 34 sites in Wales, in addition to a number of sites in Scotland, Northern Ireland, and the Channel Isles. England's totals to date include 380 retail and nursery confirmations, in addition to 95 established gardens, woods, and other wild planting areas. Wales' totals include 26 retail and nursery confirmations along with eight established gardens, woods, and other wild planting areas. In addition to *Rhododendron* and *Viburnum*, findings in these areas have been made on *Pieris, Camellia, Syringa, Kalmia* and single findings on a pot-grown *Taxus baccata* (Yew), *Hamamelis virginiana* (Witch hazel), *Laurus nobilis* (Bay laurel) and *Leucothoe* plants. Affected tree species have included a non-native American southern red oak (*Quercus falcata*), European Holm oak (*Quercus ilex*) and Turkey oak (*Q. cerris*), as well as native beech (*Fagus sylvatica*), Southern beech (*Nothofagus obliqua*), horse chestnut (*Aesculus hippocastanum*), sweet chestnut (*Castanea sativa*), and winter's bark (*Drimys winterii*). All these findings are associated with previous adjacent findings of the disease in rhododendron. For more information or maps of the wildland and retail sites, go to: http://www.defra.gov.uk/planth/pramorum3.htm.

LEGISLATION

The Agriculture appropriations bill was passed by the Senate November 3rd, and includes $37 million for disease, pest control, and research for California agriculture. Most of the funding will address Pierce's Disease, the Glassy Winged Sharpshooter, Wine grape research, Pink Bollworm, and West Nile Virus. The bill includes $3,076,000 for *Phytopthora ramorum* detection, monitoring, control, and eradication, as well as $98,000 for disease research being conducted at UC Davis. The bill now goes to the President for final approval.

REGULATIONS

***Viburnum opulus* (=*V. trilobum*) - (American cranberry viburnum) - was found to be *P. ramorum*-positive at a nursery in Clackamas County, Oregon on June 6, 2005.**

The USDA Animal and Plant Health Inspection Service (APHIS) has reviewed the findings and expects to add *Viburnum opulus* (=*V. trilobum*) to the *P. ramorum* associated host list soon. For more information on American cranberry viburnum, see "Hosts of the Month" below.

Real-time or quantitative PCR (qPCR), originally developed by the Central Science Laboratory (CSL) in York, UK, has been validated by USDA APHIS PPQ CPHST for providing diagnostic determinations for the *P. ramorum* federal emergency program. The result was that minor modifications were made for optimization of the assay on a Cepheid SmartCycler® II. However, the primers used by this assay are the same as the CSL procedure. The *P. ramorum* qPCR can detect the pathogen in a broad range of host plants (from 200 ng to 2 fg of genomic DNA). The test utilizes internal control primers based on the COX gene that are multiplexed with *P. ramorum* primers and probe for each DNA sample in order to confirm that amplifiable DNA is present in environmental samples that test PCR-negative for *P. ramorum*.

The protocol was evaluated in a ring-test involving several laboratories and showed consistent results. During the ring-test on the Cepheid SmartCycler® platform, some of the participating laboratories were asked to extend the protocol to two models of the ABI system (models 7900 and 7000) and successful results were achieved eliminating the cross reactivity of the assay. Included in this work instruction are the parameters for the ABI 7900 that were determined by the USDA AMS Laboratory in Gastonia, NC and were additionally verified successfully on the ABI 7000 by the University of Tennessee.

To access the RealTime PCR protocol, go to the USDA APHIS PPQ *P. ramorum* website at: http://www.aphis.usda.gov/ppq/ispm/pramorum/pdf_files/wi-b-t-1-6rev2.pdf. For more information, contact Pat Shiel, National Program Staff Scientist, USDA APHIS Plant Protection and Quarantine, Center for Plant Health Science and Technology, at: Patrick.J.Shiel@aphis.usda.gov.

NURSERIES

The Horticultural Research Institute (HRI), the research division of the American Nursery & Landscape Association (ANLA), has convened a national working group to explore the role of nursery management practices in the battle to limit the spread of *P. ramorum*. The working group is comprised of diverse representatives from the nursery industry, with key technical, research, and policy experts from USDA's Agricultural Research Service (ARS), APHIS, and Cooperative State Research, Education, and Extension Service (CSREES), as well as the National Plant Board.

The working group met October 25 - 26 to review the current regulatory status of *P ramorum* and the progress of ongoing research initiatives in preparation for a discussion on the role of "recommended management practices" (RMPs) in disease prevention, rapid detection, containment, and elimination in nurseries. The working group evaluated and fine-tuned existing best management practices that have been developed in California, Oregon, and elsewhere. Individual management practices were considered for their conformance with key "filters," or evaluative criteria, such as their scientific basis and relevance for industry across the country.

