

Illinois

Sudden Oak Death/ *Phytophthora ramorum* Blight

Detection and Response Plan

March 2005

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1. Introduction

The Illinois Sudden Oak Death/*Phytophthora ramorum* Blight Detection and Response Plan is a coordinated effort between the University of Illinois, Morton Arboretum, Illinois Department of Natural Resources- Forestry Division, Illinois Nurseryman's Association, Illinois Department of Agriculture, Illinois Forestry Development Council and the USDA-State Plant Health Inspector. The purpose of this plan is to detect and actively pursue eradication of this disease if and when it appears in Illinois. This plan also seeks to provide an organized effort to educate green industry professionals, regulatory personnel and extension personnel on disease detection and identification, disease reporting, eradication and methods to prevent spread of the disease in Illinois.

Overview

The causal agent of sudden oak death, *Phytophthora ramorum* (Fy-TOFF-thor-uh ruh-MOR-um) was first identified in 1993 in Germany and the Netherlands on ornamental rhododendrons. *P. ramorum* was first isolated in the United States in 1995, in Mill Valley, California, where it was found to kill oaks and tanoaks. It is now known to cause damage to a wide range of trees and ornamental plants. The disease has been found on various native hosts in 14 coastal counties in California, in Curry County Oregon and in Nassau County, NY. The fungus has been confirmed in nursery stock in California, Oregon, Washington and British Columbia. To date (March, 2005), the disease has **not** been identified in Illinois. The disease has also been seen in countries in Europe including Belgium, Denmark, France, Germany, the Netherlands, Norway, Poland, Republic of Ireland, Slovenia, Spain, Sweden and the UK. The geographic origin of the pathogen is unknown at this time, however because of its limited known geographical distribution in relation to host distribution, it is believed to be recently introduced to the United States. North American and European isolates generally represent two distinct populations that appear to have the same potential host range but differ in their aggressiveness to tree hosts. In experiments, the European isolates (type A1) are generally more aggressive than the North American isolates (type A2). Recently however, the A1 type has been recovered from nursery stock in Washington and British Columbia.

The pathogen causes two types of diseases: 1.) bark cankers that may kill the host and 2.) foliar blights that serve as reservoirs for the pathogen. On oaks and tanoak infection results in canker and tree mortality. The disease on plants other than oaks is referred to as ramorum leaf blight or ramorum dieback or by regulation as *Phytophthora ramorum*. As of January, 2005, 31 plant species have been proven hosts and another 37 plants have been associated with the disease. Some of these species can be grown in Illinois and include Japanese pieris, Douglas fir, rhododendrons, witchhazels, viburnums, beeches, and lilacs.

Two different spores are produced on the leaves of susceptible leaf hosts but have not been identified on bark cankers on trees. Foliar hosts are therefore likely to be important providers of inoculum for initiating and maintaining tree epidemics. The fungus is regarded as a cool- temperature organism with an optimum temperature for growth of around 20⁰ C (68⁰ F) and minimum and maximum temperatures of 2⁰ C and 30⁰C (37⁰ F and 86⁰ F) respectively. The pathogen is thought to be dispersed locally by rain splash, wind-driven rain, irrigation or ground water. Long distance spread may be by movement of contaminated plant material, growing media, soil carried on vehicles, machinery, footwear or animals.

Impact

P. ramorum has been shown to kill tanoaks, coast live oaks, California live oaks, Shreve's oaks and canyon live oaks in California. In coastal California, the value of oak woodland suitable for residential development has been estimated at \$20,000/acre. The hardwood industry in California is worth over \$500 million for forest products alone (Standiford 2000). If other species of oaks were susceptible in other areas of the country, the economic impact would be significantly increased. In research done by Rizzo et al. in 2002, northern red oak (*Quercus rubra*) and pin oak (*Quercus palustris*) developed stem cankers after inoculation of seedlings with the pathogen. Further research by USDA scientists Tooley and Kyde showed that under greenhouse conditions, 10 different Eastern forest species developed lesions and foliar disease after inoculation with *P ramorum*. If oaks and possibly other species of Eastern deciduous forests prove susceptible to the pathogen, the potential threat to commercial timber production in the United States is in excess of \$30 billion (California Oak Task Force). The coniferous foliar hosts such as coast redwood and Douglas fir have significant economic value as well.

Foliage plants such as rhododendron and viburnum are important in the Horticultural industry. During 1997, about 14.2 million potted azaleas valued at \$48.3 million were produced in the United States (USDA National Agricultural Statistics Service, 1997 Floriculture Crops Summary; April 1998) This does not include nursery production of azalea or rhododendrons. Although the disease does not always kill *Rhododendron* spp., disease will significantly affect volume of movement in the trade.

Heavy loss of oaks or of related susceptible genera could result in significant ecological effects, including changes in forest composition; loss of wildlife food and habitat; increased soil erosion and a significant increase in fuel loads in heavily populated urban-forest interfaces. *P. ramorum* has been recovered from soil, litter on the soil, and rainwater collected adjacent to diseased coast live oaks and from wood of infected trees two months after they were cut down (Davidson et al. 2002).

Early Detection Efforts

In March 2004, when it was discovered that plants had been shipped from some California *P. ramorum*-infected nurseries to other states, the USDA and APHIS worked to trace those shipments. Inspectors inspected all of the recipient nurseries and suspect plants were sampled and tested for *Phytophthora*. In Illinois, those tests were run by the University of Illinois Plant Clinic. All samples from trace-back inspections were negative.

In May 2004, Agriculture Secretary Ann Veneman transferred \$15.5 million to the Animal and Plant Health Inspection Service (APHIS) to help halt the spread of *P. ramorum*. APHIS launched a national survey to determine if additional host are showing disease symptoms in other parts of the United States. Funding will allow for inspection of nurseries (especially on plants shipped from the West Coast) and to survey forest environments and to determine forest health risk factors. As of January 10, 2005 *P. ramorum* was been detected in 22 states.

