



CALIFORNIA OAK MORTALITY TASK FORCE REPORT MARCH 2006

MONITORING

A sample taken from a seasonal stream in the Kitsap Peninsula area of Pierce County, Washington has been confirmed *P. ramorum*-positive by the USDA APHIS Beltsville, Maryland laboratory. The most common method of sampling streams for *P. ramorum* is "stream baiting," or suspending a substrate (in this case, rhododendron leaves) in flowing water and then analyzing the resulting leaves. The confirmed sample was part of the environmental monitoring project currently being conducted in partnership by Washington's Department of Natural Resources and the Washington State Department of Agriculture (WSDA) as part of the National *P. ramorum* Survey of Forest Environments, Stream Survey Pilot Project.

The sample was taken in mid-January, 2006 from a seasonal stream that flows through and adjacent to an ornamental nursery. Plants from the nursery tested positive in 2004 and 2005. In both years, the nursery immediately complied with the USDA confirmed nursery protocol (CNP). The pathogen was declared eradicated at the nursery according to the 2004 federal protocol. The cause of the reoccurring infestation in 2005 is unknown; however, the nursery immediately moved to comply with CNP upon confirmation. The 2005 results were complicated by a positive soil sample from the immediate area under the infected stock at the nursery; consequently, the 2005 eradication protocol cannot be completed until temperatures warm, allowing for successful soil treatment.

In order to determine the extent of water contamination, the agencies are monitoring the water upstream and downstream from the positive site. Further, to determine whether an infestation exists outside the affected nursery, monitoring for signs of infestation throughout the immediate watershed area will be conducted. Approximately two miles from the stream sample site, the watershed empties into the salt water of Puget Sound, where it is believed that *P. ramorum* is unlikely to survive.

USDA APHIS is currently reviewing the WSDA findings to develop an appropriate response to this unusual situation.

REGULATIONS

USDA APHIS has issued a Federal Domestic Quarantine Order identifying 13 new plants that have been added to the APHIS list of *P. ramorum* hosts and associated hosts. One of the plants, found in an infested area of California and identified by Washington State, was *Abies magnifica*. The other 12 new species were reported from Canada, and include: *Acer davidii*, *Ardisia japonica*, *Euonymus kiautschovicus*, *Gaultheria shallon*, *Hamamelis X intermedia* (*H. mollis* & *H. japonica*), *Leucothoe axillaris*, *Magnolia grandiflora*, *Michelia maudiae*, *Michelia wilsonii*, *Osmanthus decorus* (= *Phillyrea decora*; = *P. vilmoriniana*), *Prunus lusitanica*, and *Rosa rugosa*. Since Koch's postulates have not yet been completed for these plants, they will be added to the associated host list.

Koch's postulates have been completed for *Frangula purshiana* (formerly listed as *Rhamnus purshiana*), *Adiantum aleuticum*, and *Adiantum*



jordanii. Consequently, APHIS has moved these three species from the associated host list to the host list.

Acer circinatum* (vine maple) and *Arctostaphylos columbiana* (manzanita) symptomatic plants in Humboldt County have been identified as *P.

***ramorum*-positive following samples taken and cultured by UC researchers.**

Symptomatic *A. circinatum* was found in a residential Redway yard growing at the base of a grove of symptomatic California bay laurel and tanoak trees. *P. ramorum*-positive CA bay laurel had previously been confirmed at the location. Symptomatic *A. columbiana* was found growing on the first bench of a ridge top system in a Douglas-fir/tanoak/madrone forest near the Avenue of the Giants in Humboldt Redwoods State Park. Symptomatic tanoak, California bay laurel, and madrone were observed, with Douglas-fir, California black oak, California hazelnut, toyon, and poison oak also present. APHIS is reviewing the findings and anticipates adding these two species to the host list in the near future.

On February 3, 2006, USDA APHIS issued an update to the Trace-Forward Protocol for Nurseries that Received Plant Material Shipped from a Confirmed *P. ramorum*-Infested Nursery.

