CALIFORNIA OAK MORTALITY TASK FORCE REPORT
TO THE BOARD OF FORESTRY
OCTOBER 2013

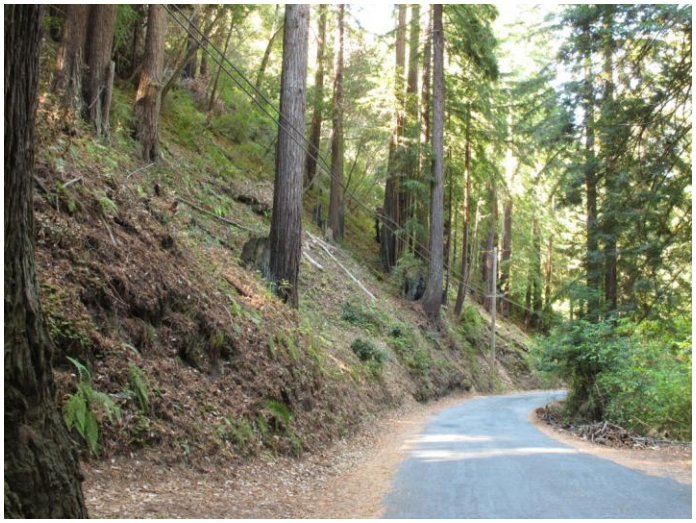
REGIONAL MONITORING AND MANAGEMENT UPDATES

An Update on the Big Sur Region – Forests in the Big Sur region that burned in 2008 during the Basin and Chalk wildfires now have very high fuel levels as well as lush basal resprouting in redwood, tanoak, madrone, and California bay laurel. Burned areas that were infested with *P. ramorum* prior to the fires are slowly becoming reinfested with the pathogen as well as other *Phytophthora* species. Reinvasion is especially common where overstory bay trees survived the fire.

A previously infested, intensely burned, UC Davis long-term ecological monitoring plot now dense with tanoak and redwood resprouts. *P. ramorum* has not been recovered from the site since the fire. Photo by Kerri Frangioso, UC Davis, September 2013.

A UC Davis plot that burned in 2008 (a) 1 year post fire and (b) 5 years post fire (2013) the understory is dense with tanoak and redwood resprouts. Photos by Kerri Frangioso, UC Davis.

To address the increased fuel loads from *P. ramorum* and the 2008 wildfires, several programs are underway. The Los Padres National Forest and the Nature Conservancy's Fire Learning Network initiated Fire Scape Monterey in the spring of 2011, which brings community members and 27 public and private organizations together to work on local fire issues. Participants recently visited the Santa Lucia Preserve in Carmel Valley to view a fuel reduction project completed 2 years ago in an area severely affected by SOD. Hundreds of standing dead tanoaks were felled and chipped on site. Following the treatment, native understory vegetation, including ferns and coffeeberry, recolonized the site. The Preserve also provided demonstration areas where bay removal and Agri-Fos® are being used to manage for the pathogen. Additionally, the California Department of Forestry and Fire Protection (CAL FIRE) is supporting multiple fuel reduction projects in the Big Sur region, and the Palo Colorado community and Mid-Coast Fire Brigade have pooled resources to implement a project with no outside funding, collectively removing fuels along 4 miles of shared roadway. For a short video of volunteers working in Palo Colorado, go to http://www.youtube.com/watch?v=KZQnYLloKA4&feature=youtu.be.



Roadside clearance along Palo Colorado Road. Photo by Kerri Frangioso, UC Davis.

Phytophthora ramorum continues to spread southward along the Big Sur coast, with tanoak mortality intensifying in Landels-Hill Big Creek Reserve as well as in the Mill, Plaskett, and Willow Creek watersheds. To date, the San Carporforo watershed, which represents the southern boundary of Monterey County, has not been culture positive for the pathogen even though four consecutive *P. ramorum*-positive PCR water positives were recovered from the watershed in 2012 (March –June 2012). Stream sample results from 2013 are still pending.

Tanoak mortality along south coast of Big Sur, Mill Creek watershed.
Photo by Kerri Frangioso, UC Davis, March 2013.

Recent tanoak mortality in Devil's Creek watershed, Big Creek Reserve.
Photo by Kerri Frangioso, UC Davis, October 2013.

