



## CALIFORNIA OAK MORTALITY TASK FORCE REPORT MAY 2012

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### REGULATIONS

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**The USDA Animal and Plant Health Inspection Service (APHIS) issued a Federal Order on April 18, 2012, placing restrictions on the importation of *P. ramorum* host plants for planting into the U.S. APHIS has been requiring that plants from several European countries and the United Kingdom be accompanied by inspection certifications and proof of *P. ramorum*-free testing.**

The new order requires specific countries to have in place an annual pest exclusion program that incorporates monitoring, sampling, testing, and a validation process to verify the absence of *P. ramorum* in places of production. APHIS will approve countries to export host material to the U.S. if the program is comparable to APHIS' restrictions for interstate movement of *P. ramorum* hosts. The shipments must also be accompanied by a phytosanitary certificate with an additional declaration about the place of production. Host plants for planting will be allowed into the U.S. from countries where *P. ramorum* is not known to be found if accompanied by a phytosanitary certificate with an additional declaration stating that *P. ramorum* is not known to exist within the country.

Restrictions apply to host plants for planting and all plant parts intended for propagation except seed of the plant taxa. For questions, contact William Aley, Sr. Import Specialist, APHIS Plant Protection and Quarantine, at (301) 851-2130 or [William.D.Aley@aphis.usda.gov](mailto:William.D.Aley@aphis.usda.gov).

### MONITORING

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**In 2011, 329 Great Britain and Northern Ireland sites were identified with *P. ramorum*** on Japanese larch, with clearing occurring on 3,435 hectares (8,488 acres) and a volume of 678,000 m<sup>3</sup> logs removed. The 2012 British Forestry Commission *P. ramorum* larch aerial survey is now underway. Flight paths are determined by areas considered high risk for pathogen establishment. The first two flyovers in southwest England identified 50 sites requiring follow-up investigations. Most of the sites in question are small (sometimes individual trees) and close to, or contiguous with, previous infection sites. To access the 2011 Forestry Commission summary of *P. ramorum* activities for last year, go to [www.forestry.gov.uk/pramorom](http://www.forestry.gov.uk/pramorom).

**A forest planted by Paul McCartney in memory of his late wife Linda has been destroyed by *P. ramorum*.** After Linda's death in 1998, McCartney planted numerous trees on the border of their family estate in Somerset, England. Most of the larch trees have had to be removed.

**Update on Sudden Oak Death in Oregon Forests – Since first discovered in southwest Oregon forests in July 2001, an interagency team has been attempting to eradicate *Phytophthora ramorum* through early detection and destruction of infected and nearby host plants.**



Post-treatment monitoring in 2009 and 2010 showed that the disease and the pathogen were eliminated from more than 50 percent of the treated sites, yet the pathogen continued to slowly spread. From 2007 to 2009, there were approximately 60 new infested sites per year. In 2010, the number of new infested sites increased to 83, with many locations where treatment delays had occurred in prior years. In 2011, 172 new sites (nearly triple the three-year average) were detected, one of which was located at Cape Sebastian, 6.5 miles north of the quarantine boundary and 12 miles from the nearest known outbreak (figures 1 and 2). It is unknown whether spread to the Cape occurred naturally or by humans transporting infected material. Thus far in 2012, 40 new infested sites have been detected.

Continued spread of sudden oak death is attributed to the slow development of symptoms in infected trees which hinders early detection, and to delays in completing eradication treatments which allow disease spread from known infestations. Many of the sites discovered on private land in 2009 and early 2010 remained untreated for more than a year due to lack of funds, contributing to disease spread and intensification, especially near the central part of the quarantine area. Infested sites on federal land have been fully or partially treated.