The goal of the HRI working group is to develop a basic menu of RMPs that can be used by nurseries nationwide to establish or improve management plans. HRI and ANLA expect to distribute the early recommendations of this working group in January 2006. These guidelines will be reviewed and expanded with new research findings and gained practical experience. Long-term goals for ANLA and HRI include building a working model for response to emerging plant pests and considering how quality assurance systems may contribute to future nursery inspection, certification, and quarantine programs.

For more information on the HRI working group, contact: K. Marc Teffeau, Director of Research & Regulatory Affairs, HRI/ANLA or Craig J. Regelbrugge, Senior Director for Government Relations, ANLA, at: (202) 789-2900.

A Nursery Pest Advisory Task Force (NPATF) was created in August of 2005 at the request of California's Secretary of Agriculture, AG Kawamura. The Task Force is comprised of representatives from the USDA, California Department of Food and Agriculture, CDF, UC Davis, county agricultural commissioners, and the nursery industry.

Dave Fujino (Hines Nurseries) was elected CA NPATF Chair based on his involvement and experience with the CA Association of Nurseries and Garden Centers Nursery Growers Association, as well as for his broad understanding of CA nursery industry concerns. Karen Suslow (Hines Nurseries) was elected to serve as Vice Chair, specifically responsible for issues related to *P. ramorum*. A new vice chair with appropriate technical understanding and interest will be assigned to each new pathogen/pest of national importance that emerges.

The purpose of the NPATF is to address issues related to new and/or emerging nursery pests, as well as to help identify research needs to address the management of these pests, help identify potential research funding sources, and facilitate communication between regulators and CA nursery industry representatives.

Objectives of the present NPATF group are to initially focus on *P. ramorum*, working in concert with the California Oak Mortality Task Force in its efforts to address *P. ramorum* issues, help identify *P. ramorum* research needs of direct relevance to the CA nursery industry, help identify *P. ramorum* research funding, and provide advice based on sound science and best management practices to help inform state and federal regulatory agencies.

The Advisory Task Force meets on a bimonthly basis. For more information on the CA NPATF, contact Dave Fujino at: dwfujino@sbcglobal.net or Karen Suslow at: ksuslow@hineshort.com.

USDA APHIS has confirmed the detection of *P. ramorum* at two nurseries in Washington State. These two additional infested nurseries are located in Snohomish County and King County. Infected species at both nurseries are varieties of Rhododendron. The King County nursery is a trace-forward from a positive supplier in Oregon; the Snohomish County nursery was found during the National *P. ramorum* Nursery Survey.

***P. ramorum* federal order compliance agreements, trace-forward/-back investigations, the USDA APHIS National Nursery Survey, and other investigations are ongoing.** To date, 99 sites in seven states have had *P. ramorum* detections. Positive findings by state are: CA(55), GA(4), LA(2), OR(20), TN(1), SC(1), and WA(16).

RESEARCH

Epidemiology of *Phytophthora ramorum* Infecting *Rhododendron* under Simulated Nursery Conditions – A research update by Steve Tjosvold, University of California Cooperative Extension, Santa Cruz County

Some important observations have been documented over the past two years in experiments devised to understand the spread and infection of *Phytophthora ramorum* under simulated nursery conditions. More disease has been observed in the nursery experiments during the relatively wet winter/spring season of 2005 as compared to the relatively dry and unusually warm spring of 2004. The following summary is organized according to the three inoculum sources that were evaluated. Experiments are underway to repeat observations for the 2005/06 winter/spring season.

Irrigation water:

- (2004) Viable naturally-occurring inoculum was detected (by pear-baiting) in winter and spring from a nearby stream and at sprinkler heads after pumping from the stream.
  (2005) Inoculum is detected all year in the stream and at sprinkler heads after pumping.
- (2004) No disease is detected on rhododendron stock irrigated with infested stream water.
- (2005) Disease occurred in the wet spring on plants irrigated with sprinkler-applied stream water, but not on plants irrigated with drip-applied stream water or with city water.

Soil:

- (2004) In field conditions, infested rhododendron leaf-disks mixed into the top 1 cm soil of rhododendron stock were viable for 28 weeks (direct plating onto selective media). In greenhouse conditions, viability was up to at least 66 weeks.
- Infected plants were observed both years during the spring only.
  (2004) Infection was only found on leaves touching inoculated soil and in (2005) soil-inoculum was splash dispersed to plants and infection occurred with sprinkler irrigation but was avoided with drip irrigation.