The new protocol is intended to establish a set of procedures that are used to determine if a nursery that has received plants from a *P. ramorum*-positive nursery in fact did acquire infected nursery stock, thus becoming infested as well. Compliance with these procedures will insure a consistent, science and risk-based response to detection of *P. ramorum* in commercial nursery stock. To access the updated protocol, go to the APHIS website at:

http://www.aphis.usda.gov/ppq/ispn/pramorom/pdf_files/traceforwardprotocol.pdf.

NURSERIES

The California Department of Food and Agriculture identified four *P. ramorum*-positive nurseries during February, bringing CA's 2006 total number of positive nurseries to five. One of the finds was at a production facility in Contra Costa County, where two *Camellia* plants were found to be infected during a compliance agreement inspection. The nursery had also been found to be infested in 2004 as a result of trace-forward investigations. The nursery does ship interstate; trace-forward and -back lists are being generated for follow-up investigations. A second confirmation was made at a retail nursery in Alameda County, confirmed during a preliminary inspection that was intended to qualify the site for a compliance agreement. *P. ramorum*-positive plants included *Camellia* and *Pieris*. The nursery had also been found positive in 2005 during a trace-forward investigation. The site ships bareroot, non-host nursery stock interstate. The county is conducting trace-back and -forward investigations. A third confirmed location was a retail nursery in Nevada County found to have *P. ramorum*-positive *Camellia* 'scentsation' as a result of an inspector conducting a site visit and noticing the symptomatic plant during an unrelated truck inspection. The Nevada County nursery was also found positive for the pathogen in 2004 during a trace-forward investigation and again in 2005 during a nursery stock cleanliness inspection. This nursery does not ship interstate. The final February *P. ramorum* confirmation in California was made at a Napa County retail nursery during a trace-forward investigation from a Canadian nursery. The nursery was also found positive in 2004 during a compliance agreement inspection. The positive plant was a *Camellia japonica* 'black ruby.' This nursery does not ship interstate.

**RESEARCH**

An intradepartmental USDA *P. ramorum* research needs assessment and coordination meeting was held February 8, 2006. Officials from USDA's Animal and Plant Health Inspection Service; Forest Service (FS); Agricultural Research Service; and Cooperative State Research, Education, and Extension Service met to work on designing complementary research and extension activities and to assemble briefing papers on USDA's *P. ramorum* program. The research gaps identified will be used to steer awarding of funds from the USDA FS 2006 *P. ramorum* request for proposals and to update the Pacific Southwest Research Station five-year *P. ramorum* research plan. For more information, contact Susan Frankel, Sudden Oak Death Research Program Manager, USDA FS, Pacific Southwest Research Station at: sfrankel@fs.fed.us.

Two UK Forestry Commission Forest Researchers along with three Italian forest pathologists/mycologists from Viterbo University went on an expedition to Nepal in late 2005 to investigate the possibility of the Himalayas being the geographic origin of *P. ramorum* and *P. kernoviae* as well as to identify any currently unknown *Phytophthora* species that may pose a threat to EU forests. The trek covered 120 km round trip through a coniferous forest made up of blue pine, spruce, cypress and yew, in addition to broadleaved areas comprised of elm, oak, *Lithocarpus*, horse chestnut, walnut, maple, and areas with understory rhododendron. Samples were taken from plants, streams, and soil. Results are pending. For additional details on the expedition, go to: [http://www.forestresearch.gov.uk/pdf/FR_SBNews_0512.pdf/\\$FILE/FR_SBNews_0512.pdf](http://www.forestresearch.gov.uk/pdf/FR_SBNews_0512.pdf/$FILE/FR_SBNews_0512.pdf).

The UK's Department for Environment, Food, and Rural Affairs (DEFRA) has posted a final report on the Science and Research project "Conservation (micro-prop) of rare plants from *P. ramorum* infected site in the South West (PH0316)" conducted from 8/04 – 8/05. The December 7, 2005 report can be found on DEFRA's website at: http://www2.defra.gov.uk/research/project_data/More.asp?I=PH0316&SCOPE=0&M=PSA&V=AF%3A090.

Executive Summary: The objective of this research work was to develop a protocol to micropropagate material from ancient Rhododendron and Camellia species situated in historic gardens that are potentially infected with *Phytophthora ramorum*. Key to this protocol would be to obtain clean juvenile plant tissues from mature plants growing outdoors. This would then be bulked up through micropropagation in the laboratory under sterile conditions and, after inspection, be released to the environment.