The increase in disease and decrease in state and federal funds resulted in eradication treatment costs on private lands that exceeded project funds. [In March 2012, the state quarantine area was expanded to 202 mi<sup>2</sup> and regulations were revised.](#) The revised quarantine establishes a generally infested area in which eradication treatments are no longer required, and provides for increased utilization of tanoak within the region. Outside of the generally infested area eradication is required for all new infestations. Although the initial goal of complete eradication in Curry County forests is now considered unachievable, a slow the spread program will continue through early detection and rapid eradication of new infestations that are most important in terms of slowing disease spread; reducing inoculum levels wherever practical through cost-share projects and best management practices; and improved education and outreach to prevent spread by humans. For more information on Sudden Oak Death in Oregon, go to [http://www.oregon.gov/ODA/CID/PLANT\\_HEALTH/sod\\_index.shtml](http://www.oregon.gov/ODA/CID/PLANT_HEALTH/sod_index.shtml).

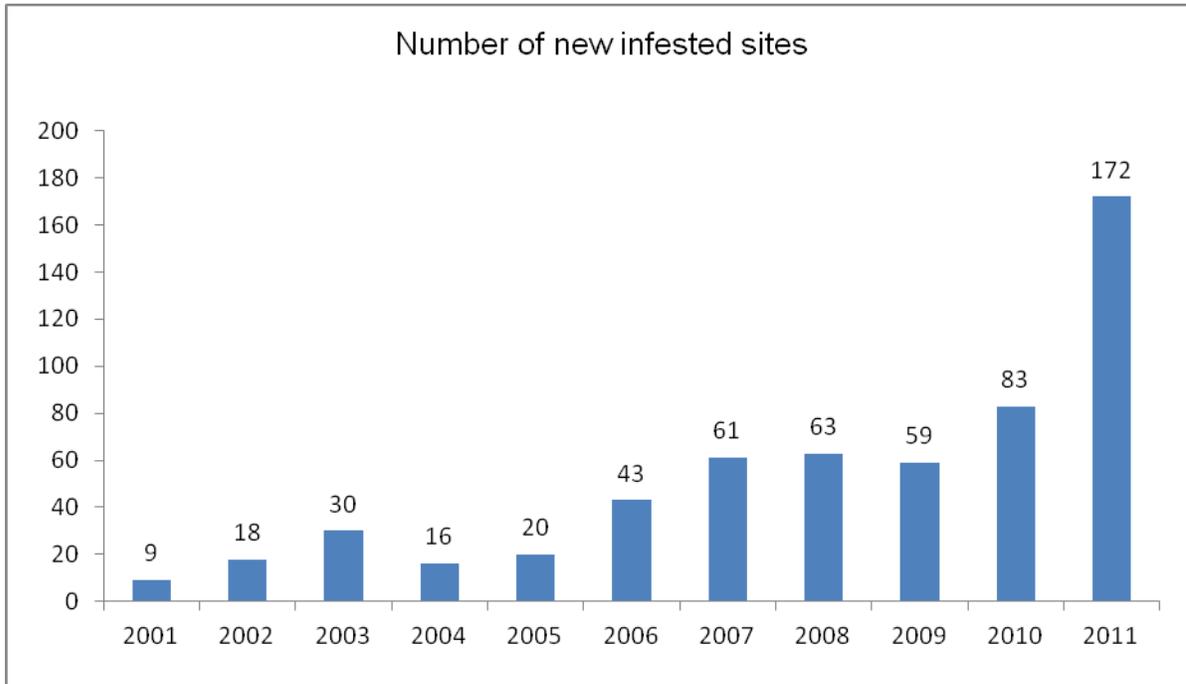


Figure 1. Number of new SOD sites discovered annually in Curry County forests, 2001-2011.

