



United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine



**Official Regulatory Protocol for *Phytophthora ramorum* Detections in
Residential or Landscaped Commercial Settings**

Confirmed Residential Protocol: Version 2.0
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United States Department of Agriculture (USDA)
Animal Plant Health Inspection Service (APHIS)
Plant Protection and Quarantine (PPQ)

Center for Plant Health Science and Technology (CPHST)
Emergency and Domestic Programs (EDP)
Eastern Region (ER)
Western Region (WR)

RESIDENTIAL PROTOCOL VERSION 2.0

TABLE OF CONTENTS

INTENDED USE AND GOAL	2
DISCLAIMER	3
DEFINITIONS	4
TRIGGER EVENTS FOR USE OF PROTOCOL	6
AUTHORITIES	7
COMMUNICATE AND NOTIFY	9
CONDUCT INVESTIGATION	10
SECURE THE SITE	11
SURVEY THE SITE AND PERIMETER	12
ESTABLISH THE DESTRUCTION RADIUS (RADII) AND QUARANTINE BLOCK(S)	14
DISINFEST THE SITE	15
NINETY (90) DAY QUARANTINE ACTIVITIES	16
RELEASING THE SITE	18
POST DISINFESTATION MONITORING	19

FIGURES

FIGURE 1: DIAGRAM SHOWING DESTRUCTION BLOCK, QUARANTINE BLOCK AND DELIMITATION AREA	17
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APPENDICES

APPENDIX 1: APHIS LIST OF REGULATED HOSTS AND PLANTS ASSOCIATED WITH <i>P. RAMORUM</i>	20
APPENDIX 2: <i>P. RAMORUM</i> QUESTIONNAIRE FOR PROPERTY OWNERS OR MANAGERS	21
APPENDIX 3: FOLLOW UP SURVEY FOR LOCATIONS WITH <i>P. RAMORUM</i> INFECTED PLANTS	23
APPENDIX 4: CUT STUMP TREATMENT FOR <i>P. RAMORUM</i> INFECTED HAP	25
APPENDIX 5: DIAGNOSTICS	26
APPENDIX 6: TREATMENT AND DISINFECTION	27

RESIDENTIAL PROTOCOL VERSION 2.0

INTENDED USE

The movement and planting of host and associated host plant (HAP) infected with *Phytophthora ramorum* in both residential and commercial settings has prompted the need for a standard protocol for use by state and federal regulators to respond to these detections. This USDA, APHIS, PPQ protocol specifies actions that are to be taken when a positive *Phytophthora ramorum* infection is confirmed in plantings in residential or commercial landscape settings. Other Protocols have been established and posted for use in Retail and Production Nurseries. The Confirmed Nursery Protocol may be used as a resource when applying this protocol. If there are large areas of contiguous host material or large caliper infested plants encountered, consult with the PPQ Regional Office and APHIS Headquarters for guidance. This protocol may be used in association with the other protocols where applicable.

GOAL

The goal of this protocol is to ensure that any infestations of this serious pathogen are consistently and effectively addressed, mitigated, and eradicated when possible. Cooperation by the nursery and landscape industry and members of the public is essential. Early detection and reporting of potential *P. ramorum* infestations is critical to ensure that spread is contained. The strategies employed in the protocol are intended to ensure a rapid and appropriate response to prevent the spread of the disease.

RESIDENTIAL PROTOCOL VERSION 2.0

DISCLAIMER

CHALLENGES: *P. ramorum* is a microorganism. Thus it can be challenging to detect and difficult to eradicate. It can infect plants, infest media, soil and water and persist despite best efforts. It can wash into nearby waterways and may actually be present during eradication and monitoring procedures, thus any waterways should be baited and tested for the pathogen. The science and our understanding of *P. ramorum* are constantly being updated. As new information becomes available, it will be reflected in updated protocols.

