



CALIFORNIA OAK MORTALITY TASK FORCE REPORT DECEMBER 2009

Note: The COMTF report is produced 11 times a year. There will be no report in January 2010. The next report will be issued the first week of February 2010.

MONITORING

Japanese larch, western hemlock, and birch have been reported as new

Phytophthora ramorum hosts. These new finds were made in the United Kingdom (UK) as a result of a find in east Cornwall (southwest England) in August 2009 when infected rhododendron was identified in the understory of mature Japanese larch (*Larix kaempferi*). At that time, the pathogen was also found on the foliage of young thicket-stage Japanese larch nearby. Subsequent testing of sites known to have *P. ramorum* in north and west Devon and west Somerset has found the pathogen in mature Japanese larch, infecting both foliage as well as bark. Species in the larch understory, such as rhododendron and sweet chestnut, have shoot and leaf infections, while beech, birch (*Betula pendula*), oak, and Western hemlock (*Tsuga heterophylla*) have all been found with bole cankers. Some of the confirmed sites have little or no rhododendron present. Prior to these findings, tree infection in the UK has only been identified in relatively close proximity to infected rhododendron.

Forestry Commission staff, Forest Research scientists, the Food and Environment Research Agency (FERA), and others are assessing the situation. However, efforts are hampered in the field, as Japanese larch is shedding its needles and shutting down for winter, as well as in the laboratory, where obtaining confirmations is difficult due to an excessive amount of resin production resulting from bole infections. Efforts are also under way to fully identify infected Japanese larch symptoms, test the susceptibility of logs to *P. ramorum* and *P. kernoviae*, and determine the spore levels at the infected sites.

To date, Japanese larch symptoms have been found on shoots and foliage, with wilted, withered shoot tips and blackened needles. Infected shoots shed their needles prematurely. Other symptoms include branch dieback, and the worst affected trees have been found with numerous cankers on branches and upper trunks, with copious resin flow from affected areas. (View [photos of Japanese larch symptoms](#).)

The significance of these finds is hard to assess at this early stage. Western hemlock is native along the Western US coast from Northern California up into Alaska and grows in a climate that would be very conducive to disease development. Silver birch (*Betula pendula*) is widely planted as an ornamental in the western US.

For more information, go to

<http://www.forestry.gov.uk/website/forestry.nsf/byunique/inf-d-7xvfac>.



NURSERIES

Two Shelby County, Alabama nurseries were confirmed *P. ramorum*-positive on 12/1/09. One of the sites is a retail nursery/garden shop found to have infected *Pieris japonica* and *Camellia* sp. The nursery was previously inspected in June and July of 2009, at which time water samples were taken and confirmed positive for the pathogen. This nursery was previously found positive for *P. ramorum* in 2004 and 2006. The other site was a retail nursery, which was previously inspected in July 2009. At the time, water within the nursery was confirmed positive for the pathogen. The nursery has not previously had positive plants detected.

[A ribbon-cutting ceremony for the National Ornamentals Research Site at Dominican University of California \(NORS-DUC\)](#) in San Rafael, California, was held 10/26. Representatives of Congresswoman Woolsey, Senator Feinstein, and CA Assemblyman Jared Huffman presented proclamations, and Joseph Fink, Dominican University President, congratulated all parties on the establishment of this first national US nursery site for invasive species research. It is anticipated that the site will be completed in January, with the first experiment to begin shortly thereafter. In preparation for experiments, Marin County isolates are being obtained, and plants are being imported to the site from a *P. ramorum*-compliant nursery. All plants will be isolated and monitored for two to three weeks prior to use, helping to assure the absence of the pathogen prior to experimentation. The secure site is the first of its kind, with state-of-the-art soil and water containment and treatment facilities onsite. As part of the comprehensive effort to monitor for *P. ramorum* on Dominican grounds, stream baiting on the Campus is also underway. For more information, contact Sheila Johnson-Brousseau at sheila.johnson-brousseau@dominican.edu or Kathy Kosta at KKosta@cdfa.ca.gov.

MANAGEMENT

New Sudden Oak Death (SOD) study aimed at protecting canyon live oak - The Midpeninsula Regional Open Space District's Los Trancos Preserve is the only known site where heritage canyon live oaks are dying from *P. ramorum*. Consequently, the District and scientists implemented a new study in November to determine if use of Agri-Fos[®], in combination with removal of California bay laurel in close proximity to canyon live oaks, can help protect specimen trees.

Twelve large canyon live oak trees along two popular trails were sprayed with Agri-Fos[®]. The trees will be sprayed again in spring 2010 and then annually thereafter each fall. Select bays near the treated oaks were removed this month to reduce the risk of infection. (See [photos of the MROSD canyon live oak protection measures](#).)

As part of this same study, bay trees will also be removed from around large canyon live oaks in the District's Russian Ridge Preserve. Scientists are concerned that visitors climbing the oaks in the area may be contributing to pathogen spread, as *P. ramorum* spores on their shoes may be transmitted directly to the tree trunks. Consequently,



District managers are asking the public to stop climbing these trees in an effort to help protect them from SOD.

In 2005, the District committed more than \$150,000 over 10 years to research the prevention and treatment of sudden oak death. There are currently several ongoing sudden oak death research projects on District land conducted in partnership with scientists from UC Davis, UC Berkeley, the USDA Forest Service, and Phytosphere Research. For more information, go to www.openspace.org or call Leigh Ann Maze at (650) 691-1200.