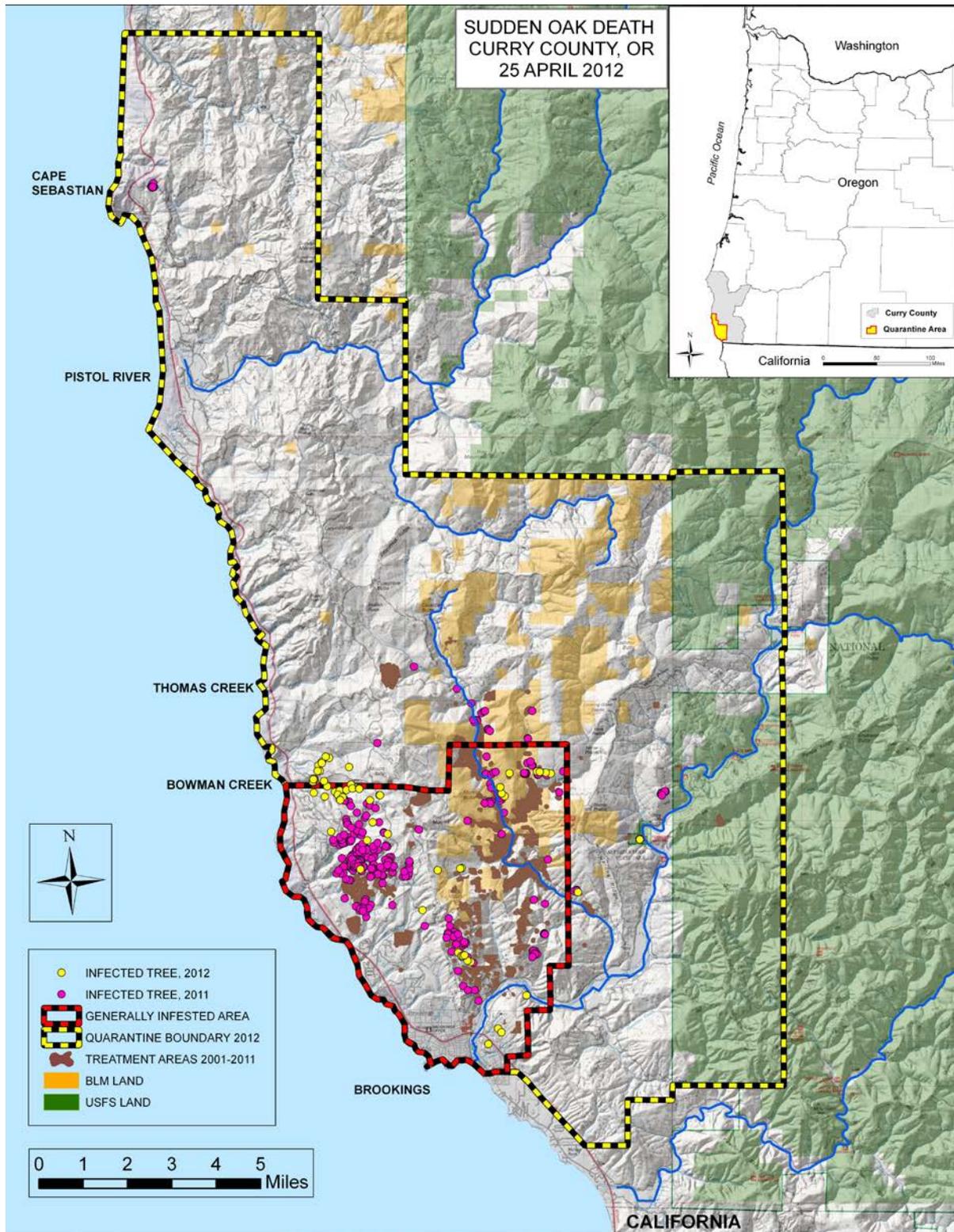


Figure 2. Location of *P. ramorum*-infested areas in 2011 and 2012, the revised quarantine area, Curry County, Oregon, March 2011. Sites enlarged for visibility.



## NURSERIES

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### **California's first *P. ramorum*- positive nursery for 2012 was identified on April 13<sup>th</sup>.**

The Orange County production nursery was found to have infected *Loropetalum chinense*, *Rhododendron*, and star jasmine (*Trachelospermum jasminoides*) during a compliance agreement inspection. All of the plants other than star jasmine were located in the shade cloth area of the nursery. The nursery ships interstate and had not been previously positive for the pathogen. Trace-back and trace-forward investigations are underway. The Orange County Agricultural Commissioner's office will conduct the confirmed nursery protocol.

**The Oregon Department of Agriculture (ODA) 2012 Federal Order survey of nurseries shipping interstate is underway.** As was done in the 2011 survey, ODA will assess certified nurseries for issues such as standing water and the presence of leaf debris. The goal is to help nurseries identify ways *Phytophthora* could be entering and spreading within their establishments. At the end of this season, ODA will compare data from 2011 and 2012 assessments to determine if the assessment itself caused nurseries to change production practices in a positive way.