RESIDENTIAL PROTOCOL VERSION 2.0

DEFINITIONS

- Associated plants:** 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.
- Delimitation survey:** A survey done to determine the extent of the infestation within a residential or commercial site.
- Destruction radius:** Block of plants to be destroyed. Within a residential or landscaped commercial setting the destruction radius is defined as all *P. ramorum* infected HAP and all other HAP within 2 meters of any infected HAP.
- HAP:** **Host and associated host plants** listed on the official APHIS List of Regulated Hosts and Plants Associated with *Phytophthora ramorum*.
- Emergency Action Notification (EAN):** PPQ Form 523 or equivalent State document is used to specify the regulatory actions to be taken at a residential or commercial site.
- PASS (Potentially Actionable Suspect Sample):** A presumptive positive *P. ramorum* sample diagnosed or identified by a provisionally approved laboratory or diagnostician with identification authority that would require confirmatory testing by an official APHIS Laboratory due to the nature of the plant sampled and the necessity for Federal confirmation. (For more information see: "PASS System Policy" at: http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/protocols.shtml)
- Quarantine block:** Area identified as a 30 meter radius around the destruction radius designed to determine if *P. ramorum* has spread beyond the destruction radius.

RESIDENTIAL PROTOCOL VERSION 2.0

- Quarantine period:** A minimum of 90 days that begins when the Delimitation Survey is completed and lasts until such time as both plant parts and climatic conditions conducive to disease expression have occurred. During the **quarantine period**, inspection, sampling, and testing must reveal no further detection of *P. ramorum*.
- SPHD:** The State Plant Health Director of a particular state. Lead APHIS contact in each state responsible for overseeing all Plant Protection and Quarantine activities in that state. SPHD's can be found listed at:
<http://pest.ceris.purdue.edu/directory.php?list=SPHD>
- SPRO:** The State Plant Regulatory Official is the person primarily responsible for plant health programs in that state. SPRO's can be found listed at:
www.nationalplantboard.org/member/index.html

RESIDENTIAL PROTOCOL VERSION 2.0

TRIGGER EVENTS FOR USE OF PROTOCOL

This protocol shall be implemented by APHIS-PPQ and/or its State Plant Regulatory cooperators when the presence diseases caused by *P. ramorum* have observed and the presence of *P. ramorum* has been confirmed in a residential or commercial landscape setting from samples collected as part of a trace forward survey*, trace back survey*, *P. ramorum* nursery survey*, or found by any other means. Confirmed samples must have been diagnosed using a methodology approved by USDA, APHIS, PPQ and consistent with the Potentially Actionable Suspect Sample (PASS) protocol*.

*See http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/ for links with details on trace forward survey, trace back survey, *P. ramorum* nursery survey, and the PASS protocol.

RESIDENTIAL PROTOCOL VERSION 2.0

AUTHORITIES

- For states with quarantines equivalent to the Federal regulation, State personnel will conduct specific actions required by the protocol, within and around the residential or commercial landscape setting, under State authority with Federal support.
- For States without quarantines for *P. ramorum* equivalent to the Federal regulations, specific actions required by this protocol within and around the residential or commercial landscape setting will be conducted under Federal authority, in cooperation with State personnel.
- Authority for this protocol is derived from the Section 414 of the Plant Protection Act, 7 USC 7714, 114 STAT. 445, PUBLIC LAW 106–224—JUNE 20, 2000, as follows: SEC. 414. GENERAL REMEDIAL MEASURES FOR NEW PLANT PESTS AND NOXIOUS WEEDS. (a) AUTHORITY TO HOLD, TREAT, OR DESTROY ITEMS.—If the Secretary considers it necessary in order to prevent the dissemination of a plant pest or noxious weed that is new to or not known to be widely prevalent or distributed within and throughout the United States, the Secretary may hold, seize, quarantine, treat, apply other remedial measures to, destroy, or otherwise dispose of any plant, plant pest, noxious weed, biological control organism, plant product, article, or means of conveyance that— (1) is moving into or through the United States or interstate, or has moved into or through the United States or interstate····· (B) is or has been otherwise in violation of this title; (2) has not been maintained in compliance with a post entry quarantine requirement; or (3) is the progeny of any plant, biological control organism, plant product, plant pest, or noxious weed that is moving into or through the United States or interstate, or has moved into the United States or interstate, in violation of this title.
- (b) AUTHORITY TO ORDER AN OWNER TO TREAT OR DESTROY.— (1) IN GENERAL.—The Secretary may order the owner of any plant, biological control organism, plant product, plant pest, noxious weed, article, or means of conveyance subject to action under subsection (a), or the owner’s agent, to treat, apply other remedial measures to, destroy, or otherwise dispose of the plant, biological control organism, plant product, plant pest, noxious weed, article, or means of conveyance, without cost to the Federal Government and in the manner the Secretary considers appropriate. (2) FAILURE TO COMPLY.—If the owner or agent of the owner fails to comply with the Secretary’s order under this subsection, the Secretary may take an action authorized by subsection (a) and recover from the owner or agent of the owner the costs of any care, handling, application of remedial measures, or disposal incurred by the Secretary in connection with actions taken under subsection (a).
- (c) CLASSIFICATION SYSTEM: (see Plant Protection Act, 7 USC 7714., 114 STAT. 445, PUBLIC LAW 106–224—JUNE 20, 2000)