Jackson Demonstration State Forest - Tanoak and California bay laurel trees were found *P. ramorum* positive in August on Jackson Demonstration State Forest (JDSF), confirming the pathogen's presence on the Forest following positive stream sampling and a June 2013 USDA Forest Service Aerial Survey that identified suspicious tanoak mortality. The positive trees were identified in the North Fork of the South Fork (NFSF) of the Noyo River, adjacent to the remote Trestle Trail. The nearest known infestations are 10 miles northwest at MacKerricher State Park and Ingelnook. Ground surveys were also conducted in other sub-watersheds that had positive spring stream survey results as well as in areas identified from the aerial survey. While some samples were positive for *P. nemorosa*, no terrestrial *P. ramorum* infections have been identified outside of the NFSF Noyo site. Ground surveys will continue in the stream-positive watersheds.

On JDSF, the Trestle Trail follows the NFSF of the Noyo River. Remnants of the historic railroad system wind up the river. Photo by Julie Rhoads, CAL FIRE, 2013.

Tanoak infected with SOD above the NFSF of the Noyo River.
Photo by Julie Rhoads, CAL FIRE, 2013.

JDSF managers have been coordinating with SOD researchers and CAL FIRE forest pathologists to develop a strategy for mitigating the effects of *P. ramorum* infestations on the Forest; however, due to the terrain, size, and location of the infestation, eradication and containment efforts are not feasible for this site. Seasonal trail closures and other best management practices will be utilized to minimize pathogen spread.

Update on Sudden Oak Death in Oregon Forests - Since 2001, a multi-agency group has been working year-round in Oregon to slow the spread of *P. ramorum* by establishing a quarantine and implementing a program of early detection and eradication. However,

expansion and intensification of disease in late 2012 triggered a revision of Oregon's quarantine rule in March 2013 and increased the quarantine area to 264 mi^2 (figure 1). The revised rule establishes a "Generally Infested Area" (GIA) within the quarantine boundary where *P. ramorum* treatment is no longer required. It also defines high-priority sites where eradication treatments are required and increases utilization of tanoak within the quarantine area, permitting it and other host plants to be transported out of the quarantine zone if they are from a disease-free area (officially surveyed within the past 6 months and found to be disease free and located more than ¼ mile from any infested site).

The GIA (currently 48 mi^2) has had a large increase in the number of dead tanoak over the past year, creating hazardous conditions for wildfire and tree failure. As of September 2013, approximately 14 new infested sites were found outside of the GIA, but none were outside of the quarantine area (figure 1). Eradication treatments are no longer being conducted on private land inside the GIA, but federal agencies continue to treat infestations on federal lands. Infested sites outside of the GIA are being cut and burned in order to slow pathogen spread; however, treatment size varies according to fund availability.

The initial goal of *P. ramorum* eradication from Curry County forests is no longer achievable. Therefore, the program redirected efforts to slow disease spread through early detection and eradication of new high-risk infestations that pose threats to greater disease spread; reducing inoculum levels through cost-share projects and best management practices; and education and outreach. A lingering concern is increased tree mortality posing hazardous conditions to people, dwellings, and roadways if standing dead trees and fuels are not removed.

For more information, contact Alan Kanaskie, Oregon Department of Forestry, at (503) 945-7397 or alan.kanaskie@state.or.us.