## RESEARCH

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### **Your ideas and opinions are requested for the 2012 *P. ramorum* Research Needs**

Assessment being conducted by the California Oak Mortality Task Force (COMTF) in cooperation with the USDA Forest Service, Pacific Southwest Research Station. Separate "nursery" and "wildland" research needs assessments will be used to prioritize current research needs. Deadline for input is June 10, 2012. Go to <http://ucanr.org/2012wildlandrna> to participate in the wildland survey or [http://ucanr.org/2012nursery\\_rna](http://ucanr.org/2012nursery_rna) for the nursery survey.

**Kasuga, T.; Kozanitas, M.; Bui, M.; Hüberli, D.; Rizzo, D.M.; and Garbelotto, M.** 2012. Phenotypic Diversification is Associated with Host-Induced Transposon Derepression in the Sudden Oak Death Pathogen *Phytophthora ramorum*. PLoS ONE 7(4): e34728. DOI: 10.1371/journal.pone.0034728.

Abstract: The oomycete pathogen *Phytophthora ramorum* is responsible for sudden oak death (SOD) in California coastal forests. *P. ramorum* is a generalist pathogen with over 100 known host species. Three or four closely related genotypes of *P. ramorum* (from a single lineage) were originally introduced in California forests and the pathogen reproduces clonally. Because of this the genetic diversity of *P. ramorum* is extremely low in Californian forests. However, *P. ramorum* shows diverse phenotypic variation in colony morphology, colony senescence, and virulence. In this study, we show that phenotypic variation among isolates is associated with the host species from which the microbe was originally cultured. Microarray global mRNA profiling detected derepression of transposable elements (TEs) and down-regulation of crinkler effector homologs (CRNs) in the majority of isolates originating from coast live oak (*Quercus agrifolia*), but this expression pattern was not observed in isolates from California bay laurel (*Umbellularia californica*). In some instances, oak and bay laurel isolates



originating from the same geographic location had identical genotypes based on multilocus simple sequence repeat (SSR) marker analysis but had different phenotypes. Expression levels of the two marker genes analyzed by quantitative reverse transcription PCR were correlated with originating host species, but not with multilocus genotypes. Because oak is a nontransmissible dead-end host for *P. ramorum*, our observations are congruent with an epi-transposon hypothesis; that is, physiological stress is triggered on *P. ramorum* while colonizing oak stems and disrupts epigenetic silencing of TEs. This then results in TE reactivation and possibly genome diversification without significant epidemiological consequences. We propose the *P. ramorum*-oak host system in California forests as an ad hoc model for epi-transposon mediated diversification.

**Significance:** This study found that the virulence of plant-borne diseases depends not only on the particular strain of a pathogen, but on where the pathogen has been before landing on its host. It demonstrated that the pattern of gene regulation—how a cell determines which genes it will express and how it will express them—rather than gene make-up alone affects how aggressively a microbe will behave in a plant host. The pattern of gene regulation is formed by past environments or by an original host plant from which the pathogen is transmitted.

In the study, researchers showed that genetically identical strains of *P. ramorum* isolated from different plant hosts were strikingly different in their virulence and their ability to proliferate, and showed that these traits were maintained long after they had been isolated from their hosts. The implications for disease control are significant, as researchers say that it may not be enough to know what strain of pathogens they are dealing with in order to make treatment decisions, it also may be necessary to know how the pathogen's genes are being regulated. Also identified were two groups of genes that are capable of affecting virulence and whose expression patterns are indicative of the previous host species they inhabited. Over-expression of transposons—mobile genetic elements—combined with under-expression of crinkler genes—genes involved in host-pathogen interactions—is consistently associated with lowered fitness of the pathogen. Understanding the regulation of these genes may provide scientists with some future approaches to control the disease, such as manipulating the gene expression to artificially reduce the aggressiveness of plant pathogens.