2. Outreach

Detection and Procedure Training

The Illinois Sudden Oak Death/ *P. ramorum* Blight Task Force arranged to educate regulatory and extension personnel as well as Green Industry stakeholders in detection and response to sudden oak death/ *P. ramorum* blight. The first training videoconference occurred on October 26, 2004. Participants in this training were first line responders: Task Force members, Extension Specialists and Educators in IPM, Horticulture, Natural Resources Management and Crop Systems; IDA Plant and Pesticide Inspectors; IDNR Regional and District Foresters; Illinois-based USDA APHIS-PPQ Inspectors and Morton Arboretum staff. The focus was on *P. ramorum* hosts, symptoms, biology, epidemiology and regulatory issues. Immediately following the national training, Illinois participants dialed into an Illinois-only telenet session to discuss the first draft of this written response plan. The national session was recorded and made available online (<http://www.ncipm.org/sod>) and via CD. Locations for the videoconference were the University of Illinois-Urbana campus, The Morton Arboretum, and Extension Unit offices in DuPage, Fulton, Jackson, Jasper, Kendall, Madison, Sangamon and Winnebago counties.

A second statewide training event was held on March 7, 2005. This session was similar to the videoconference offered in October, but was updated and tailored for Illinois. The target audience was arborists, nurseryman, landscape contractors, and Illinois Master Gardeners. Publicity for this event was handled through the Illinois Landscape Contractors Association magazine, Illinois Nurserymen's Association publications, Illinois Agri-News Extension Notebook, and an Illinois Arborists Association email list. Master Gardener local county coordinators contacted their volunteers as well as sent fliers to local Green Industry businesses. In addition, the event was announced during Pesticide Safety Education Ornamental Training clinics offered at sites around the state during the winter and spring of 2005. This videoconference was offered simultaneously at 41 University of Illinois Extension Unit offices, at the University of Illinois-Urbana campus and at one site in St. Louis, MO. Evaluations (272 returned) were positive: 98.5% indicated increased ability to identify possible Sudden Oak Death situations, 97.2% indicated that they will improve the way they scout for problems on plants in the landscape and 94.2% indicated that they will change their practices for inspecting newly acquired potential host plants.

Additional sudden oak death/ *P. ramorum* blight outreach efforts include:

- Nancy Pataky (University of Illinois Plant Clinic Director) and Karel Jacobs, (Morton Arboretum) presented information during the Illinois Arborists Association meeting on October 19-20, 2004.
- Monica David provided information at the Mid-Am Trade show in Chicago on January 19-21, 2005. Handouts were distributed from the University of Illinois-Dept. of Natural Resources and Environmental Sciences booth.
- Nancy Pataky presented a class at the Illinois Nurseryman's Association's Pro Hort Symposium on February 1 and 2, 2005.
- A training class is planned for the Master Gardener State conference in Collinsville on September 22-24, 2005.

Following the March 7, 2005 videoconference, the Illinois Sudden Oak Death/ *P. ramorum* Blight Task Force will continue to evaluate the need for further educational efforts in Illinois.

3. Detection

Host List

Sudden oak death/*P. ramorum* blight is a disease that has the ability to infect a wide range of hosts. It is not limited to oak as the name would seem to imply. In the U.S., sudden oak death/*P. ramorum* blight initially was present only on California plants (such as tanoak) that could not survive outdoors in Illinois. This host list has grown considerably since the disease was first found. As of January, 2005, 31 plant species have been proven as hosts. Another 37 plants have been associated with this fungus. The fungus has been proven to be present on those 37 hosts, but Koch's postulates (isolate from infected host, inoculate healthy host, observe symptoms, re-isolate from newly infected host) have not yet been completed to prove these are true hosts. All 68 species are under regulatory scrutiny. Some of those species can be grown outdoors in Illinois. Others might be shipped to Illinois and used in interior growing spaces. Some hosts of concern in Illinois might include viburnum, rhododendron, lilac, pyracantha, witch hazel, pieris, honeysuckle and others. The official US host list is provided by USDA APHIS at www.aphis.usda.gov/ppq/ispm/sod/index.html. This list is attached to this document as Appendix 1. Keep in mind that the list changes often, so note the revision date on any such listing.

Field Symptoms

This disease causes a wide range of symptoms on forest and nursery plants. In general, symptoms are of two types: bark cankers that may kill the host and foliar blights that may serve as a reservoir for the pathogen – a place for the fungus to form spores that may move to other plants. The cankers are generally associated with hosts in the oak family while the foliar blights occur mostly on shrubs with a few other tree hosts. A national pest alert fact sheet about sudden oak death/*P. ramorum* blight can be downloaded at www.ncipm.org/sod/predplanning/index.html

Sudden oak death/*P. ramorum* blight causes rapid decline and death of California oaks, usually resulting in death in 1 to 3 years. On oak, the disease causes a bleeding canker on the stems or trunk. You might also see similar bleeding cankers on Illinois oaks; but the sudden oak death cankers ooze a black or reddish fluid, and the wood under them has black zone lines evident when bark is removed. Once crown dieback begins, the leaves turn brown in a few weeks.

The foliar symptoms include gray to brown to purple lesions on the leaf blade, petiole, or stems. The lesions usually do not have a distinct border. Symptoms on shrubs can easily be confused with other leaf blights, shoot blights, and early defoliation and/or plant death. In fact, there are other *Phytophthora* species that do occur as foliar blights on shrubs in Illinois and are visually indistinguishable from sudden oak death/*P. ramorum* blight. Laboratory testing is the only way to prove the presence of the *P. ramorum* pathogen. Some images of sudden oak death/*P. ramorum* blight can be found at www.suddenoakdeath.org or www.aphis.usda.gov/ppq/ispm/sod/pdf_files/phytophthoraramorumsymptoms.pdf. These images show the types of symptoms that should be sampled.

