# CALIFORNIA OAK MORTALITY TASK FORCE REPORT
# AUGUST 2015

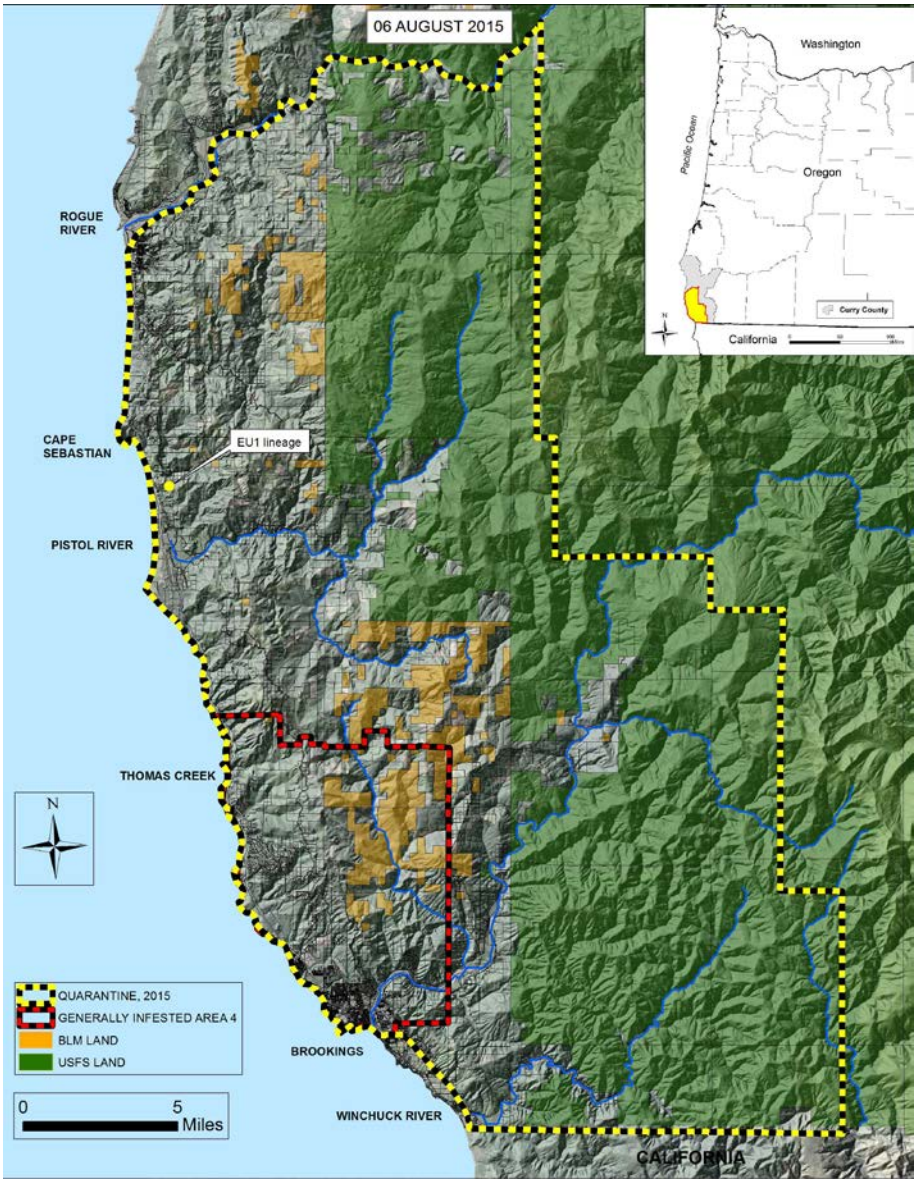
## MONITORING

**The EU1 *Phytophthora ramorum* lineage has been recovered from a tanoak in** Oregon. This is the first report of EU1 on US forest vegetation (previously only found in nurseries, streams, and European forests). The pathogen was first isolated by the Hansen lab (OSU) on February 11, 2015 from samples collected by the Oregon Department of Forestry during ground checks of an aerial survey. In May, the Grünwald lab (USDA ARS) completed their periodic genotyping of isolates and identified the EU1 clonal lineage from the tanoak isolate. The stump of the tree was re-sampled on May 28th and confirmed to be the EU1 lineage. To date all other US *P. ramorum* forest vegetation isolates have been the NA1 lineage.