**Vercauteren, A.; Riedel, M.; Maes, M.; Werres, S.; and Heungens, K. 2012. Survival of *Phytophthora ramorum* in *Rhododendron* root balls and in rootless substrates. Plant Pathology. DOI: 10.1111/j.1365-3059.2012.02627.x.**

**Abstract:** This study assesses the survival of *Phytophthora ramorum* in the root ball of *Rhododendron* container plants as well as in different rootless forest substrates and a horticultural potting medium. Following inoculation of the root balls, the aboveground plant parts stayed symptomless, whilst the pathogen could be recovered with a novel non-destructive baiting assay from the root balls until at least 8 months post-inoculation. Plating of surface-sterilized roots and direct microscopic analysis confirmed the presence of *P. ramorum* in the roots. *Phytophthora ramorum* could also be baited from the root



balls of symptomless *Rhododendron* plants from commercial nurseries, even 2 years after acquisition. Survival of *P. ramorum* in rootless media was assessed after burying disks of infected leaf material below the soil surface in columns filled with four different undisturbed forest substrates or a potting medium, and incubated at an outdoor quarantine facility. *Phytophthora ramorum* could be recovered at least 33 months after burial from all substrates, with a significant increase in recovery after the winter period. These data suggest the possibility for long-term symptomless presence of *P. ramorum* in root balls of commercial *Rhododendron* plants as well as survival in potting medium and different forest substrates under western European climate conditions. Symptomless presence in root balls can contribute to latent spread of this pathogen between nurseries. The novel baiting test, being non-destructive, simple and applicable to a relatively large number of plants, can offer a valuable tool to test plants for the presence of *Phytophthora* species in root balls.

#### **RELATED RESEARCH**

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**Hong, C.; Richardson, P.; Hao, W.; Ghimire, S.R.; Kong, P.; Moorman, G.W.; Lea-Cox, J.D.; and Ross, D.S.** In press. *Phytophthora aquimorbida* sp. nov. and *Phytophthora* taxon 'aquatilis' recovered from irrigation reservoirs and a stream in Virginia, USA. *Mycologia*, 10.3852/11-055. Preliminary version published as DOI:10.3852/11-055. <http://www.mycologia.org/cgi/content/abstract/11-055v1>.

**Liebhold, A.M.; Brockerhoff, E.G.; Garrett, L.J.; Parke, J.L.; and Britton, K.O.** 2012. Live plant imports: the major pathway for forest insect and pathogen invasions of the US. *Frontiers in Ecology and the Environment* 10: 135–143. <http://dx.doi.org/10.1890/110198>.

#### **MEETINGS**

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**The “Early Bird” registration for the Fifth Sudden Oak Death Science Symposium** (held in Petaluma, June 19 – 22, 2012) is available until May 18<sup>th</sup>. After that, registration increases to the full rate of \$275. Special Symposium events include a “Sudden Oak Death: Biosecurity Concerns and Forest Restoration” field trip, a poster session, and a half-day dedicated to “[What are we trying to save? Tanoak: history, values and ecology](#),” a mini-fest of all things tanoak. Papers presented during the tanoak session will be published as a book on tanoak as a compendium of what we have learned about this host. To register, go to <http://ucanr.org/sites/sod5/Registration/>. For information on the Symposium, go to <http://ucanr.org/sites/sod5/>.

The group room rate of \$110 per night is available at the Sheraton until May 4, 2012, subject to availability. For travel information or to secure overnight accommodations, go to [http://ucanr.org/sites/sod5/Travel\\_and\\_Lodging\\_Information/](http://ucanr.org/sites/sod5/Travel_and_Lodging_Information/).

#### **PERSONNEL**

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**Dr. Wolfgang Schweigkofler joined the National Ornamental Research Site at Dominican University of California (NORS-DUC) as an on-site plant pathologist in April.** Prior to working for NORS-DUC, he worked as a Post-doctoral fellow in the



Garbelotto lab at UC Berkeley and as a Senior Plant Pathologist at the Research Center Laimburg in Italy. At NORS-DUC he will work on nursery detection and control of *P. ramorum*, collaborating with ongoing projects as well as planning and initiating new ones. Dr. Schweigkofler can be reached at [wolfgang.schweigkofler@dominican.edu](mailto:wolfgang.schweigkofler@dominican.edu) or (415) 257-1366.