RESIDENTIAL PROTOCOL VERSION 2.0

- (d) APPLICATION OF LEAST DRASTIC ACTION: (see Plant Protection Act, 7 USC 7714., 114 STAT. 445, PUBLIC LAW 106-224—JUNE 20, 2000)

RESIDENTIAL PROTOCOL VERSION 2.0

COMMUNICATE AND NOTIFY

Communicate officially confirmed finds using the bullets below:

- Immediately notify the State Plant Health Director (SPHD) and the State Plant Regulatory Official (SPRO) of the State in which the residential or commercial site is located. The SPHD will notify the Regional Office and National Headquarters Office. See Appendix 12, Resource and Contact List (Confirmed Nursery Protocol: Version 8.0).
- Laboratories need to notify the SPHD, the SPRO, the Regional Office, the National Program Manager, and the submitter.
- Ideally the SPRO should notify the consumer/homeowner but either the SPRO (if State authority is used) or the SPHD (if Federal authority is used) may notify consumer/homeowner with the infected plant(s).
- The SPRO and SPHD will use state channels, including public affairs offices to make any public announcements, as necessary. The SPHD will ensure that the USDA APHIS Office of Legislative and Public Affairs is aware of any pending release, via the Regional Office and National Headquarters Office.

RESIDENTIAL PROTOCOL VERSION 2.0

CONDUCT AND DOCUMENT INVESTIGATIONS

- Complete Appendix 2. This questionnaire should be completed as much as possible during the initial property owner or manager contact, at the time the site is secured and the suspect plant(s) are safeguarded. The remainder of the questionnaire not completed and Appendix 3 should be completed at the time of the delimiting survey.
- Document any proof of purchase the consumer may have, such as receipts, pot labels, et cetera.

RESIDENTIAL PROTOCOL VERSION 2.0

SECURE THE SITE

When the presence of *Phytophthora ramorum* has been confirmed in a residential or commercial setting:

- All HAP genera within a 30 meter radius of the infected plant(s) shall be placed on hold and remain under regulatory control as per the Emergency Action Notification (EAN) or State equivalent document. These plants should be safeguarded remain undisturbed until the delimitation survey is complete and results identify all plants requiring destruction Any regulatory control (hold) may also include “any other product or article that an inspector determines to present a risk of spreading *Phytophthora ramorum*, if an inspector notifies the person in possession of the product or article that it is subject to the restrictions in the regulations” (7CFR part 301.92-2) within the infested site.
- A delimitation survey will take place on the residential or commercial site per this protocol; and,
- Complete the questionnaire “Follow up Survey for Locations with Infected Plants” (Appendix 3).
- Any equipment used on the residential or landscaped commercial sites is not moved from the site without proper treatment and disinfection (see Appendix 6)
- Any additional treatments and/or basic sanitary and precautionary measures shall be detailed on the EAN.
 - PPQ form 523, Emergency Action Notification will be used as the official Federal authorization of hold. The required treatments and/or basic sanitary and precautionary measures (e.g. bio-containment of suspected infected material, etc.) should be included in the PPQ form 523. If the State initiated action, then the appropriate State notification would be used.
- If any other plants in the area are observed to be showing symptoms consistent with diseases caused by *P. ramorum*, then these plants must be sampled and tested for the presence of *P. ramorum*.
- If the infected plant is located on the boundary between properties, regulatory controls may be placed on multiple properties. In the event the infected plant is located in a public common area, such as a boulevard or roadside, the regulatory official shall determine the appropriate area to be placed under regulatory control.