The lone EU1-infected tree was 12 inches in diameter and located on non-industrial private land, approximately 1 mile north of a small private nursery (now closed) located near the Pistol River (in Curry Co.). In August 2012, EU1 *P. ramorum*-positive plants were found at the nursery. The nursery underwent the USDA APHIS Confirmed Nursery Protocol and a voluntary recall of shipped plants was issued. Later that year the nursery closed. Comparison of the genotypes of the tanoak and nursery isolates suggests the nursery as the probable source for the forest infestation.

If the genetic linkage to the nursery is confirmed, it demonstrates a pathway from nursery to forests (during a time of more comprehensive nursery inspections than are currently in place). The EU1 lineage has been found to be more aggressive than the NA1 in pathogenicity tests, and it kills or damages several conifer species in Europe. The EU1 lineage is also of the opposite mating type as the NA1, creating the potential for sexual reproduction and increased variability in the pathogen population.

To date, the infected tanoak and all other tanoaks within 50 feet of the infected tree have been felled, piled, and covered with plastic. Trees 50 to 300 feet from the infected tree have been felled, but not piled. Piling and burning of all tanoaks and other host plants will be completed this fall when wildfire risk is low. Stumps will not be treated with herbicide. Vegetation in the vicinity of the infected tree is mostly Douglas-fir and red alder. Detection surveys are being intensified in the area, and two new stream-baiting stations are being added. For more information, contact Alan Kanaskie at alan.kanaskie@oregon.gov.




Location of EU1 lineage detection in Oregon: within the quarantine area, north of the Generally Infested Area.

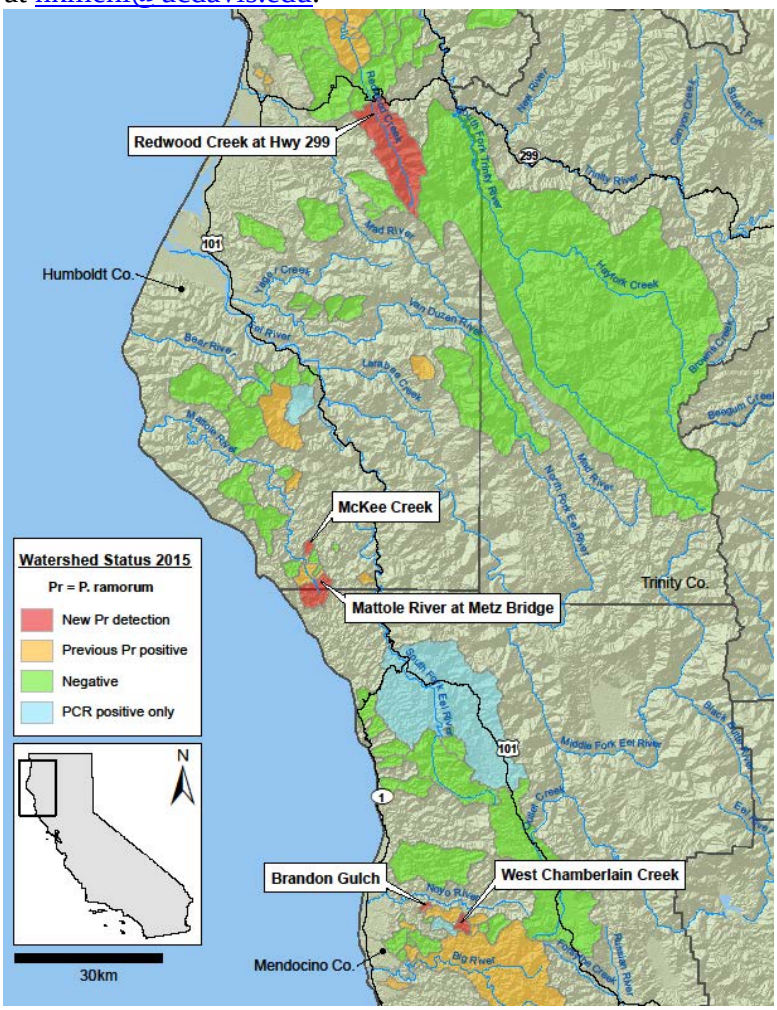
**2015 California stream monitoring update –Five watersheds in Humboldt and** Mendocino Counties tested *P. ramorum* positive for the first time (Humboldt-3 and Mendocino-2). All previous detections were also found positive (Humboldt-12, Mendocino-7). In Monterey County, the pathogen was recovered from two of the five known infested waterways.