There are many diseases that mimic sudden oak death/*P. ramorum* blight on shrubs. Symptoms on trees in the oak family (*Quercus* species, chestnut, beech) usually involve bleeding cankers that girdle and kill a tree. On oak these symptoms might be confused with oak wilt, oak decline, and red oak borer injury. An excellent reference with photos can be found at www.na.fs.fed.us/spfo/pubs/pest_al/sodeast/sodeast.htm. In Appendix 2, we have provided several “screening questions” to help you determine which suspect samples should be submitted for laboratory diagnosis.

Laboratory Tests

In Illinois, suspect plants are being tested by the University of Illinois Plant Clinic, using ELISA (enzyme-linked immunosorbent assay) tests. This assay has been streamlined but still requires about 7 hours to perform. The assay detects a number of different species belonging to the *Phytophthora* genus. According to national APHIS protocol, the specific fungus, *Phytophthora ramorum*, can be confirmed only by using PCR (polymerase chain reaction) diagnostic testing. An ELISA positive for *Phytophthora* indicates that one or more of many *Phytophthora* species is present. The ELISA does not identify the various *Phytophthora* species. If a positive *Phytophthora* result is obtained by ELISA in Illinois, the sample is then sent to national testing labs in Beltsville, Maryland. PCR tests for *P. ramorum* are performed on the suspect samples from each state. In 2004 the Plant Clinic tested 146 nursery samples for *P. ramorum*. Five samples were forwarded to Beltsville for PCR testing. All were negative for *P. ramorum* and thus were sudden oak death/*P. ramorum* blight negative.

Any suspect plant sample should be handled as a potential positive. The sample should be placed in two layers of zip-lock plastic bags before leaving the sampling site. In order to have enough plant material for testing, 10 to 20 symptomatic leaves should be included in each sample. Only live, symptomatic tissue should be sampled. As a precaution, dip pruners in disinfectant between cuts. If a suspect tree with bleeding canker is found, contact the Plant Clinic at 217-333-0519 to discuss sampling technique. A plant clinic data form must accompany the sample and must be filled out entirely. The data form is available as Appendix 4 or can be downloaded from the University of Illinois Plant Clinic web site at <http://plantclinic.cropsci.uiuc.edu/>. The cost for sudden oak death/*P. ramorum* blight ELISA testing is \$25.00 per sample. The fee is required with the sample.

In order to reduce the number of samples sent to the Plant Clinic, in 2005 we are encouraging pre-screening through the University of Illinois Distance Diagnostics through Digital Imaging. Suspect samples should be submitted through local University of Illinois Extension offices (see Appendix 3). A digital image will be taken by extension staff and the sample will be entered via DDDI software at that office. Images are viewed by state extension specialists. If the images suggest a possible sudden oak death/*P. ramorum* blight positive, the submitter will be instructed on how to send the sample to the Plant Clinic. The fee for any pre-screened samples in 2005 will be \$12.50. If a sample is sent directly to the Plant Clinic without pre-screening, the fee is \$25.00. A completed Plant Clinic specimen data form must accompany any sample sent to the Plant Clinic. A form with the Plant Clinic mailing address is provided in Appendix 4.

4. Response

The purpose this chapter is to explain what must be done and what can be done if *Phytophthora ramorum* is positively detected within Illinois. Should *P. ramorum* become established within Illinois, this document will be updated to reflect new strategies regarding quarantine, eradication, and management strategies.”

Patience and Discretion

For many individuals, the identification and confirmation process for *P. ramorum* may seem excessive. Understandably, if this organism appears in our state, we all want to know about it as soon as possible. However, for the reasons outlined below, it is absolutely necessary that we follow the established procedures.

1. *P. ramorum* is impossible to positively diagnose on-site (even for trained a plant pathologist) and it is easily confused with other less important diseases and disorders. It is important to remember that there are many species of *Phytophthora* currently established in Illinois, but *P. ramorum* is **not** one of them.
2. The introduction of *P. ramorum* is potentially devastating for the affected nurseries, forests and landscapes.
3. A positive diagnosis in any state will result in a cascade of state and federal actions, perhaps even the imposition of a quarantine and loss of interstate nursery and lumber products trade.
4. Starting or perpetuating false rumors only serve to heighten fears and disrupt trade and ultimately our state economy.

If a positive *P. ramorum* case is found in Illinois, the official announcement will be made by the Director of Agriculture or his designate. In Illinois this would be the USDA-APHIS-PPQ State Plant Health Director, Stephen Knight (847-299-6939) and the Illinois Department of Agriculture State Plant Regulatory Official, Mark Cinnamon (847-294-4343). The IDA and USDA-APHIS-PPQ would then issue a joint public information media release through their respective public information offices that will provide resources and answers to questions that will surely follow. The University of Illinois Plant Clinic staff will not release test results and cannot make an announcement directly. National protocol prohibits release of such information until a positive has been confirmed through USDA-APHIS-PPQ.

Response & Disposal Procedures

The response to a positive *P. ramorum* detect largely depends upon *where* the organism is found. There are somewhat different procedures for nursery, garden center, forest, and landscape settings. With the situation regarding *P. ramorum* being ever changing as new discoveries are found, you are encouraged to view the most current regulatory details online:

Protocol regarding nurseries and garden centers.

- www.aphis.usda.gov/ppq/ispm/sod

Protocol regarding residential/commercial landscapes, and forests

- www.ncipm.org/sod/crdprotocol.pdf

USDA-APHIS and the Illinois Department of Agriculture (IDA) have the legal right and responsibility, (refer to the State of Illinois “Insect Pest and Plant Disease Act”, 505 ILCS 90, www.ilga.gov/legislation/ilcs/ilcs.asp), to quarantine all or part of a *P. ramorum*-infested nursery or garden center. The purpose of such regulatory action is to prevent the inter- and intrastate movement of infested plants, plant products, growing medium, and other articles that might be infested. Following regulatory action, the infested nursery or garden center is sampled intensively to determine the extent of the infestation. Where an infected plant(s) is found, all host and associated host plants within a contiguous block will be destroyed using approved methods. If needed, surveys are initiated to locate and investigate: 1) the origin of the infestation (trace-backward) and 2) the destinations for infested plants were inadvertently shipped (trace-forward). Following the 90 day quarantine, nursery plants that have been placed under regulatory control may be released from regulatory action if the following can be demonstrated: 1) there are no additional detections of *P. ramorum* in nursery stock, and 2) water and potting media have also tested negative for *P. ramorum*.