RESEARCH

Mascheretti, S.; Croucher, P.J.P.; Kozanitas, M.; Baker, L.; and Garbelotto, M. 2009. Genetic epidemiology of the Sudden Oak Death pathogen *Phytophthora ramorum* in California. *Molecular Ecology* 18:4577–4590. DOI: 10.1111/j.1365-294X.2009.04379.x.

Abstract: A total of 669 isolates of *Phytophthora ramorum*, the pathogen responsible for Sudden Oak Death, were collected from 34 Californian forests and from the ornamental plant trade. Seven microsatellite markers revealed 82 multilocus genotypes (MGs) of which only three were abundant (>10%). Iteratively collapsing based upon minimum FST, yielded five meta-samples and five singleton populations. Populations in the same metasample were geographically contiguous, with one exception, possibly explained by the trade of infected plants from the same source into different locations. Multidimensional scaling corroborated this clustering and identified nursery populations as genetically most distant from the most recent outbreaks. A minimum-spanning network illustrated the evolutionary relationships among MGs, with common genotypes at the centre and singletons at the extremities; consistent with colonization by a few common genotypes followed by local evolution. Coalescent migration analyses used the original data set and a data set in which local genotypes were collapsed into common ancestral genotypes. Both analyses suggested that meta-samples 1 (Santa Cruz County) and 3 (Sonoma and Marin Counties), act as sources for most of the other forests. The untransformed data set best explains the first phases of the invasion, when the role of novel genotypes may have been minimal, whereas the second analysis best explains migration patterns in later phases of the invasion, when prevalence of novel genotypes was likely to have become more significant. Using this combined approach, we discuss possible migration routes based on our analyses, and compare them to historical and field observations from several case studies.

FEATURE STORY

SOD Regulations Impact Coast Redwood Cone (Seed) Collections - Coast redwood (*Sequoia sempervirens*) seed production, like that of most conifer species, is periodic and irregular. This year, for the first time since 1985, there is an abundant redwood cone crop in Mendocino County, with cone production the heaviest in areas that were directly impacted by 2008 fires.



P. ramorum regulations now must be incorporated into the seed collection process. Enacted to help prevent inadvertent transport of the pathogen, the regulations require that redwood needles and twigs be treated or removed from cones prior to leaving the quarantine area. Since the cones and seeds of redwood are live and perishable, treatments such as heat (temperatures above 46° C) and sterilizing agent dips (bleach) are impractical as they are damaging to the seed's vital tissues. Therefore, the only effective method of compliance is cone clipping, or removing all plant parts from the cone.

The clipping process has time constraints and is labor intensive. Coast redwood cones are quite small (~1.5-2.5 cm length), and there are thousands of redwood cones per bushel. Clipping each cone at the apex requires many workers since one worker can generally only clip 1-2 bushels per 8-hour day depending on proper tool use and experience level. Correct timing of collections is essential. Quality seed comes from fully ripened cones, and there is a very short window (often one week or less) in which to collect cones once they are mature, yet before the scales open and shed their seed. In addition, once cones are removed from a tree, they immediately begin to dry and start to open. It is imperative to complete clipping before the cones open to avoid mixing the seed with debris.

Redwood cone collection in Mendocino County this year has ranged from 50-200 bushels per lot and, depending on lot size, can take weeks to clip. For example, last year, Cal Fire collected 74 bushels of redwood cones on Soquel Demonstration State Forest in Santa Cruz County. Utilizing nursery and forest staff plus five days of work by a 12-person Conservation Camp crew, it took more than six days to clip all cones from the small branches and twigs. Mendocino County's redwood collection target for this season is 200-300 bushels. Depending on labor force availability and duration, cooperators may pay up to \$5760 per day for a week or more of clipping cones, or approximately \$135 per bushel.

This year's bumper crop replenished the seed reserve, and will likely supply Mendocino's Cooperative redwood seed needs for the next 15-20 years. Abundant coast redwood seed crops are rare, and healthy, local seed reserves are essential to preserving the genetic integrity of California's redwood forests.

RESOURCES

The National Park Service, Pacific Coast Science and Learning Center, has produced a "Sudden Oak Death: Battling an Invasive Disease" video. The ten minute documentary explores the story of *P. ramorum*, documenting the history of the disease, describing its pathology, and explaining measures that can be taken to help prevent its spread. To access the video, go to YouTube at <http://www.youtube.com/watch?v=lewpMtIosPI>.

CALENDAR OF EVENTS

12/9 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC

Berkeley Campus; 1 – 3 p.m.; Pre-registration is required. This class is free and will be held rain or shine. To register, email kpalmieri@berkeley.edu and provide your



name, phone number, affiliation and license number (if applicable). For more information, go to <http://nature.berkeley.edu/garbelotto/english/sodtreatmenttraining.php> or contact Katie Palmieri at (510) 847-5482 or kpalmieri@berkeley.edu.

3/7/10 – 3/12/10 - 5th IUFRO *Phytophthora* in Forest Trees and Natural Ecosystems Conference; Rotorua, New Zealand; For more information or to register, go to <http://www.phyto2010.com/registration.html>.