This research was initiated because of the outbreak of *Phytophthora ramorum* in Cornwall and its threat to the ancient (up to 150 years old) and unique Rhododendrons and Camellias which were introduced by the plant hunters of the mid 19th Century. Current policy is to invariably destroy infected specimens, but this project aims to conserve the rare plants by micropropagation. This technique has to be used because standard propagation techniques eg. cuttings do not work on such old plant material.

Previous micropropagation of some of these mature plants had had very little success due to the high contamination naturally present on old plant material. To improve on this success rate a technique has been developed whereby dormant shoots, on point of bud burst, have been cleaned and covered by a perforated flower sleeve to protect the



developing shoot. The juvenile material has remained covered until stem growth has reached 2-4cm, then it has been removed together with a portion of old stem and brought into the laboratory. It has been grown on in standard flower food for up to a period of 14 days before surface sterilization and introduction into the micropropagation system.

Results have shown a marked decrease in the contamination problems associated with earlier attempts to propagate these varied *Rhododendron* types and consequently an increase in the proportion of clean cultures from the endangered *Rhododendrons*. Future work will focus on the cleaning up of certain stubbornly contaminated *Rhododendrons*, possibly by first grafting onto pot grown rootstocks and then using the protected rejuvenated material for micropropagation. Further research into the micropropagation of the *Camellias* is ongoing (under a follow-on project); clean cultures can be obtained but their multiplication and subsequent rooting is proving difficult.

Jiang, Rays H.Y.; Tyler, Brett M.; Whisson, Stephen C.; Hardham, Adrienne R., and Govers, Francine. 2006. Ancient Origin of Elicitin Gene Clusters in *Phytophthora* Genomes. *Molecular Biology and Evolution* 23(2):338-351. DOI:10.1093/molbev/msj)39.

Abstract: The genus *Phytophthora* belongs to the oomycetes in the eukaryotic stramenopile lineage and is comprised of over 65 species that are all destructive plant pathogens on a wide range of dicotyledons. *Phytophthora* produces elicitins (ELIs), a group of extracellular elicitor proteins that cause a hypersensitive response in tobacco. Database mining revealed several new classes of elicitin-like (ELL) sequences with diverse elicitin domains in *Phytophthora infestans*, *Phytophthora sojae*, *Phytophthora brassicae*, and *Phytophthora ramorum*. ELIs and ELLs were shown to be unique to *Phytophthora* and *Pythium* species. They are ubiquitous among *Phytophthora* species and belong to one of the most highly conserved and complex protein families in the *Phytophthora* genus. Phylogeny construction with elicitin domains derived from 156 ELIs and ELLs showed that most of the diversified family members existed prior to divergence of *Phytophthora* species from a common ancestor. Analysis to discriminate diversifying and purifying selection showed that all 17 ELI and ELL clades are under purifying selection. Within highly similar ELI groups there was no evidence for positively selected amino acids suggesting that purifying selection contributes to the continued existence of this diverse protein family. Characteristic cysteine spacing patterns were found for each phylogenetic clade. Except for the canonical clade ELI-1, ELIs and ELLs possess C-terminal domains of variable length, many of which have a high threonine, serine, or proline content suggesting an association with the cell wall. In addition, some ELIs and ELLs have a predicted glycosylphosphatidylinositol site suggesting anchoring of the C-terminal domain to the cell membrane. The *eli* and *ell* genes belonging to different clades are clustered in the genomes. Overall, *eli* and *ell* genes are expressed at different levels and in different life cycle stages but those sharing the same phylogenetic clade appear to have similar expression patterns.

Jung, Thomas; Hudler, George W.; Jensen-Tracy, S.L.; Griffiths, H.M.; Fleischmann, F.; and Osswald, Wolfgang. November 2005. Involvement of *Phytophthora* species in the decline of European beech in Europe and the USA. *Mycologist*, Volume 19, Part 4. British Mycological Society. DOI: 10.1017/S0269915X05004052.