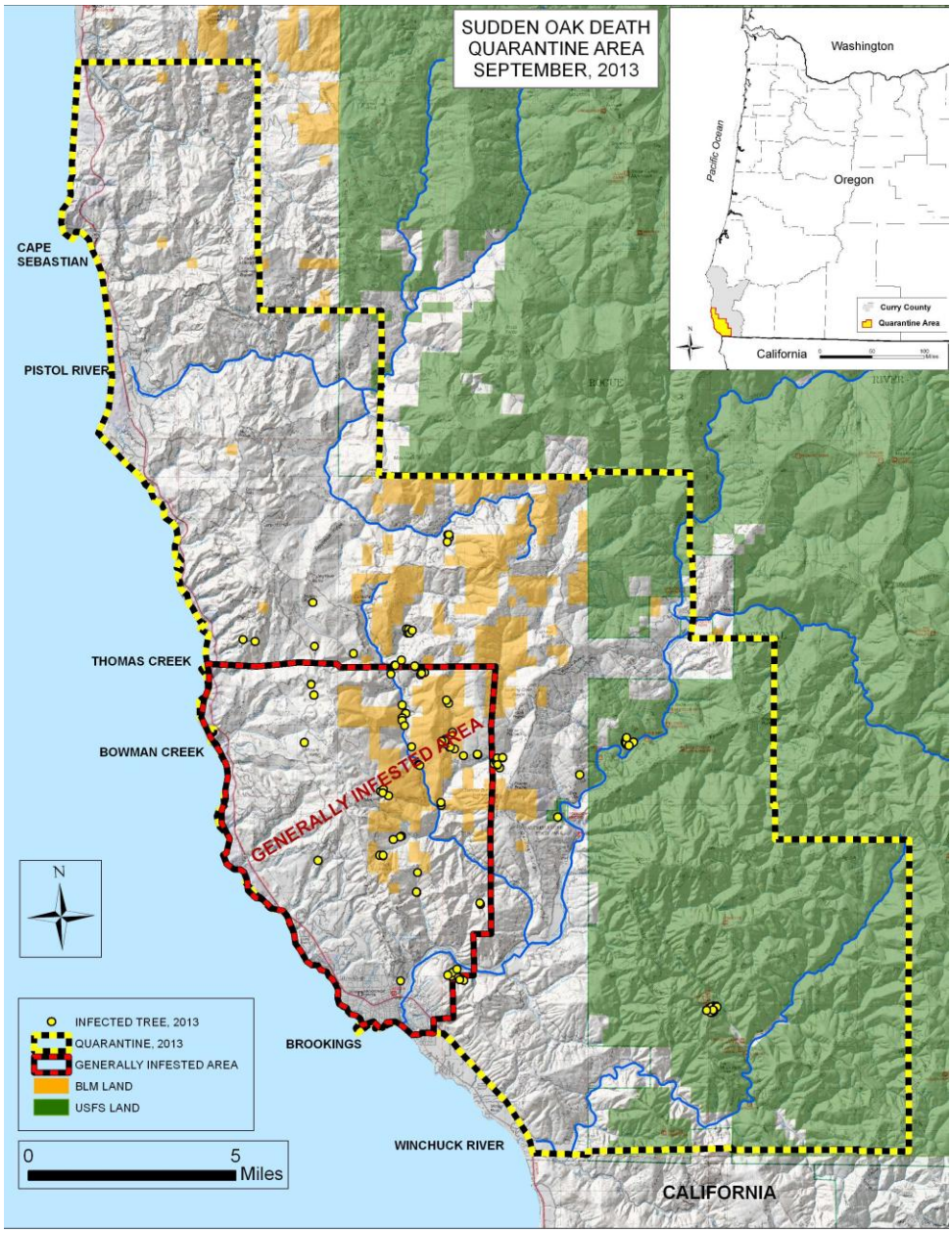


Figure 1. Location of sites infested with *Phytophthora ramorum* in southwest Oregon that were discovered in 2013 (as of September). Sites enlarged for visibility.

RESEARCH

Rooney-Latham, S.; Honeycutt, E.; Ochoa, J.; Grünwald, N.J.; and Blomquist, C.L. 2013. First Report of Camphor Tree (*Cinnamomum camphora*) as a Host of *Phytophthora ramorum*. Plant Disease. 97(10): 1377-1377.

Cinnamomum camphora (Lauraceae) is an evergreen shade tree grown in many parts of the United States, including California. From 2007 to 2011, an arborist working in a residential neighborhood in Mill Valley (Marin Co.) noticed several camphor trees with