In northern Humboldt County, *P. ramorum* was detected for the first time in Redwood Creek at the Highway 299 crossing. The detection is roughly 9 miles upstream from the known infestation in Redwood Valley; the inoculum source is unknown. In the Mattole region of southern Humboldt County, the pathogen was detected for the first time in

McKee Creek and in the Mattole River at Metz Bridge (the most upstream location on the Mattole River to date). Previously the most northern detection along the Mattole was 4 miles downstream at Whitethorn (confirmed in 2011).

In Mendocino County, *P. ramorum* was detected for the first time in two Jackson Demonstration State Forest watersheds: West Chamberlain Creek (in the North Fork of the Big River watershed) and Brandon Gulch (in the South Fork of the Noyo River watershed). *P. ramorum* was also detected in newly established sites upstream from previous sampling sites in Hare and Chamberlain Creeks. Both of these waterways were first found positive in 2014.

From February to June, 139 sites in five counties (Del Norte-19, Humboldt-72, Mendocino-32, Monterey-7, and San Luis Obispo-9) were monitored throughout northern and central coastal California. Monitoring was not conducted in the Sierra Nevada region, Sonoma, or San Benito Counties this year. For more information, contact Heather Mehl at hkmehl@ucdavis.edu.




California has 5 new 2015 *Phytophthora ramorum* water confirmations in Humboldt (3) and Mendocino (2) Counties.

**The Kitsap County, WA botanical garden had a new *P. ramorum*-positive** *Rhododendron* confirmation in July. The positive plant was in the same vicinity of the garden as all of the hosts that have been found positive since March. The rhododendron and surrounding plants have been destroyed. Steam treatment of the soil is underway. Garden staff will be implementing best management practices throughout the nursery as well as taking required precautionary steps near the positive sites. A follow-up survey is planned for early fall.

## MANAGEMENT

**Redwood National Park (RNP) has treated 152 acres over two sites (94 acres; 58** acres) since discovering SOD at the park in July and September, 2014. Treatments have included using herbicides, or removing all infected tanoak and bay trees within each infestation as well as within a 100-meter buffer zone. Follow-up surveys of the treated area this spring revealed *P. ramorum*-positive tanoak and bay trees adjacent to both treatment sites, resulting in an additional 131 acres (70 acres and 61 acres) needing to be treated in the next few months. Only trees within falling distance of a park facility (i.e. trail, road, structure) will be felled. All others will be treated with imazypr and left on site. In 2016, RNP personnel plan to continue a "slow the spread" campaign, monitoring both treatment areas (including a 400 meter buffer around each site) and streams as well as using aerial detection as time and funding allow. For more information, contact Leonel Arguello at leonel_arguello@nps.gov.