Aerial:

- During rain storms, inoculum was caught in rain up to 0.5m from inoculated rhododendron. In plant blocks (nursery stock spaced at commercial spacing), plant infections were detected up to 0.5 m from inoculated plants. New infections occurred on inoculated plants relatively frequently. No long distance movement in wind was detected; possibly only rain-splash dispersal is important in nursery stock.

Researchers modeling *P. ramorum* met on November 1 at the USDA Forest Service, Southern Research Station in Asheville, NC. Eight national-scale *P. ramorum* risk models were presented and compared as well as several models predicting risk of *P. ramorum* for California. An APHIS comparison of the models reveals a consistent national pattern of high risk in the coastal North-West and the central Appalachian Mountains, and low risk through the Great Plains. View the *P. ramorum* risk model summary. The models differ in predicting the extent of risk in the North East, coastal California, parts of the South East and the Northern Mid West. The greatest uncertainty appears to be the extent of the Northern boundary of risk east of the Rockies and the degree of risk in the South East. Most likely comparing the output from multiple models will give decision makers more information than a single model alone. USDA APHIS provided an overview of all the models. The presentations and *P. ramorum* modeling publications will be posted to the COMTF website (www.suddenoakdeath.org) in the next few weeks. The meeting was organized by the USDA Forest Service, Pacific Southwest Research Station and the USDA Forest Service, Eastern Forest Environmental Threat Assessment Center. For further information, contact Susan Frankel, USDA FS Pacific Southwest Research Station Sudden Oak Death Research Program Manager, at: sfrankel@fs.fed.us.

The European and Mediterranean Plant Protection Organization (EPPO) Conference, "*Phytophthora ramorum* and other forest pests," held **October 3-8** in **Falmouth, Cornwall, Great Britain, was attended by 76 delegates from 22 EPPO member countries as well as the United States, Canada, and Australia.** The conference provided a forum for presentations and discussions on distribution, detection, management, research, and prevention of *Phytophthora ramorum* and other invasive species. Participants also discussed current phytosanitary alerts concerning forest pests, and reviewed the EPPO forest quarantine project and its outcomes. Attendees also visited The Lost Gardens of Heligan, where rhododendrons (originally imported from China in the late 19th century) infected with *P. ramorum* and *P. kernoviae* were viewed and phytosanitary measures were discussed. Proceedings will be available on the EPPO website later this year at: http://www.eppo.org/.

Denman, S., Kirk, S. A., and Brasier, C. M. *Phytophthora ramorum* on *Quercus ilex* in the United Kingdom. Plant Disease. 89:1241, 2005; published online as DOI: 10.1094/PD-

89-1241A. Accepted for publication 8 August 2005.
http://www.apsnet.org/pd/searchnotes/2005/pd-89-1241a.asp

RESOURCES

The Department for Environment, Food, and Rural Affairs (DEFRA) has several new resources posted to their website, including:

Key research findings for *Phytophthora ramorum* and *P. kernoviae* funded by the DEFRA Plant Health Division can be found at: http://www.defra.gov.uk/planth/science/resdec04.pdf.

An updated *P. ramorum* Frequently Asked Questions (FAQ) - To access the updated FAQ, go to: http://www.defra.gov.uk/planth/pramorum8.htm. Information covered includes general background and history, epidemiology, management, the nursery industry and trade, and contact information.

A *Phytophthora kernoviae* FAQ - The FAQ can be found at: http://www.defra.gov.uk/planth/pkfaq.htm. Questions addressed include basic background information, its relationship to *P. ramorum*, management, basic research, the host list with a link to symptomatic photos, and contact information.

"A Practical Guide for the Nursery Stock and Garden Centre Industry" for *Phytophthora ramorum* can be found at: http://www.defra.gov.uk/planth/pestnote/2005/pramnurs.pdf.

A *P. kernoviae* chronology documenting noteworthy events - The chronology can be found at: http://www.defra.gov.uk/planth/pkernovii1.htm.

COLLABORATION

The California Invasive Plant Council (Cal-IPC) is a non-profit group that protects California's wildlands from invasive plants through research, restoration, and education. Similar to the COMTF, their membership includes public and private land managers, researchers, volunteer stewards, and concerned citizens. In light of the overlap in efforts between groups, the COMTF is exploring the opportunity to work more closely with them on educational outreach opportunities. For more information on Cal-IPC, visit their website at: http://www.cal-ipc.org/.