#### **CALENDAR OF EVENTS**

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- 5/1 - San Francisco Community SOD Blitz; 8:30 a.m.; Golden Gate Park Presidio and Golden Gate Park.** For more information on the Presidio Blitz, contact Christa Conforti at [CConforti@presidiotrust.gov](mailto:CConforti@presidiotrust.gov). For more information on the Golden Gate Park Blitz, contact Gloria Koch-Gonzalez at [Gloria.Koch-Gonzalez@sfgov.org](mailto:Gloria.Koch-Gonzalez@sfgov.org).
- 5/1 - Sudden Oak Death and ramorum blight: Disease symptoms and management tactics in forests and nurseries workshop;** A free workshop for natural resource managers, foresters, horticulturists, plant health inspectors, and members of the public.; USFS Office, Gasquet; 1:00 – 3:00 p.m.; To register, please call (707) 464-7235. For more information, contact Yana Valachovic at [yvala@ucdavis.edu](mailto:yvala@ucdavis.edu).
- 5/2 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC Berkeley Campus;** 1:00 – 3:00 p.m.; Pre-registration is required. This class is free and will be held rain or shine. To register, or for questions, email [kpalmieri@berkeley.edu](mailto:kpalmieri@berkeley.edu), and provide your name, phone number, affiliation and license number (if applicable), and the date for which you are registering. For more information, go to <http://nature.berkeley.edu/garbelotto/english/sodtreatmenttraining.php>.
- 5/5- "A Planner's Guide for Oak Woodlands" webinar registrant optional field trip to Sierra Foothill Research and Extension Center;** For more information, go to [http://ucanr.org/sites/oak\\_range/Planners\\_Guidelines\\_for\\_Oak\\_Woodlands/](http://ucanr.org/sites/oak_range/Planners_Guidelines_for_Oak_Woodlands/).
- 5/5 - Carmel Valley Community SOD Blitz; 9:00 a.m.; Garland Ranch Regional Park Visitor Center;** 700 West Carmel Valley Rd.; For more information, contact Tim Jensen at [tjensen@mprpd.org](mailto:tjensen@mprpd.org).
- 5/8 - Sunol Community SOD Blitz; For more information, contact Ellen Natesan at** [ENatesan@sfwater.org](mailto:ENatesan@sfwater.org).
- 5/8 - Free SOD Update for Foresters and Land Managers workshop; Fort Bragg Grange 672, 26501 Highway 1, Fort Bragg;** 1:00 – 5:00 p.m.; This session is intended for foresters, public agency representatives, conservation groups, Tribal land managers, and arborists. Topics will include new conifer hosts, treatment recommendations, regulatory impacts, SOD and harvest documents/forestry operations; survey protocols; and ecological impacts, including fire risk and suppression. Registration is required. To register, go to <https://ucanr.org/survey/survey.cfm?surveynumber=8280>. For more information, contact Janice Alexander at (415) 473-3041 or [jalexander@ucdavis.edu](mailto:jalexander@ucdavis.edu).
- 5/8 - Mendocino County SOD Community Meeting for the public; Fort Bragg Grange 672, 26501 Highway 1, Fort Bragg;** 6:30 – 8:30 p.m.; This meeting is intended to inform the public about what SOD is, how it spreads and kills trees,