branch dieback and decline. Affected trees had patchy, irregular cankers on the branches and shoot blight. Cankers were black and most had horizontal fissures. Cankers were most abundant in the inside and lower portions of the canopies. In 2011, samples sent to Bartlett Tree Laboratory tested positive for *Phytophthora* sp. using the Agdia ELISA *Phytophthora* kit (Agdia, Elkhart, IN). In February 2009 and April 2011, camphor leaf samples were collected by Sacramento Co. inspectors during an annual nursery inspection for *Phytophthora ramorum* and submitted to CDFA. The normally bright green leaves were reddish with small necrotic spots surrounded by green halos. Camphor samples from Marin Co. were also collected and sent to CDFA in September 2011. An organism with coralloid coenocytic hyphae, chlamydospores, and ellipsoidal semi-papillate sporangia grew on CMA-PARP (4) from both Marin and Sacramento Co. samples. Morphologically, it matched the description of *P. ramorum* (3). rDNA sequences of the internal transcribed spacer (ITS) region of the Marin (GenBank KC473521) and Sacramento (KC473522) isolates, amplified using primers ITS1 and ITS4 (4), were 100% identical to *P. ramorum* by a BLAST query (AY038058). Microsatellite loci placed the Marin isolate in the NA1 clonal lineage, while the Sacramento isolate belonged to the NA2 lineage (2). Pathogenicity of both isolates was tested on 5 trees grown in 18.93-liter pots. Three leaves on each tree were inoculated with 6-mm agar plugs taken from the margin of 7-day-old cultures grown on V8 juice agar (V8). Leaves were wounded with a sterile pushpin and two colonized plugs of each isolate were covered with a freezer tube cap filled with sterile dH_2O and attached to the leaves with a pin-curl clip (4). Three branches of the same plants were wounded and inoculated with a 3-mm colonized agar plug for each isolate and secured with Parafilm. An equal number of leaves and stems were treated with uncolonized V8 plugs as controls. Plants were sprayed with dH_2O, covered in large plastic bags, and placed in a growth chamber at 18°C. After 4 days, the bags, caps, and plugs were removed from the leaves. Black lesions were seen 7 days after inoculation on most leaves and 10 to 14 days on inoculated branches. After 32 days, *P. ramorum* was isolated from leaf lesions and canker margins onto CMA-PARP. No *Phytophthora* spp. grew from the controls. The experiment was repeated once with similar results. Overall, leaf and stem lesions were larger with the NA2 lineage isolate than the NA1 lineage isolate, which is consistent with previous research (1). Leaf abscission was seen in 30% of the leaves inoculated with the NA2 lineage isolate but none of the NA1 or control leaves. To our knowledge, this is the first report of *P. ramorum* on camphor in nursery and landscape settings. Mill Valley is known for its mild temperatures and abundant summer fog. Optimal weather conditions likely led to the spread of *P. ramorum* from infected neighboring forest hosts to camphor in Mill Valley, rather than from an introduction of infected nursery plants.

RELATED RESEARCH

Schoebel, C.N.; Jung, E.; and Prospero, S. 2013. Development of New Polymorphic Microsatellite Markers for Three Closely Related Plant-Pathogenic *Phytophthora* Species Using 454-Pyrosequencing and Their Potential Applications. Phytopathology. 103(10): 1020-1027.

Kriticos, D.J. and Venette, R.C. 2013. Advancing Risk Assessment Models to Address Climate Change, Economics, and Uncertainty. NeoBiota Special Issue. 18: 218 pgs. This special issue of *NeoBiota* was published following the 2012 meeting of the International Pest Risk Mapping Workgroup. The 13 papers presented focus on interactions between pest risk and climate change, policy, and economics as well as pest control research and surveillance and pest risk uncertainty.

EDUCATION AND OUTREACH

Free Sudden Oak Death Treatment Training workshops are being offered this fall in communities that participated in the 2013 SOD Blitz campaign. Each two-hour session will cover basic Sudden Oak Death information, integrated pest management approaches, selection of candidate trees for treatment, and proper preventative treatment application. For more information, go to the "Calendar of Events" below or http://nature.berkeley.edu/garbelotto/english/sodblitzfollowup.php.

A voluntary, industry-developed "Best Management Practices Online Tool" is now available to assist nursery crop producers in developing an effective preventive action and monitoring plan to reduce the risk of introducing CA quarantine pests and pathogens into their operations. Growers/shippers are able to create a set of BMPs unique to their nursery based on county locations and the pests/pathogens under quarantine or of concern in those counties. For more information on the online tool or for dates and locations for free training (with CEUs), go to http://ucanr.edu/sites/UCNFA/2013_Educational_Programs/BMPs_Online_Tool_Demonstration/.

A multistate research group sponsored by the National Institute of Food and Agriculture Specialty Crop Research Initiative will launch a 14-part webinar series to promote safe water recycling in the horticulture industry on October 8th. This series will focus on mitigating the risks of spreading pathogens during irrigation and ways to improve recycled water quality. For the schedule of events and webinar details, go to http://www.irrigation-pathogens.ppws.vt.edu/webinar/index.php. For questions, contact Chuan Hong at chhong2@vt.edu.