Abstract: European beech (*Fagus sylvatica* L.) is an important forest tree species which was always considered being non-problematic with regard to its susceptibility to pathogens and insects. However during the past decade, in Europe and the north-eastern USA an increasing number of trees and stands were showing symptoms typical for *Phytophthora* diseases: increased crown transparency, abnormally small and often yellowish foliage, a dieback of the crown, tongue-shaped necroses of the inner bark and the cambium with tarry or rusty spots on the surface of the bark either extending up to 7m from the stem base (collar rot) or occurring isolated higher up the stem (aerial bleeding cankers), fine root destructions and necrotic lesions on suberized roots. Large-scale investigations on both continents using specific isolation methods and ELISA kits for detection, and morphological and physiological parameters as well as ITS-DNA sequence analysis for identification demonstrated that several *Phytophthora* species were regularly involved as inciting agents of the decline. The most important species were *Phytophthora citricola*, *P. cambivora* and *P. cactorum* in Europe, and *P. inflata* in the USA. Their pathogenicity to beech was shown by stem inoculation and soil infestation tests performed by various groups. A small-scale nursery survey in Germany revealed that beech fields are regularly infested with various *Phytophthora* species. Options for disease management and control are discussed, and an emphasis is put on the prevention of disease spread via infested nursery stock.

Vettraino, A.M.; Hüberli, D.; Swain, S.; Bienapfl, J.C.; Smith, A.; and Garbelotto, M. Accepted December 8, 2005. First Report of Infection of Maiden-Hair Fern (*Adiantum jordanii* and *A. aleuticum*) by *Phytophthora ramorum* in California. Plant Disease 90:379, 2006. Published online at: <http://www.apsnet.org/pd/current/> as DOI: 10.1094/PD-90-0379B.

Win, Joe; Kanneganti, Thirumala-Devi; Torto-Alalibo, Trudy; Kamoun, Sophien. Accepted October 5, 2005. Computational and comparative analyses of 150 full-length cDNA sequences from the oomycete plant pathogen *Phytophthora infestans*. Fungal Genetics and Biology 43 (2006) 20-33. Available online at: www.sciencedirect.com.

MEETINGS

The California Oak Mortality Task Force, in cooperation with the USDA APHIS, will be holding its annual meeting in Carmel at the Carmel Mission Inn, March 20 – 23, 2006. To kick off our meeting, an evening wine and cheese reception is planned at “A Taste of Monterey” on 3/20. On 3/21, presenters at the COMTF meeting will provide general nursery, wildland, and regulatory updates as well as the latest information on management and research. The 3/22 USDA APHIS *Phytophthora ramorum* Program Review will address issues surrounding the federal *P. ramorum* regulatory program, presenting information on what the program has accomplished to date as well as future program plans. Finally, on 3/23, a carpool field trip to Pfeiffer Big Sur State Park will be offered to attendees interested in seeing *P. ramorum* in a forested setting. For more information, or to register by the 3/10 deadline, go to the Task Force website at: www.suddenoakdeath.org.

A mini-symposia titled “*Phytophthora ramorum* (Sudden Oak Death) in Wildlands and Nurseries” will be held at the Fifth National Integrated Pest Management Symposium in St. Louis, MO April 4-6, 2006. At the Symposium, COMTF, Oregon State University,



and USDA APHIS representatives will present information on early *P. ramorum* detection and emergency response protocols for nursery and landscape settings, as well as background information on the pathogen and the risks it presents to our forests and gardens. For more information, go to the Symposium website at: <http://www.ipmcenters.org/ipmsymposium/>.

KUDOS

In December 2005, the USDA Forest Service Washington office conducted a review of the Pacific Southwest Region and Pacific Southwest Research Station. In the report, the COMTF was commended for modeling “a successful partnership for invasive species control. Collaboration involved the State, the USDA Forest Service, Pacific Southwest Region, and universities as well as private and other public partners.”

CALENDAR OF EVENTS

3/7-9 – EU Risk Assessment for *Phytophthora ramorum* (EU-RAPRA) meeting; Federal Biological Research Centre for Agriculture and Forestry; Braunschweig, Germany; For more information, go to the RAPRA website at: <http://rapra.csl.gov.uk/>.