CALENDAR OF EVENTS

11/14 – "*Phytophthora ramorum/Phytophthora kernoviae*: Meeting for Interested Organizations" at the Royal Horticultural Conference Centre, Vincent Square, London. This meeting is sponsored by the Department for Environment, Food, and Rural Affairs and is by invitation only. Sessions will update attendees on the current situation in the UK, Europe, and the USA, and consider future action.

11/15 – Pacific Coast *P. ramorum* Conference at the Seattle Airport DoubleTree Hotel, Seattle, WA from 10:00 a.m. – 3:00 p.m. This meeting is sponsored by the Oregon Association of Nurseries, the Washington State Nursery and Landscape Association, and the British Columbia Landscape and Nursery Association, and is by invitation only. Attendees will be addressing *P. ramorum* geographic distribution in the nursery trade, current and future regulatory issues, and the nursery certification "clean stock" and systems approach, among other issues.

HOSTS OF THE MONTH

***Abies concolor* (white fir) – is an evergreen tree native to the mountains of southern Oregon, California, the southern Rocky Mountains, and Baja California.** Large and symmetrical, white fir grows 80 – 120ft tall and 15 – 20ft wide in its native range and in the

Pacific Northwest. White fir is one of the top timber species found in the Sierra Nevada Mountains of CA and is a popular Christmas tree, as well as one of the most commonly grown native firs in Western gardens.

Young trees are conical in shape, but develop a dome-like crown with age. The flattened needles of white fir are silvery blue-green, blunt at the tip, and grow 2 – 3in long. Often curving upwards, the needles extend at right angles from the twig, and twigs produce a citrus smell when needles are broken. White fir is monoecious, producing yellow- to red-toned, catkin-like male flowers and inconspicuous yellow-brown female flowers. The oblong cones grow 3 – 5 ½in upright, are yellow-green to purple in color, and are deciduous at maturity, dispersing seed in the fall. New twigs are dark-orange, but become gray-green, then gray with maturity. The bark of saplings is thin, smooth, and gray, turning thick, ash-gray with age, and developing deep irregular furrows.

P. ramorum- infected *Abies concolor* (white fir) was first reported in the October 2005 COMTF newsletter as having been found at a Christmas tree farm in the quarantined county of Santa Clara. Additional sampling of the tree farm is underway. Koch's Postulates have not been completed. The USDA Animal and Plant Health Inspection Service (APHIS) has reviewed the CDFA data and expects to add *A. concolor* to the official list of associated host plants soon.

References:

- Brenzel, Kathleen. Sunset Western Garden Book. Menlo Park, CA: Sunset Publishing Corporation, 2001. p 163.
- Virginia Tech Forestry Department; Dendrology at Virginia Tech; *Abies concolor*, 2005-2006 http://www.cnr.vt.edu/dendro/dendrology/syllabus/factsheet.cfm?ID=94

***Viburnum opulus* (=*V. trilobum*) - (American cranberry viburnum) - belongs, is a dense, rounded crown large deciduous shrub native to the northeastern and northwestern US that grows 8 – 12ft tall, and equally as wide.** The opposite three-lobed ovate shaped leaves have a toothed margin and grow 2 – 5in long. Leaf color in the summer is dark-green, turning a red to purple color in fall. Showy 4-5 in cyme white flowers bloom in early June, and the edible persisting red drupe fruit matures in late summer. American cranberry viburnum bark is waxy and gray brown in color.

The juicy, but acidic American cranberry viburnum fruit can be eaten raw or cooked, tasting best after a frost. Rich in vitamin C, it is an excellent substitute for cranberries and can be used in preserves or jams. Various plant parts, such as the roots, branches, and bark are also known to be used as a laxative, to alleviate fever, to induce vomiting, and as a digestive aid.

P. ramorum-infected *Viburnum opulus* (=*V. trilobum*) 'Baily Compact' (American cranberry viburnum) was identified as one of several Viburnum, Rhododendron, and Camellia species found positive at a Clackamas County, OR nursery. This new associated host joins the already listed *Viburnum opulus* (European cranberrybush).

References:

- University of Connecticut; UConn Plant Database; *Viburnum trilobum* http://www.hort.uconn.edu/plants/v/vibtri/vibtri1.html
- Minnesota Power Website; The Right Tree Book; *Viburnum trilobum* http://www.mnpower.com/treebook/fact119.html
- Plants for a Future Website;*Viburnum trilobum*; http://www.ibiblio.org/pfaf/cgi-bin/arr_html?Viburnum+trilobum&CAN=COMIND