## NURSERIES

**From January 1 to August 6, 2015, *P. ramorum* has been reported in 13 nurseries** (CA 1, NY 1, OR 9, WA 1, VA 1), one commercial landscape (LA), two residences (OH, OR), and a botanic garden (WA) in non-quarantine areas. *P. ramorum* was detected in *Arctostaphylos* (1); *Camellia* (2); *Kalmia* (1); *Mahonia* (1); *Osmanthus* (1); *Pieris* (5); *Rhododendron* (41); soil samples (8); *Vaccinium* (4); *Viburnum (9); Vinca* (1); and a water sample (1). Six of the nurseries ship interstate and are in the USDA APHIS federal compliance program (started spring, 2014; Federal Order DA-2014-02). The Confirmed Nursery Protocol is underway in all nurseries and has resulted in two detections at trace-forward sites (CA, OH). Detections at the WA botanic garden are in managed landscapes; survey and disinfestation procedures are underway. The OH and OR residential confirmations were the result of trace-forward investigations from a positive WA nursery. The OR residential confirmation was made after a Master Gardener found suspicious symptoms in his yard. Investigations to determine how *P. ramorum* arrived at the site are underway.

## RESEARCH

**Potter, C. 2015. "Tree and Forest Pests and Diseases: Learning from the Past to** Prepare for the Future." K. Kirby and C. Watkins (Eds.), Europe's Changing Woods and Forests: From Wildwood to Managed Landscapes (pp. 337-346). Oxford, UK: CAB International. DOI: 10.1079/9781780643373.0337.

This chapter charts the progress of three important but biologically different epidemics – DED [Dutch Elm Disease], *Phytophthora ramorum* blight and ash dieback - assessing their environmental and cultural impact and reflecting on comparisons that can be made and lessons that can be drawn. The chapter establishes that the extent to which Europe's forests, woodlands and treescapes can be protected from further damaging pest and disease outbreaks will depend both on the ability of plant health authorities to prevent new introductions and the effectiveness with which outbreaks can be managed to minimize their impacts where pests and diseases have become established. The lessons from history are not encouraging on either count.

**Rollins, L.; Elliott, M.; and Chastagner, G. 2015. A new method to apply** *Phytophthora ramorum* inoculum to hosts that simulates overhead irrigation. Plant Health Progress. DOI:10.1094/PHP-RS-15-0008.

Abstract: The inoculum threshold for *Phytophthora ramorum* in irrigation water required for infection of plant material was investigated using a novel pressurized device designed to deliver zoospore inoculum in a way that simulated certain aspects of overhead irrigation. The measured-inoculum spray applicator (MISA) was made from plastic plumbing parts and worked by spraying measured volumes of pressurized zoospore inoculum onto plant material through an adjustable misting nozzle attached to the bottom of the device. Pressurization and spraying of *P. ramorum* zoospores through the MISA did not significantly affect zoospore viability or infectivity on wounded and non-wounded detached *Rhododendron* x 'Nova Zembla' leaves under controlled laboratory conditions. An inoculum threshold of 51 zoospores/ml was found for infection of *Rhododendron* leaves by *P. ramorum* using regression analysis. The MISA can potentially be used to simulate overhead irrigation in research involving pathogenic *Phytophthora* spp., and the results of the current research may assist nursery managers, property owners, and regulatory agencies in assessing the risk of using *P. ramorum* infested water for irrigation within nurseries and private landscapes.

**The proceedings of the 2014 IUFRO meeting on "Phytophthoras in Forests and** Natural Systems" has been published on the Forest Phytophthoras of the World website: http://forestphytophthoras.org/. The complete citation is: Sutton, W.; Reeser, P.W.; and Hansen, E. M. tech. coords. 2015. Proceedings, 7th Meeting of the International Union of Forest Research Organization (IUFRO) S07.02.09: Phytophthoras in Forests and Natural Ecosystems. Esquel, Argentina, Nov. 10-14, 2014. 197 pp. http://forestphytophthoras.org/proceedings.