3/8 – COMTF Spring Training: Detection and Control of *P. ramorum* in Non-infested Counties; 12:30 – 4:30 p.m.; UC Cooperative Extension, San Luis Obispo County; 2156 Sierra Way, San Luis Obispo, CA 93401; Continuing education credits include DPR, ISA, and SAF; To access the agenda or to register, go to: www.suddenoakdeath.org; For more information, contact Janice Alexander, COMTF Educational Outreach Coordinator, at: (415) 499-3041 or jalexander@ucdavis.edu.

3/14 – Sudden Oak Death Spreads in West Marin: A Community Meeting; 7:45 – 9:00 p.m.; The Dance Palace Community Center; 503 B Street, Point Reyes Station, CA 94956; For more information, contact Janice Alexander, COMTF Educational Outreach Coordinator, at: (415) 499-3041 or jalexander@ucdavis.edu.

3/20 – COMTF Meet and Greet Wine and Cheese Reception; By Registration Only; 6:30 – 8:00 p.m.; A Taste of Monterey; 700 Cannery Row # Kk, Monterey, CA

3/21 – “*Phytophthora ramorum*: A Management and Research Update” COMTF-wide Annual Meeting; 8:30 a.m. – 5:00 p.m.; Carmel Mission Inn, Carmel, CA; Registration Required; To register, go to: www.suddenoakdeath.org; for questions, contact Katie Palmieri, COMTF Public Information Officer, at: (510) 847-5482 or via email at: palmieri@nature.berkeley.edu.

3/21 – The first organizational meeting of the COMTF Conservation Committee; 11:35 a.m. – 12:35 p.m.; Carmel Mission Inn, Carmel, CA; During the COMTF meeting lunch break; For more information, contact Katie Palmieri, COMTF Public Information Officer, at: (510) 847-5482 or palmieri@nature.berkeley.edu.

3/22 – APHIS *P. ramorum* Program Review; Carmel Mission Inn, Carmel, CA; 8:30 a.m. – 4:30 p.m. Carmel Mission Inn, Carmel CA; Registration is strongly recommended to insure a seat; To access the agenda and/or to register, go to: http://www.aphis.usda.gov/ppq/ispm/pramorom/program_review.html. For more



information, contact Jonathan Jones, National *Phytophthora ramorum* Program Manager, USDA APHIS PPQ, at: Jonathan.M.Jones@aphis.usda.gov.

3/23 – Free half-day carpool field trip to Pfeiffer Big Sur State Park; Carpool begins and ends at lobby of Carmel Mission Inn, Carmel, CA; 9:00 a.m. – 1:00 p.m.; Wear hiking shoes and layered, comfortable clothing; For more information, contact Katie Palmieri, COMTF Public Information Officer, at: (510) 847-5482 or palmieri@nature.berkeley.edu.

4/4 – 6 - The Fifth National Integrated Pest Management Symposium, "Delivering on a Promise;" St. Louis, MO; For more information, go to the Symposium website at: <http://www.ipmcenters.org/ipmsymposium/>.

4/17 – Submission deadline for the Sixth California Oak Symposium, "California's Oaks: Today's Challenges, Tomorrow's Opportunities;" For more information on the call for papers, the Symposium, or contact information, go to the Symposium website at: <http://danr.ucop.edu/ihrmp/symposium.htm>; The meeting will be held in Rohnert Park, CA, October 9 – 12, and will feature a Sudden Oak Death field trip on 10/9.

4/26 – COMTF Spring Training: A management update for *P. ramorum*/Sudden Oak Death: Symptoms, regulations, treatment, and Best Management Practices; 9 a.m. – 12:30 p.m.; UC Cooperative Extension, Mendocino County; 890 N. Bush St., Ukiah, CA 95482; Additional details will be forthcoming; For more information, contact Janice Alexander, COMTF Educational Outreach Coordinator, at: (415) 499-3041 or jalexander@ucdavis.edu.

5/7 – Free 2006 Bringing Back the Natives Garden Tour; 10:00 a.m. – 5:00 p.m.; Registration for the 60-garden tour is required in order to receive the guidebook and directions, as well as to reserve a spot; For more information or to register, go to: www.BringingBacktheNatives.net.