- what symptoms look like, prevention and management, and what community members can do to help.
- 5/12 - Mount Tamalpais Community SOD Blitz; For more information, contact Andrea Williams at [awilliams@marinwater.org](mailto:awilliams@marinwater.org).**
  - 5/12 - Napa Community SOD Blitz; Napa UCCE Classroom; 1710 Soscol Ave., Napa; 9:00 a.m.; For more information, contact Bill Pramuk at [info@billpramuk.com](mailto:info@billpramuk.com).**
  - 5/19 - Sonoma Community SOD Blitz; For more information, contact Lisa Bell at [lkbell@ucdavis.edu](mailto:lkbell@ucdavis.edu).**
  - 5/19 - Santa Cruz Community SOD Blitz; 10:30 a.m.; Cal Fire Training Room; Gushee St. (behind forestry office at 6059 Highway 9), Felton; For more information, contact Nadia Hamey at [nadiiah@big-creek.com](mailto:nadiiah@big-creek.com).**
  - 5/21 – 5/25 – “4th International Workshop for *Phytophthora*, *Pythium*, and *Phytopyhtium*” and International Web Symposium, “Oomycetes of Regulatory Concern in International Trade;” University of Maryland, College Park, MD; The primary purpose of the workshop is to provide hands-on training on morphological and molecular tools used to identify species within genera. For more information, go to <http://www.psla.umd.edu/faculty/Balci/workshop2011/index.cfm>.**
  - 5/26 - Los Altos Hills Community SOD Blitz; 10:30 a.m.; Council Chambers, Los Altos Hills Town Hall; 26379 Fremont Rd. Los Altos Hills; For more information, contact Sue Welch at [sodblitz09@earthlink.net](mailto:sodblitz09@earthlink.net).**
  - 6/2 - Woodside/Portola Valley Community SOD Blitz; 10:00 a.m.; Woodside Town Hall; 2955 Woodside Rd., Woodside; For more information, contact Debbie Mendelson at [naturemend@sbcglobal.net](mailto:naturemend@sbcglobal.net).**
  - 6/2 - Atherton Community SOD Blitz; For more information, contact Susan Finocchio at [susanfin@earthlink.net](mailto:susanfin@earthlink.net).**
  - 6/6 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 5/2 listing above.**
  - 6/9 - South Skyline Community SOD Blitz; 10:00 a.m.; Saratoga Fire Station, Skyline Blvd.; For more information, contact Jane Manning at [skyline\\_sod@yahoo.com](mailto:skyline_sod@yahoo.com).**
  - 6/16 - Burlingame Hills Community SOD Blitz; 10:00 a.m.; 120 Tiptoe Lane (off Canyon Rd.), Burlingame; For more information, contact Steve Epstein at [steveepstein0206@gmail.com](mailto:steveepstein0206@gmail.com).**
  - 6/19 – 6/22 - The Fifth Sudden Oak Death Science Symposium (SOD 5); Sheraton Sonoma County; 745 Baywood Drive; Petaluma. For information on the conference, go to <http://ucanr.org/sites/sod5/>. For additional information regarding submission of abstracts and conference planning, contact Katie Palmieri at [kpalmieri@berkeley.edu](mailto:kpalmieri@berkeley.edu). To register, or for or questions regarding registration, go to <http://ucanr.org/sites/sod5/> or contact Janice Alexander at [jalexander@ucdavis.edu](mailto:jalexander@ucdavis.edu).**
  - 7/24 – California Forest Pest Council Summer Insect and Disease Field Tour, Warner Mountains, Modoc National Forest; Meet in Likely, CA; 9:00 a.m. – 5:00**



p.m.; The tour will feature the current mountain pine beetle outbreak in lodgepole and whitebark pine with an emphasis on mountain pine beetle biology, individual tree protection, and stand level management. Other topics include the effects of thinning on fir engraver beetle-caused tree mortality, *Heterobasidion* (Annosus) root disease in white fir, Jeffrey pine beetle outbreak dynamics, and insects and diseases of aspen. CE Credits will be applied for from the Department of Pesticide Regulations. For more information or to register, contact Danny Cluck at [dcluck@fs.fed.us](mailto:dcluck@fs.fed.us) or (530) 252-6431.

- 9/9 – 9/14 – Sixth Meeting of the International Union of Forest Research Organizations IUFRO Working Party 7-02-09 “Phytophthora in Forests and Natural Ecosystems;”** Colegio Mayor Universitario Nuestra Señora de la Asunción, Avd. Menéndez Pidal s/n, 14004 Córdoba, Spain; For more information, contact M<sup>a</sup> Pérez Sierra at [aperesi@eaf.upv.es](mailto:aperesi@eaf.upv.es) or see <http://iufrophytophthora2012.org/>.