**The following 11 abstracts on *P. ramorum* were presented at the 2015 APS Annual** Meeting in Pasadena, CA, August 1st – 5th http://www.apsnet.org/meetings/annual/Pages/default.aspx. (See "related research" below for abstracts on *P. tentaculata.*)

**Bomberger, R.A.** and Wang, S. 2015. Diversity of *Phytophthora* Species Detected from Retail Nursery Plants in Nevada. 509-P.

**Bourret, T.B.**; Mehl, H.K.; and Rizzo, D.M. 2015. *Phytophthora* Species Infesting Californian Forest Soil During a Three Year Drought. 111-P.

**Bulluck, R.** 2015. *P. ramorum*: Successes, Failures and Lessons Learned that Can be Applied to *P. tentaculata*. 128-S.

**Espindola, A.S.**; Schneider, W.L.; Marek, S.; Hoyt, P.; and Garzon, C.D. 2015. Metagenome Data Mining for Eukaryotic Plant Pathogens. 781-P.

**Frankel, S.J.** and Cobb, R.C. 2015. Risk of Forest Diseases Given Climate Change: Case Study of *Phytophthora ramorum*. 103-S.

**Funahashi, F.** and Parke, J. 2015. Development of a Predictive Model to Estimate Conditions Lethal to Soilborne Inoculum of *Phytophthora ramorum* and *pini* During Soil Solarization. 45-O.

**Kamvar, Z.N.**; Larsen, M.M.; Kanaskie, A.M.; Hansen, E.M.; and Grünwald, N.J. 2015. Evidence for at Least Two Introductions of the Sudden Oak Death Pathogen into Oregon Forests. 16-O.

**Miles, T.D.** and Martin, F. N. 2015. Systematic Development of Species-Specific Assays for Important *Phytophthora* spp. Using Recombinase Polymerase Amplification. 32-O.

**Pastalka, T.**; Rooney-Latham, S.; Suslow, K.; and Schweigkofler, W. 2015. Monitoring the Spread of *Phytophthora ramorum* at a Quarantine Site Reveals New and Rare Pathogens of Woody Plants in Northern California. 406-P.

**Peterson, E.K.**; Parke, J.; and Grünwald, N.J. 2015. Incubation in Soil Reduces Sporulation and Risk of Epidemic Development from Leaf Disks Infested by *Phytophthora ramorum*. 69-O.

**Snover-Clift, K.**; Daughtrey. M.; Allen, T.; and Jensen, S. 2015. Expanding *Phytophthora ramorum* Sample Processing in New York: Searching for *P. kernoviae*, Identifying Species, and Evaluating Preliminary Test Methods. 510-P.

## RELATED RESEARCH

**Hansen, E.M.; Reeser, P.; Sutton, W.; Gardner, J.; Williams, N. 2015. First Report** of *Phytophthora pluvialis* Causing Needle Loss and Shoot Dieback on Douglas-fir in Oregon and New Zealand. Plant Disease. 99(5): pp. 727.

**Migliorini, D.; Ghelardini, L.; Tondini, E.; Luchi, N.; and Santini, A. 2015. The** Potential of Symptomless Potted Plants for Carrying Invasive Soilborne Plant Pathogens. Diversity and Distributions. DOI: 10.1111/ddi.12347.

**Misra, B.B. and Chaturvedi, Ratna. 2015. When Plants Brace for the Emerging** Pathogens. Physiological and Molecular Plant Pathology. *In Press*. DOI: 10.1016/j.pmpp.2015.03.004.

**Robin, C.; Brasier, C.; Reeser, P.; Sutton, W.; Vannini, A.; Vettraino, A.M.; and** Hansen. E. 2015. Pathogenicity of *Phytophthora lateralis* Lineages on Different Selections of *Chamaecyparis lawsoniana*. Plant Disease. 99(8): 1133-1139.

**Scanu, B. and Webber, J.F. 2015. Dieback and Mortality of *Nothofagus* in Britain:** Ecology, Pathogenicity and Sporulation Potential of the Causal Agent *Phytophthora pseudosyringae*. Plant Pathology. DOI: 10.1111/ppa.12399.