The Illinois Department of Natural Resources, Forestry Section (IDNR), will continue to monitor forest areas across the state. IDNR will collect samples, have them tested, and report suspected infestation to USDA-APHIS, IDA, and the US Forest Service. Removal of infected or killed trees from forested areas is only recommended if it is the first infected tree to be detected in the area. Within infested forested areas, leaving *P. ramorum* infected or killed trees on site has not been shown to increase the risk of infection to adjacent trees. The reason is that the pathogen is not known to produce spores from trunk canker infections; this type of infection represents a dead-end for the pathogen. When possible, leave forest tree debris on site as long as it does not create a fire hazard or other hazard to people.

Associated cost of removal and destruction are the responsibility of the nursery, garden center, residential/commercial landscape owner, and forest owner. Compensation may be available through a civil action requesting restitution. IDA, IDNR, or APHIS will monitor and supervise removal and destruction at positive *P. ramorum* sites.

Prevention and Management

Cultural tactics:

- Plants from *P. ramorum* -infested nurseries and *P. ramorum* -infested counties are under quarantine and thus, are not allowed to enter the channels of trade. Nevertheless, it is always a good practice to thoroughly inspect all plants for unusual disease symptoms and insects prior to introducing them into the nursery, garden center, forest, or landscape.
- Avoid planting *P. ramorum* hosts under or adjacent to oak trees. For example, Rhododendron is a commonly planted ornamental that is a host for *P. ramorum*, and it is possible that an infested rhododendron could infect a nearby oak.
- Avoid wetting the plant foliage, which will stimulate foliar diseases such as *P. ramorum*.
- Frequently monitor host plants for sudden oak death/*P. ramorum* blight symptoms and promptly submit a sample from any suspicious plant.

Fungicides:

Researchers are investigating the usefulness of a number of different fungicides to prevent infection by *P. ramorum*. However, due to the destructive nature and the regulations surrounding this pathogen, it is very difficult to conduct “ideal” efficacy studies. Thus, it is wise to use caution when interpreting the efficacy results that have been published. Some studies only test the fungicides *in vitro* (that is, in a Petri dish). Many more studies involve fungicide applications to various plants followed by artificial inoculation with the pathogen. Although these studies are valuable and often provide good indications, they do have practical limitations in the “real world”. For example, some fungicides (e.g., phosphorous acid & fosetyl-AI) also influence the host plant defenses and thus, they may not appear to work well *in vitro*. Certain contact fungicides perform well when the pathogen is artificially inoculated very soon after spraying, but it’s important to recognize that the duration of protection with these products is relatively short and that natural infections don’t all occur one or two days after spraying. Finally, recognize that differences in climate, host species, and even *P. ramorum* strains can limit the usefulness of data and recommendations generated in other regions or countries.

At this time, the two most well-documented fungicides for controlling *P. ramorum* infections are mefenoxam (a newer isomer of metalaxyl) and phosphorous acid. In fact, California and Oregon sought and received supplemental (Section 24c) labels to allow the use of these fungicides within their states on a limited basis. In the meantime, several pesticide registrants have been working to broaden their regular (Section 3) fungicide labels to include *P. ramorum* on oak and many foliar hosts. For example, national supplemental labels or revised Section 3 labels are expected for Syngenta’s Subdue Maxx (mefenoxam) and AgriChem’s Agri-Fos (phosphorous acid). Most of the research with mefenoxam has targeted the prevention of foliar infections, while most research with phosphorous acid has focused on preventing trunk cankers.

These active ingredients are sold under several trade names and there are differences among formulated products labels regarding what sites (e.g., residential landscapes, commercial landscapes, nurseries, forest, etc.) and which plants may be treated. To avoid making an illegal application, it is important to carefully read the label that accompanies the product you purchase.

For phosphorous acid-based fungicides that become registered in Illinois to control *P. ramorum* on oaks, the following information provided by the California Oak Mortality Task Force (*A Homeowner's Guide to Sudden Oak Death*) may prove useful. However, keep in mind that this information is based on observations in California on oak species not found in Illinois. The application techniques and timing information provided below have not been evaluated in our climate or with our oak species.

- There is some evidence to suggest that fungicides may interfere with the laboratory tests used to detect *P. ramorum*. For this reason, sampling for *P. ramorum* should precede the use of fungicides. False negative results are misleading and ultimately damaging to Illinois.
- For individual, high-value trees, phosphorous acid fungicide treatment can help prevent *P. ramorum* infection. Treatment can suppress disease progression in very early infections, but trees with advanced symptoms cannot be saved. Research results indicate that post-infection treatments are effective only if trees are treated within the first two months of infection. Treatment of trees having displayed symptoms for six months or longer is not recommended.
- On true oaks, the phosphorous acid fungicide may be injected or mixed with a surfactant (e.g., Pentra-Bark, sold by AgriChem) and sprayed on the trunk for absorption through the bark. In California, the optimal treatment routine for coast live oaks calls for the first treatment in November-December (if temperatures are still mild), with a booster treatment 6 months later, and then repeated annually.
- Since the treatment must be made to healthy trees, and the pathogen's distribution and activity is patchy and somewhat unpredictable, it is difficult to determine which trees need to be treated. Generally, you should treat healthy, high-value oak trees within 150 ft of other infected plants. You may want to treat healthy, high-value oaks if they are surrounded by healthy *P. ramorum*-host plants and there are known infections between 150 ft and 1,000 ft away. Treatment is NOT recommended in areas where there are no *P. ramorum*-infected plants.
- Bark beetles may attack trees that are displaying early bleeding canker symptoms of Sudden Oak Death. However, the use of insecticides to prevent these secondary invaders is unjustified and without merit.