CALENDAR OF EVENTS

10/12 – Humboldt County Sudden Oak Death (SOD) Workshop; Azalea Hall Meeting Room; 1620 Pickett Road, McKinleyville; 10:00 a.m. – 12:00 p.m. The Blitz is intended to help community members identify locations where SOD is present as well as increase local awareness of the issue. Those planning to attend are encouraged to bring a GPS unit if they have one. For more information, contact Dan Stark at (707) 445-7351 or stark@ucanr.edu.

10/12 - SOD Treatment Training Workshop; 120 Tiptoe Lane (off Canyon Rd.); Burlingame; 10:00 a.m. – 12:00 p.m.; For more information, or to register, contact Steve Epstein at steve@burlingamehills.org.

10/20 - SOD Treatment Training Workshop; Spillway Picnic Area, Tilden Regional Park (near Lake Anza) Map Link; 10:00 a.m. – 12:00 p.m.; For more information, or to register, contact Amelia Marshall at Amelia.marshall@att.net.

10/23 - SOD Treatment Training 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, and provide your name, phone number, affiliation, 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.

11/1 - SOD Treatment Training Workshop; Los Altos Library, 13 S. San Antonio Rd, Los Altos; 7:30 – 9:30 p.m.; For more information, or to register, contact Arvind Kumar at arvind.kumar@cnps.org.

11/2 - SOD Treatment Training Workshop; Sonoma; Location to be Determined; 10:00 a.m. – 12:00 p.m.; For more information, or to register, contact Lisa Bell at lkbell@ucanr.edu.

11/4 – 11/5 – Annual meeting of the Continental Dialogue on Non-Native Forest Insects and Diseases; Pittsburgh Convention Center; Pittsburgh, Pennsylvania; For more information, go to http://www.continentalforestdialogue.org/events/dialogue/2013-11-04/index.html.

11/9 - SOD Treatment Training Workshop; Foothills Park; 3300 Page Mill Road, Los Altos Hills; 10:00 a.m. – 12:00 p.m.; For more information, or to register, contact Sue Welch at sodblitz09@earthlink.net.

11/12 - SOD Treatment Training Workshop; San Francisco Presidio; Location to be Determined; 8:30 – 10:30 a.m.; For more information, go to http://nature.berkeley.edu/garbelotto/english/sodblitzfollowup.php.

11/12 - SOD Treatment Training Workshop; Fort Bragg Town Hall, Fort Bragg; 6:30 – 8:30 p.m.; For more information, or to register, contact Lori Hubbart at lorih@mcn.org.

11/13 - SOD Treatment Training Workshop; Santa Lucia Preserve; Time and Location to be Determined; For more information, go to http://nature.berkeley.edu/garbelotto/english/sodblitzfollowup.php.

11/16 - SOD Treatment Training Workshop; Dominican University, 155 Palm Ave., Joseph R. Fink Science Center, Room 102, San Rafael; 10:00 a.m. – 12:00 p.m.; For more information, or to register, contact Kristin Jacob at kristinjakob@att.net.

11/16 - SOD Treatment Training Workshop; Pelusi Building, 2296 Streblow Drive at Kennedy Park, Napa; 1:00 – 3:00 p.m.; For more information, or to register, contact Bill Pramuk at info@billpramuk.com.

11/17 - SOD Treatment Training Workshop; Cal Fire Saratoga Summit Fire Station 21; 12900 Skyline Blvd, Los Gatos; 10:00 a.m. – 12:00 p.m.; For more information, contact Jane Manning at skyline_sod@yahoo.com.

11/23 - SOD Treatment Training Workshop; Montalvo Arts Center, 15400 Montalvo Road, Saratoga; 10:00 a.m. – 12:00 p.m.; For more information, contact Kelly Sicat at KSicat@montalvoarts.org.

11/24 - SOD Treatment Training Workshop; Joaquin Miller Park, Oakland; 1:00 – 3:00 p.m.; For more information, or to register, contact Kimra McAfee at coordinator@sausalcreek.org.

11/10 – 11/14/14 - Seventh meeting of the IUFRO Working Party 7.02.09 "*Phytophthora* in Forests and Natural Ecosystems;" Esquel, Argentina. For more information, registration, or abstract submission details, go to http://www.iufrophytophthora2012.org/.