**Scott, P.M.; Barber, P.A.; and St. J. Hardy, G.E. 2015. Novel Phosphite and** Nutrient Application to Control *Phytophthora cinnamomi* Disease. Australasian Plant Pathology. DOI: 10.1007/s13313-015-0365-4.

**Sims, L.L.; Sutton, W.; Reeser, P.W.; and Hansen, E.M. 2015. The *Phytophthora*** Species Assemblage and Diversity in Riparian Alder Ecosystems of Western Oregon, USA. Mycologia. DOI: 10.3852/14-255.

**Subbarao, K.V.; Sundin, G.W.; and Klosterman; S.J. 2015. Focus Issue Articles on** Emerging and Re-Emerging Plant Diseases. Phytopathology. 105(7): 852-854.

**The following 8 abstracts on *Phytophthora tentaculata* were presented in a Special** Session at the 2015 APS Annual Meeting in Pasadena, CA, August 1st – 5th http://www.apsnet.org/meetings/annual/Pages/default.aspx.

**Kosta, K.L.** 2015. Implementing a Systems Approach of Best Management Practices in Native Plant Nurseries. 125-S.

**Miles, T.D.** and Martin, F.N. 2015. New Advances in Molecular Diagnostics for *Phytophthora tentaculata.* 123-S.

**Osterbauer, N.K.**; Lujan, M.; McAninch, G.; Lane, S.; Trippe, A. 2015. Evaluating the Efficacy of the Systems Approach at Mitigating Five Common Pests in Oregon Nurseries. 126-S.

**Rooney-Latham, S.**; Blomquist, C.L.; Guo, Y.Y.; Soriano, M.C.; Kosta, K.L.; Swiecki, T.J.; Bernhardt, E.A.; and Frankel, S. J. 2015. *Phytophthora tentaculata*, a new *Phytophthora* species in the United States affecting California native plants, grown in nurseries**.**120-S.

**Schweigkofler, W.**; Kosta, K.; Sharma, S.; Santiago, A.; Ditta, S.; Huffman, V.; and Suslow, K. 2015. Studies in the use of heat to control *Phytophthora tentaculata*. 124-S.

**Suslow, K.**; Schweigkofler, W.; Kosta, K.; Pastalka, T.; and Sharma, S. 2015. *Phytophthora tentaculata* Prioritized Host Range Study for Restoration Nursery Producers: CA Native Plants and Woody Perennials. 122-S.

**Swiecki, T.J.**; Bernhardt, E.; Rooney-Latham, S.; Blomquist, C.; Frankel, S.J.; and Kosta, K. 2015. *Phytophthora tentaculata* and Other *Phytophthora* Species Introduced into California Native Habitats via Nursery Stock. 121-S.

**Welliver, R.** 2015. A Systems Approach to Nursery and Greenhouse Phytosanitary Certification (SANC) for Plant Production Facilities in the U.S. 127-S.

## CALENDAR

**8/23 – 8/28 - 5th International Workshop on the Genetics of Tree-Parasite** Interactions; Orléans, France; For more information, or to register, go to https://colloque.inra.fr/tree-parasite-interactions2015.

**9/21 - 9/25 - 63rd Western International Forest Disease Work Conference; Newport,** Oregon; For more information, or to register, go to http://www.fs.fed.us/foresthealth/technology/wif/.

**10/21 - 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, and provide your name, phone number, affiliation and license number (if applicable), and the name and date of the class.

**11/4 – 11/5 - 2015 Annual Meeting of the California Forest Pest Council; USDA** Forest Service, Wildland Fire Training & Conference Center, Hamm and Loop rooms; 3237 Peacekeeper Way; McClellan; More information will be forthcoming. For questions, contact Katie Harrell (previously Palmieri) at kpalmieri@berkeley.edu.