Sources:

- *A Homeowner's Guide to Sudden Oak Death*. May 2004. California Oak Mortality Task Force. www.suddenoakdeath.org. <Accessed October 20, 2004>.
- *Sudden Oak Death Guidelines for Arborists*. September 2004, California Oak Mortality Task. www.suddenoakdeath.org. <February 24, 2005>.
- *A Guide for Recreational Users: Simple Precautions to Prevent the Spread of Sudden Oak Death*. September 2004. <http://cemarin.ucdavis.edu/publications.html>. <February 24, 2005>.

5. Contacts, Resources, & Acknowledgements

University of Illinois Extension

See Appendix 3 for a list of University of Illinois Extension Unit Offices (Distance Diagnosis Facilities).

Resources

- USDA-APHIS: www.aphis.usda.gov/ppq/ispm/sod
- California Oak Mortality Task Force: www.suddenoakdeath.org
- NC IPM: www.ncipm.org/sod
- Images of sudden oak death/*P. ramorum* blight can be found at: -
- www.aphis.usda.gov/ppq/ispm/sod/pdf_files/phytophthoraramorumsymptoms.pdf
- www.na.fs.fed.us/spfo/pubs/pest_al/sodeast/sodeast.htm
- Home, Yard, & Garden Pest Newsletter: www.ag.uiuc.edu/cespubs/hyg

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Appendix 1: Host list and plants associated with *Phytophthora ramorum*. Provided by USDA APHIS (Revision date 1/10/05). This list is constantly being updated. The most current version is posted at <http://www.aphis.usda.gov/ppq/ispm/sod>.

Proven Hosts for *Phytophthora ramorum*

(These may be regulated in whole or in part – see “Updates” at: <http://www.aphis.usda.gov/ppq/ispm/sod>)

| Scientific Name (31) | Common Name |
|--|---|
| <i>Acer macrophyllum</i> | Bigleaf maple |
| <i>Aesculus californica</i> | California buckeye |
| <i>Arbutus menziesii</i> | Madrone |
| <i>Arctostaphylos manzanita</i> | Manzanita |
| <i>Calluna vulgaris</i> | Scotch heather |
| <i>Camellia spp.</i> | Camellia - all species, hybrids and cultivars |
| <i>Hamamelis virginiana</i> | Witch hazel |
| <i>Heteromeles arbutifolia</i> | Toyon |
| <i>Lithocarpus densiflorus</i> | Tanoak |
| <i>Lonicera hispidula</i> | California honeysuckle |
| <i>Maianthemum racemosum</i> (= <i>Smilacina racemosum</i>) | False Solomon's seal |
| <i>Photinia fraseri</i> | Red tip photinia |
| <i>Pieris Formosa</i> | Himalaya Pieris |
| <i>Pieris formosa x japonica</i> | Pieris 'Forest Flame', forest flame andromeda |
| <i>Pieris floribunda x japonica</i> | Pieris 'Brouwer's Beauty', Brouwer's beauty andromeda |
| <i>Pieris japonica</i> | Japanese Pieris |
| <i>Pseudotsuga menziesii</i> var. <i>menziesii</i> | Douglas-fir |
| <i>Quercus agrifolia</i> | Coast live oak |
| <i>Quercus chrysolepis</i> | Canyon live oak |
| <i>Quercus kelloggii</i> | California black oak |
| <i>Quercus parvula</i> var. <i>shrevei</i> | Shreve's oak |
| <i>Rhamnus californica</i> | California coffeeberry |
| <i>Rhododendron spp.</i> | Rhododendron (including azalea) – includes all species, hybrids and cultivars |
| <i>Rosa gymnocarpa</i> | Wood rose |
| <i>Sequoia sempervirens</i> | Coast redwood |
| <i>Trientalis latifolia</i> | Western starflower |
| <i>Umbellularia californica</i> | California bay laurel, pepperwood, Oregon myrtle |
| <i>Vaccinium ovatum</i> | Evergreen huckleberry |
| <i>Viburnum x bodnantense</i> | Bodnant Viburnum |
| <i>Viburnum plicatum</i> var. <i>tomentosum</i> | Doublefile Viburnum |
| <i>Viburnum tinus</i> | Laurustinus |

Plants Associated with *Phytophthora ramorum*

(These are only regulated as nursery stock)