RESIDENTIAL PROTOCOL VERSION 2.0

SURVEY THE SITE AND PERIMETER

The goal of the survey is to locate all *P. ramorum* infected plants at the site, including in the perimeter. A detailed and thorough inspection should be conducted to determine the presence diseases caused by *P. ramorum*. Samples should be collected from unhealthy looking plants, including any plants with minute symptoms such as tiny leaf spots or brown leaf tips.

Delimiting Survey:

- Inspect all HAP genera within a 30 meter radius of the *P. ramorum* infected plant(s) and sample any unhealthy plants. Subsequent detections of *P. ramorum* as a result of the delimitation survey will require all HAP genera within a 30 meter radius of the newly detected infected plants to be surveyed and all unhealthy plants to be sampled.
- If it is suspected that the infestation is widespread then consult with the PPQ Regional Office to design and implement an appropriate delimit survey. This delimit survey includes the taxa of HAP on the property consistent with the infected plant(s).
- Document the inspection and if feasible, map all HAP showing their location.
- *P. ramorum* symptomatic plants and other unhealthy appearing plants would need to be sampled, tested, mapped, and marked or tagged.
- Samples must be analyzed using a methodology approved by APHIS (Appendix 5).

Soil Sampling:

- Soil samples must be taken in the destruction block at the time of plant removal.
- Sampling locations should take water drainage patterns into consideration, and soil down slope from the plant removal area must be sampled. Soil within the destruction radius (radii) and the quarantine area(s) must be sampled. Soil sampling protocols may be found at http://www.aphis.usda.gov/plant_health/plant_pest_info/pram
- The soil in the area of the host plant removal will be treated if soil is determined to be infested. Treat a 4-meter area or larger if testing so indicates. See Appendix 6 for treatment options.

Water Sampling:

- If the source of the infected plant is not known, it may be caused by infested water. Determine the source of water used at the residential or commercial site. Water sampling is not required for chlorinated irrigation water from municipal water facilities. Otherwise, bait the water to determine if it is infested.

RESIDENTIAL PROTOCOL VERSION 2.0

- The infected plant(s) might spread disease via water runoff. Evaluate the drainage pattern in the area of the infected plant(s). From the point of infection bait any runoff water as resources permit.. Water sampling protocols may be found at: http://www.aphis.usda.gov/plant_health/plant_pest_info/pram

RESIDENTIAL PROTOCOL VERSION 2.0

ESTABLISH THE DESTRUCTION RADIUS (RADII) AND QUARANTINE BLOCK(S)

- The destruction radius (radii) and quarantine block(s) are established when diagnostic results from all delimiting samples have been reported. The 90 day quarantine period begins when the delimiting survey is complete.
- Limit access to destruction block(s). Ensure that proper sanitation measures are applied (See Appendix 6).
- The *P. ramorum* infected plants shall be destroyed in an appropriate manner as soon as possible. (see Appendix 6)

RESIDENTIAL PROTOCOL VERSION 2.0

DISINFEST THE SITE

Plant Destruction:

- Plants that are infected with *P. ramorum* must be removed and destroyed. See Appendix 6, Treatment and Disinfection.
- Remove the infected plants and root systems as much as possible. Double bag to at least a 4-mil thickness. Larger plants must be removed at least to the root collar and the stumps treated in a manner approved by APHIS to prevent sprouting (see Appendix 4).
- Remove and destroy all HAP and HAP plant parts (for example, branches of larger shrubs or trees) within the destruction radius (a 2 meter radius (radii) of an infected plant). **Exception:** As certain trees which are bole hosts* are less susceptible to disease, unless these show symptoms and are found with disease, they may be monitored for infection rather than being destroyed, at the inspector's discretion. Consult with the PPQ Regional Office for details on available treatment options.
 - Approved methods of destruction include: incineration, deep burial, and steam sterilization. See Appendix 6 for details. If the operational conditions allow, these plants should be sampled for *P. ramorum* and their location mapped in relation to the infected plant.
- Using the survey follow up questionnaire in Appendix 3, maintain a record of the kind, size, and number of plants destroyed at each location. Some of the residential or landscape properties will have several plants, of several different HAP taxa. Record the owner's name, contact information, address and the physical location of any infected plants (See Appendix 1). Draw a map, record landmarks or enter the GPS coordinates for follow up surveys.

Debris Removal:

- Rake an area sufficient in size to collect all plant debris associated with destruction block(s) and at least 2 meters beyond. Double bag debris, as described above. Use discretion when raking around other plants. Rake from the outer edge of the area towards the infected plant(s). All debris must be destroyed by APHIS approved methods (Appendix 6).

*"Bole hosts" are those trees in which *P. ramorum* causes cankers on the trunk the symptoms of the disease, sudden oak death

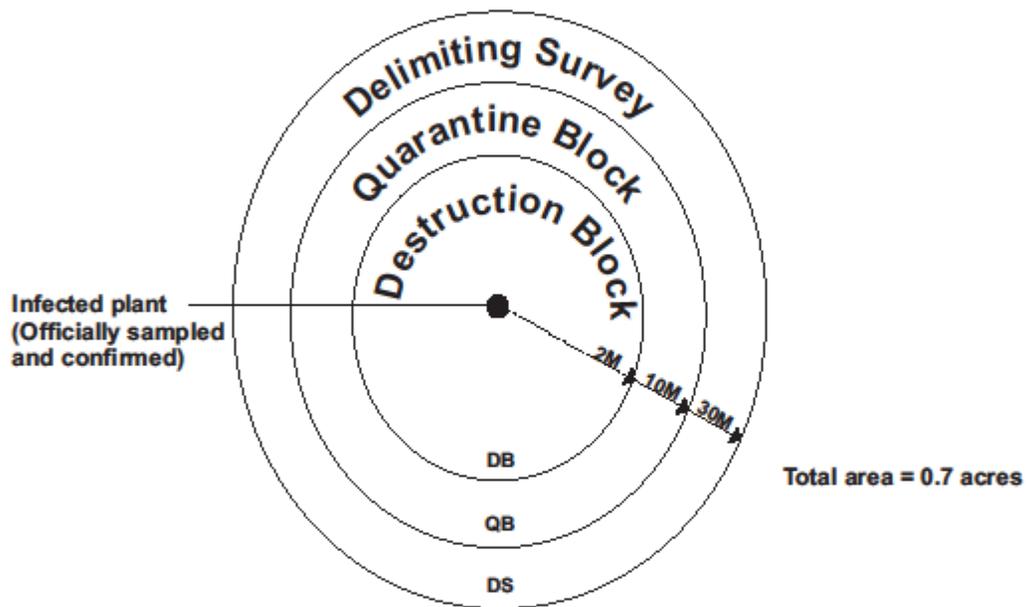
RESIDENTIAL PROTOCOL VERSION 2.0

NINETY (90) DAY QUARANTINE ACTIVITIES

- All HAP not destroyed (see **Exception** on page 15 above) that is located within the destruction block shall be placed under a 90 day quarantine to prevent movement of plants from the site.
- The quarantined plants must be inspected and tested twice during the 90-day period to ensure all *P. ramorum* infected plants have been found. If the plants remain free of *P. ramorum* during this 90 day period, the site will be released from quarantine. The 90 day quarantine must occur during a time conducive to the expression of *P. ramorum* symptoms.
- Follow up activities:
 - All testing of sampled plants, soil, and water verifies that the pathogen does not occur at the location.
 - A minimum of 90 days of weather favorable for disease development has passed from the time of host removal and disinfection.
 - USDA APHIS or State regulatory official has completed surveillance activities on the surrounding host material.

RESIDENTIAL PROTOCOL VERSION 2.0

Figure 1. Diagram showing Destruction Block, Quarantine Block and Delimitation Survey



DB:

1. Inspect all host genera and sample any unhealthy plants
2. Destroy HAP plants ASAP
3. Sample Soil and water where it drains
4. Hold any HAP not destroyed for 90-days
5. Limit access

QB:

1. Inspect all host genera and sample any unhealthy plants
2. Sample Soil and water where it drains
3. All host genera, 90-day hold
4. Limit access

DS:

1. Inspect all host genera and sample any unhealthy plants
2. Sample water if necessary

RESIDENTIAL PROTOCOL VERSION 2.0

RELEASING THE SITE

Residential or Commercial landscape sites and their plants that have been placed under regulatory control may be released from regulatory control by USDA, APHIS or its designated authority after the quarantine period if the following three conditions are met:

1. Plants of HAP genera will not be replanted within a minimum of two (2) meters of the infested area (i.e. area of host plant removal) for a period of at least two (2) years.
2. There are no additional detections of *P. ramorum* on any plants at the site based on USDA, APHIS approved plant inspection, sampling, and testing protocols for the preceding quarantine period; and
3. Water and soil have been tested and found free of *P. ramorum* based on USDA, APHIS approved sampling and testing protocols for the preceding quarantine period.

Alternative Release Strategy:

A residential or landscape site may avoid a quarantine period, through a voluntary management decision, by:

- Perform delimiting survey and host genera found free of *P. ramorum*.
- Destroying everything (all plants, pots, media, etc.) in the 2 meter destruction block(s); and
- Destroying the HAP genera and plant parts in the 30 meter quarantine block(s) and
- Sample and test soil of destruction block(s) and quarantine block(s) and drainage or source water. If soil and water samples are found free of for *P. ramorum* the area can be released.

Revisit the residential or landscape site after approximately 90 days of conducive conditions and conduct a survey inspection of the residential or commercial site to include sampling of the soil in the destruction block (2 meter area).

RESIDENTIAL PROTOCOL VERSION 2.0

POST DISINFESTATION MONITORING

Sites that have been infested will continue to have the HAP monitored (inspected, sampled and tested) when disease expression is anticipated for the following 2 years after the site(s) has been released. These sites are not under any quarantine or regulatory action, unless there are additional detections.

RESIDENTIAL PROTOCOL VERSION 2.0

APPENDIX 1

APHIS List of Regulated Hosts and Plants Associated with *Phytophthora ramorum*

A current list may be found at the USDA APHIS PPQ website at
http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/

RESIDENTIAL PROTOCOL VERSION 2.0

APPENDIX 2

P. ramorum Questionnaire for Property Owner or Manager

1. Who owns the property? (name, address, phone number(s)). _____

2. Who purchased the plants? _____
3. Where were the plants(s) purchased? (name and address) _____
 - A. When were the plants purchased and planted? _____
 - B. Did you purchase any other plants from this same nursery?

4. Have you noticed any other problems with plants on your property? _____
5. Have you moved any of these or other nearby plants to a different location?

6. Did you move any plants here from a different location? _____
 - A. What types and varieties were they? (if host material proceed to question 11 & 12)

 - B. How long ago was that? _____
 - C. What is the address of that location?

7. Do you have a landscape company that did any planting for you? _____
 - A. What is the contact information for the landscape company?

8. Have you added any mulch, potting soil or top soil to the yard recently? _____
 - A. Where did you get this material? _____
9. Information on plant material for inspector visiting property:

RESIDENTIAL PROTOCOL VERSION 2.0

A. What is the variety and number of plants?

B. What is the condition of the plant material?

C. Have the suspect plants been trimmed or pruned?

D. How were the trimmings disposed of?

E. Did the plant material come in pots? _____.

F. Did you dispose of the pots or re-use them?

G. If the pots were reused or stored, describe how the pots were handled.

H. Where are the pots now? _____

RESIDENTIAL PROTOCOL VERSION 2.0

APPENDIX 3

Follow up Survey for Locations with Infected Plants

Locations that have been found to have infected plants will be monitored for two years as per the national survey protocol. The affected area will not be under any quarantine or regulatory control, unless additional outbreaks are detected.