| Scientific Name (37) | Common Name, Date & Source of Report |
|--|---|
| <i>Abies grandis</i> | Grand fir – June 03 (1) |
| <i>Aesculus hippocastanum</i> | Horse-chestnut – Dec 03 (3) |
| <i>Arbutus unedo</i> | Strawberry tree – Dec 02 (7) |
| <i>Clintonia andrewsiana</i> | Andrew's clintonia bead lily – May 04 (5) |
| <i>Castanea sativa</i> | Sweet chestnut – Feb 04 (3) |
| <i>Corylus cornuta</i> | California hazelnut – Dec 02 (5) |
| <i>Drimys winteri</i> | Winter's bark – July 04 (3) |
| <i>Dryopteris arguta</i> | California wood fern – May 04 (5) |
| <i>Fagus sylvatica</i> | European beech – Dec 03 (3) |
| <i>Fraxinus excelsior</i> | European ash – Dec 04 (3) |
| <i>Kalmia latifolia</i> | Mountain laurel – Fall 02 (3) |
| <i>Laurus nobilis</i> | Bay laurel – July 04 (3) |
| <i>Leucothoe fontanesiana</i> | Drooping leucothoe - Oct 03 (3) |
| <i>Nothofagus obliqua</i> | Roble beech – Dec 04 (3) |
| <i>Pieris formosa</i> var. <i>forrestii</i> | Chinese Pieris – Oct 03 (3) |
| <i>Pieris formosa</i> var. <i>forrestii</i> x <i>Pieris japonica</i> | Pieris – Oct 03 (3) |
| <i>Pittosporum undulatum</i> | Victorian box – Dec 02 (6) |
| <i>Pyracantha koidzumii</i> | Formosa firethorn – Apr 04 (9) |
| <i>Quercus cerris</i> | European turkey oak - Feb 04 (3) |
| <i>Quercus falcata</i> | Southern red oak – Nov 03 (3) |
| <i>Quercus ilex</i> | Holm oak – Dec 03 (3) |
| <i>Quercus rubra</i> | Northern red oak – Nov 03 (8) |
| <i>Rhamnus purshiana</i> | Cascara – Dec 02 (4) |
| <i>Rubus spectabilis</i> | Salmonberry – Dec 02 (4) |
| <i>Salix caprea</i> | Goat willow – July 04 (3) |
| <i>Syringa vulgaris</i> | Lilac – 2003 (3) updated Oct 03 |
| <i>Taxus baccata</i> | European yew – Aug 03 (3) |
| <i>Taxus brevifolia</i> | Pacific yew – May 03 (5) |
| <i>Toxicodendron diversilobum</i> | Poison oak – Dec 02 (4) |
| <i>Viburnum davidii</i> | David Viburnum - Oct 03 (3) |
| <i>Viburnum farreri</i> (= <i>V. fragrans</i>) | Fragrant Viburnum – Oct 03 (3) |
| <i>Viburnum lantana</i> | Wayfaringtree Viburnum – Oct 03 (3) |
| <i>Viburnum opulus</i> | European cranberrybush Viburnum – Oct 03 (3) |
| <i>Viburnum</i> x <i>burkwoodii</i> | Burkwood Viburnum – Oct 03 (3) |
| <i>Viburnum</i> x <i>carlcephalum</i> x <i>V. utile</i> | Viburnum – Oct 03 (3) |
| <i>Viburnum</i> x <i>pragense</i> | Prague Viburnum – Oct 03 (3) |
| <i>Viburnum</i> x <i>rhytidophylloides</i> | Alleghany or Willowood Viburnum – Sept 04 (2) |

Sources of Report for Associated Hosts

- ¹ California Department of Food and Agriculture
- ² Oregon Department of Agriculture
- ³ Department for Environment, Food, and Rural Affairs, UK
- ⁴ Everett Hanson, Oregon State University
- ⁵ David Rizzo, University of California – Davis
- ⁶ Matteo Garbelotto, University of California - Berkeley
- ⁷ Eduardo Moralejo, Instituto Mediterráneo de Estudios Avanzados, IMEDEA (CSIC-UIB) - Balearic Islands, Spain
- ⁸ Plant Protection Service, Wageningen, Netherlands
- ⁹ Canadian Food Inspection Agency, Canada
- ¹⁰ Daniel Hüberli, University of California – Berkeley
- ¹¹ Adam Zych, Plant Protection and Seed Service – Poland

Rationale for Lists:

Host Plants for *Phytophthora ramorum*:

Host plants are naturally infected associated plants added upon completion, documentation, review and acceptance of traditional Koch's postulates. Some are regulated in part (such as redwood and Douglas fir); others are regulated in their entirety (such as tanoak and western star flower). Details on regulated plants and articles can be found via links to "Phytophthora ramorum 7 CFR 301.92" and "Recent Modifications to Phytophthora ramorum Regulations" at: <http://www.aphis.usda.gov/ppq/ispm/sod>

The plants listed in the original Interim Rule dated 14 February 2002 were adapted from a review and evaluation of lists of regulated plants from other regulatory agencies.

Plants Associated with *Phytophthora ramorum*:

Associated plants are those reported found naturally infected and from which *P. ramorum* has been cultured and/or detected using PCR (Polymerase Chain Reaction). For each of these, traditional Koch's postulates have not yet been completed or documented and reviewed. These reports must be documented and reviewed by PPQ before they will be listed.

Regulation at the genus level:

For either list, a listed plant may be revised to regulate at the genus level to ensure appropriate and effective inspection in quarantine areas, regulated nurseries, and regulated articles to mitigate the spread of *P. ramorum*. An example is when the number of individual species, hybrids, or cultivars listed or to be listed is determined to prevent appropriate and effective inspection or regulation.



Appendix 2: Screening questions to determine the need to submit a plant sample for *Phytophthora ramorum* testing¹

1. What plant or plants are affected?

- The plant is a camellia, rhododendron, viburnum, pieris, kalmia or lilac purchased since 2002 – go to Question 4.
- The plant is adjacent to a camellia, rhododendron, viburnum, pieris, kalmia or lilac purchased since 2002 – go to Question 2.
- None of the above – unlikely to be *P. ramorum*. Do not submit sample.²

2. Is the plant known to be a host for *P. ramorum*? (Current host list can be found on the USDA-APHIS website at www.aphis.usda.gov/ppq/ispm/sod).

- Yes. Plant name appears on the list of hosts or associated hosts for *P. ramorum*, or plant belongs to the same genus as a listed host or associated host – go to Question 3.
- No. Plant name does not appear on the list of hosts or associated hosts, nor does the plant belong to the same genus as a listed host or associated host – unlikely to be *P. ramorum*. Do not submit sample.²

3. Is the plant a member of the oak family (red oak, pin oak, beech, chestnut, chinquapin)?

- Yes. Go to Question 5.
- No. Go to Question 4.

4. Does the plant display foliar symptoms of leaf spots, defoliation, or stem dieback similar to those shown on the photos of plants infected with *P. ramorum*? (www.ncipmc.org/sod/images.html)

- Yes. Contact your local University of Illinois extension office for digital image submission.
- No. Unlikely to be *P. ramorum*. Do not submit sample².