Sudden Oak Death Property Owner or Manager Survey:

1. Date of plant collection: _____
2. Property Owner or Manager Name:

3. Location: _____
4. Name(s) and numbers of plants collected for destruction:
 - a. _____ # _____
 - b. _____ # _____
 - c. _____ # _____
 - d. _____ # _____
 - f. _____ # _____
 - g. _____ # _____
 - h. _____ # _____
 - i. _____ # _____
5. Where were the plants purchased?
 - a. _____ # _____
 - b. _____ # _____
 - c. _____ # _____
 - d. _____ # _____
 - f. _____ # _____
 - g. _____ # _____
 - h. _____ # _____
 - i.. _____ # _____
6. When were the plants purchased?
 - a. _____ # _____
 - b. _____ # _____
 - c. _____ # _____
 - d. _____ # _____
 - f. _____ # _____
 - g. _____ # _____
 - h. _____ # _____

RESIDENTIAL PROTOCOL VERSION 2.0

- i. _____ # _____
7. Any proof of purchase or documentation such as receipts, pot labels, etc...
List Here: _____
8. Survey types of host plants in the landscape and list names and numbers:
- | | | | |
|----|-------|---|-------|
| a. | _____ | # | _____ |
| b. | _____ | # | _____ |
| c. | _____ | # | _____ |
| d. | _____ | # | _____ |
| f. | _____ | # | _____ |
| g. | _____ | # | _____ |
| h. | _____ | # | _____ |
| i. | _____ | # | _____ |
9. Samples of *symptomatic* landscape hosts taken? Yes No
10. Soil samples taken? Yes No (plants still in pots)
11. Comments:

RESIDENTIAL PROTOCOL VERSION 2.0

APPENDIX 4

Cut Stump Treatments for *P. ramorum* Host and Associated Plants

(Contact the PPQ Regional Office and CPHST for guidance)

RESIDENTIAL PROTOCOL VERSION 2.0

APPENDIX 5

Diagnostics

Revised April 2007

Samples must be analyzed using a methodology approved by APHIS. See techniques posted at: http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/

RESIDENTIAL PROTOCOL VERSION 2.0

APPENDIX 6

Treatment and Disinfection for Residential or Landscaped Setting

Revised August 2009

The following techniques are approved by USDA APHIS PPQ for control of *P. ramorum* in residential and landscape sites found to contain plants infected with *P. ramorum*.

Infected Plants:

Note: Host and associated host plant (HAP) material, must be collected and incinerated or double bagged and deep buried in a site approved by USDA, APHIS or their delegated regulatory authority.

- **Incineration (burning to ash):** Infected plants, associated growth media, associated containers (i.e. pots and trays), all leaf debris in and around the area where plants were stored may be incinerated at a facility or other location (e.g. on site) approved by USDA and permitted within state and municipal statutes or regulations. Off site movement must be properly safeguarded and every effort to prevent plant debris or soil from being dislodged from the plants prior to incineration should be taken. Burning may be through open burning or in an incinerator.
- **Deep burial:** Infected plants, associated growth media, associated containers (i.e. pots and trays), all leaf debris in and around the area where plants were stored must be double bagged using plastic bags to at least a 4 mil thickness or greater and buried to a depth of no less than 2 meters to the top of the debris. The material must be buried at a USDA approved site, onsite, or in a municipal landfill, which will be undisturbed. Every effort to prevent plant debris or soil from being dislodged from the plants should be taken.
- **Steam sterilization:** Dry heat or steam commonly heated to internal temperatures of 212° F (100° C) for 30 minutes followed by burial in a landfill, or as otherwise detailed in the USDA Treatment Manual for “insect pests and pathogens in garbage”, Schedule T415b. http://www.aphis.usda.gov/ppq/manuals/port/Treatment_Chapters.htm