5. If the plant is a member of the oak family, does it display the following symptoms?

- Bleeding from the bark without wounds, cracks, or insect holes (www.ncipmc.org/sod/images.html). Bleeding does not have a foul odor. In advanced stages of the disease, bleeding may be accompanied by widespread, rapid death of the crown. Contact your local extension office for testing. Observe surrounding nursery plants and repeat questionnaire starting at Question 2 if symptoms are present.
- No bleeding from the bark, or bleeding is associated only with wounds, cracks, or insect holes – unlikely to be *P. ramorum*. Do not submit sample.²

¹From USDA *Phytophthora ramorum* Educate to Detect Program (PRED). Adapted for Illinois by Nancy Pataky, University of Illinois Plant Clinic, March 2005.

²Information on other plant diseases and disorders is available through the University of Illinois (<http://www.ag.uiuc.edu/~vista/pubs.html>)

**Appendix 3:
University of Illinois Extension Unit Offices
(Distance Diagnostics Facilities).**



| COUNTY | OFFICE ADDRESS | CITY/ZIP | PHONE | FAX |
|---------------------|------------------------|----------------------|--------------|--------------|
| Adams | 330 S. 36th St. | Quincy, 62301 | 217-223-8380 | 217-223-9368 |
| Bond | POB 187 | Greenville, 62246 | 618-664-3665 | 618-664-9227 |
| Boone | 930 W. Locust St. | Belvidere, 61008 | 815-544-3710 | 815-544-4606 |
| Bureau | 850 Thompson St. | Princeton, 61356 | 815-875-2878 | 815-875-2870 |
| Calhoun/Jersey | 818 S. Park St. | Hardin, 62047 | 618-576-2293 | 618-576-8013 |
| Carroll | 807D S. Clay St. | Mt. Carroll, 61053 | 815-244-9444 | 815-244-3836 |
| Cass | 651 S. Job | Virginia, 62691 | 217-452-3211 | 217-452-7260 |
| Champaign | 801 N Country Fair | Champaign, 61821 | 217-333-7672 | 217-333-7683 |
| Christian | 1120 N Webster | Taylorville, 62568 | 217-287-7246 | 217-287-7248 |
| Clark | 15493 N State HW1 | Marshall, 62441 | 217-826-5422 | 217-826-8631 |
| Clay | 235 Chestnut St. | Louisville, 62858 | 618-665-3328 | 618-665-4985 |
| Clinton | 1163 N 4th St. | Breese, 62230 | 618-526-4551 | 618-526-4597 |
| Coles | 707 Windsor Rd. | Charleston, 61920 | 217-345-7034 | 217-348-7940 |
| Cook Chicago North | 2840 N. Lincoln Ave. | Chicago, 60657 | 773-755-2223 | 773-755-7776 |
| Cook Chicago South | 8751 S. Greenwood | Chicago, 61619 | 773-768-7779 | 773-768-4818 |
| Cook/North Suburban | 1699 Wall St. | Mt. Prospect, 60056 | 847-437-6449 | 847-437-7583 |
| Cook/South Suburban | 5527 Miller Circle Dr. | Matteson, 60443 | 708-720-7500 | 708-720-7509 |
| Crawford | 301 S. Cross St. | Robinson, 62454 | 618-546-1549 | 618-544-3222 |
| DeKalb | 1350 W. Prairie Dr. | Sycamore, 60178 | 815-758-8194 | 815-758-8199 |
| DeWitt | POB 347 | Clinton, 61727 | 217-935-5764 | 217-935-8932 |
| DuPage | 310 S CountyFarm Rd. | Wheaton, 61944 | 630-653-4114 | 630-653-4159 |
| Edgar | 210 W. Washington | Paris, 61944 | 217-465-8585 | 217-463-1192 |
| Edwards | 350 N. Seventh | Albion, 62806 | 618-445-2934 | 618-445-3746 |
| Effingham | 1209 Wenthe Dr. | Effingham, 62401 | 217-347-7773 | 217-347-7775 |
| Ford/Iroquios | 912 W. Seminary Ave. | Onarga, 60955 | 815-268-4051 | 815-268-4058 |
| Franklin | 1212 Rte 14 West | Benton, 62812 | 618-439-3178 | 618-439-2953 |
| Fulton | 15411 N IL 100 Hwy. | Lewistown, 61542 | 309-547-3711 | 309-547-3713 |
| Greene | RR3, Box 129C | Carrollton, 62016 | 217-942-6996 | 217-942-3827 |
| Grundy | 1802 N. Division St. | Morris, 60450 | 815-942-2725 | 815-942-9519 |
| Hancock | 550 N. Madison St. | Carthage, 62321 | 217-357-2150 | 217-357-3598 |
| Henry/Stark | 26234 N 100 Ave. | Galve, 61434 | 309-853-1533 | 309-853-1634 |
| Jackson | 402 Ava Rd. | Murphysboro, 62966 | 618-687-1727 | 618-687-1612 |
| Jasper | 1401 Clayton | Newton, 62448 | 618-783-2521 | 618-783-2232 |
| Jefferson | 4618 Broadway | Mt. Vernon, 62864 | 618-242-0780 | 618-242-0781 |
| Johnson | 208 E. Main St. | Vienna, 62995 | 618-658-5321 | 618-658-2028 |
| Kane | 535 S. Randall Rd. | St. Charles, 60174 | 630-584-6166 | 630-584-4610 |
| Kankakee | 1650 Commerce Dr | Bourbonnais, 60914 | 815-933-8337 | 815-933-8532 |
| Kendall | 7775B IL Rte 47 | Yorkville, 60560 | 630-553-5823 | 630-553-5871 |
| Lake | 100 S US Hwy 45 | Grayslake, 60030 | 847-223-8627 | 847-223-9288 |
| LaSalle | 1689 N 31st Rd. Ste 2 | Ottawa, 61350 | 815-433-0707 | 815-433-5454 |
| Lawrence | 600 Cherry Lane | Lawrenceville, 62439 | 618-943-5018 | 618-943-4968 |

| | | | | |
|------------------|-----------------------|----------------------|--------------|--------------|
| Lee | 280 W. Wasson Rd. | Amboy, 61310 | 815-857-3525 | 815-857-3527 |
| Livingston | 1412 S. Locust St. | Pontiac, 61764 | 815-842-1776 | 815-842-6547 |
| Logan | 980 N. Postville Dr. | Lincoln, 62656 | 217-732-8289 | 217-735-5837 |
| Macon | 2535 Millikin Pkwy. | Decatur, 62526 | 217-877-6042 | 217-877-4564 |
| Macoupin | 210 N. Broad St. | Carlinville, 62626 | 217-854-9604 | 217-854-7804 |
| Madison | 900 Hillsboro | Edwardsville, 62025 | 618-650-7050 | 618-655-9951 |
| Marion | 1404 E. Main | Salem, 62881 | 618-548-1446 | 618-548-9891 |
| Marshall/Putnam | 327 Edward St. | Henry, 61537 | 309-364-2356 | 309-364-2804 |
| Mason | 133 S. High | Havana, 62644 | 309-543-3308 | 309-543-6239 |
| McDonough | 3022 W. Jackson St. | Macomb, 61455 | 309-837-3939 | 309-833-3019 |
| McHenry | POB 1430 | Woodstock, 60098 | 815-338-4747 | 815-338-4755 |
| McLean | 402 N. Hershey Rd. | Bloomington, 61704 | 309-663-8306 | 309-663-8270 |
| Monroe | 901 Illinois Ave. | Waterloo, 62298 | 618-939-3434 | 618-939-7708 |
| Montgomery | 1 Industrial Park Dr. | Hillsboro, 62049 | 217-532-3941 | 217-532-3944 |
| Morgan | 104 N. Westgate Ave. | Jacksonville, 62650 | 217-243-7424 | 217-243-1544 |
| Moultrie/Douglas | 122 S. Walnut St. | Arthur, 61911 | 217-543-3755 | 217-543-3757 |
| Ogle | 421 W. Pines Rd. | Oregon, 61061 | 815-732-2191 | 815-732-4007 |
| Peoria | 4810 N. Sheridan Rd. | Peoria, 61614 | 309-685-3140 | 309-685-3397 |
| Perry | 3764 State Rt 13/127 | Pinckneyville, 62274 | 618-357-2126 | 618-357-3934 |
| Piatt | 210 S. Market St. | Monticello, 61856 | 217-762-2191 | 217-762-2703 |
| Pike | 1301 E. Washington | Pittsfield, 62363 | 217-285-5543 | 217-285-5735 |
| Randolph | 313 W. Belmont St. | Sparta, 62286 | 618-443-4364 | 618-443-1922 |
| Rock Island | 4550 Kennedy Dr. | East Moline, 61244 | 309-796-0512 | 309-796-0673 |
| Saline | 34 Veterans Dr. Ste D | Harrisburg, 62946 | 618-252-8391 | 618-253-3006 |
| Sangamon | POB 8467 | Springfield, 62791 | 217-782-4617 | 217-524-6662 |
| Shelby | 1125 W. North 2nd | Shelbyville, 62565 | 217-774-9546 | 217-774-9549 |
| Stephenson | 2998 W Pearl City Rd. | Freeport, 61032 | 815-235-4125 | 815-232-9006 |
| Tazewell | 1505 Valle Vista | Pekin, 61554 | 309-347-6614 | 309-347-5472 |
| Vermillion | 25 E. Liberty Lane | Danville, 61832 | 217-442-8615 | 217-442-8628 |
| Warren | 1000 N. Main | Monmouth, 61462 | 309-734-5161 | 309-734-5532 |
| Washington | 9623 Wall St. | Nashville, 62263 | 618-327-8881 | 618-327-8882 |
| Wayne | 2-B Frontier Dr. | Fairfield, 62837 | 618-842-3702 | 618-842-4725 |
| Whiteside | 100 E. Knox | Morrison, 61270 | 815-772-4075 | 815-772-4077 |
| Will | 100 Manhattan Rd. | Joliet, 60433 | 815-727-9296 | 815-727-9364 |
| Williamson | 1306 N. Atchison Ave. | Marion, 62959 | 618-993-3304 | 618-997-1542 |
| Winnebago | 4311 W. State St. | Rockford, 61102 | 815-986-4357 | 815-986-4329 |
| Woodford | 117 West Center | Eureka, 61530 | 309-467-3789 | 309-467-6034 |

Plant Clinic
1401 W. St. Mary's Road
Urbana, IL 61802
(217)333-0519

UNIVERSITY OF ILLINOIS
PLANT CLINIC SPECIMEN DATA FORM
Open May 1st through Sept 15th

Office Use Only

| | |
|----------------|------|
| Plant Clinic # | |
| Date Received | |
| County | |
| Charge | |
| Date Paid | Ck # |

Submitter _____

Grower _____

Commercial _____ Home Grower _____

County _____

Send response to: Name _____

Address _____

City _____ State _____ Zip _____

Phone# (____) _____ E-mail address _____

Crop or Plant Name _____ Variety _____

Describe Problems or Symptom/Sketch Distribution:

Symptoms Appeared in Past: Days _____ Weeks _____ Months _____

Describe Conditions Prior to Symptom Development:

Temperature _____ Rainfall _____ Other _____

Planting History: Crop Two Years Ago _____ Crop One Year Ago _____

Soil Type: _____ pH _____ % Organic Matter _____

Soil Test Information: _____

Type of Nitrogen Application: _____

Chemicals Applied this year: _____

Fertilizer _____ Type of Application _____

Herbicide(s) _____

Rates _____

Type of Application _____

Chemicals Applied Last Year _____

Ornamentals:

Approximate Age and Size: _____

Condition of Nearby Species: _____



Appendix 5: Sudden Oak Death/*P. ramorum* Blight Sample Flow Chart