Non-Porous Surfaces:

Most disinfectants are not labeled for use in soil and are only useful for nonporous materials such as concrete floors, nursery pots, and plastic sheeting. A number of disinfectants are registered for use on nonporous surfaces that may effectively reduce populations of *Phytophthora* species. If it is practical, tools such as knives, pruners, water breakers, water wands and other implements used in the quarantine area should only be used in the quarantine area. The following table modified from <http://www.ehs.columbia.edu/decon.html> examines the effects of different classes of disinfectants on pathogenic microorganisms. This list is for explanation and information

RESIDENTIAL PROTOCOL VERSION 2.0

only. Few disinfectants are specifically labeled for *Phytophthora* species and are shown in **Bold**.

All labels for the disinfectants listed below must be strictly adhered to for maximum efficacy and environmental and worker safety.

Summary of Disinfectant Activities

Disinfectant	Trade names	Comments	Contact time
Alcohols (ethyl and isopropyl) 60-85%	Lysol Spray	Evaporates quickly so that adequate contact time may not be achieved, high concentrations of organic matter diminish effectiveness; flammable.	10-15 minutes
Phenolics (0.4%-5%)	Pheno-cen	Phenol penetrates latex gloves; eye/skin irritant; remains active upon contact with organic soil; may leave residue.	10-15 minutes
Quaternary Ammonium (0.5-1.5%)	Consan Triple Action 20 Physan 20 Green-Shield	Effective for non-porous surface sanitation (floors, walls, benches, pots). Low odor, irritation. Use according to labels.	10-15 minutes
Chlorine (100-1,000 ppm)	10% Clorox 10% Bleach	Inactivated by organic matter; fresh solutions of hypochlorite (Clorox) should be prepared every 8 hours or more frequently if exposed to sunlight; corrosive; irritating to eyes and skin. Exposure to sunlight further reduces hypochlorite efficacy. Keep solution in opaque container.	10-15 minutes

Water:

- **For dust abatement, fire suppression, and equipment cleaning:** Clorox (sodium hypochlorite) is labeled (EPA Reg. No 5813-50) for treatment of water (~50 ppm available chlorine) for controlling the spread of *Phytophthora spp.* via water used for dust abatement, fire suppression, and equipment cleaning. The active ingredient level must be measured from water collected at the sprinkler head.
- **For irrigation:** Chlorine levels of 2ppm or 2mg/liter or greater has been correlated with the control of *Phytophthora spp.* in re-circulated irrigation systems. Recirculated, non-

RESIDENTIAL PROTOCOL VERSION 2.0

municipal water must be chlorinated at an active chlorine concentration equal to or greater than 2 mg/liter of water and monitored to maintain the proper chlorine levels.

Soil and Potting Media:

- **Potting media:** Potting media must be heated such that the internal temperature in the center of the load reaches at least 180 degrees F for 30 minutes or treated with an approved fumigant as detailed below. Treatment must be conducted in the presence of an inspector.

- **Soil treatment:**
 - A load of soil being treated must be heated such that the temperature in the center of the load reaches at least 180 degrees F for 30 minutes.
 - Field soil treatments must be conducted in the presence of an inspector and treated with an approved fumigant listed below as per the label.
 - If considering the use of solarization for soil treatments contact the PPQ Regional Office and CPHST.

All fumigants are restricted use and must be applied according to labels by a licensed applicator. Any use of pesticides in any manner not listed on the label is unlawful.

Summary of Labeled Soil Fumigants

Fumigant	Trade names	Comments
Chloropicrin	Chlor-O-Pic Metapicrin Timberfume Tri-Clor	Often used in combination with methyl bromide due to its ability to be detected in small quantities.
Dazomet	Basamid	Methyl isothiocyanate (MITC) breaks down into cyanide gas. Granular formulation that is water activated. Requires careful soil preparation and incorporation into soil. All application must be made in accordance with labeling.
Metam-sodium	Busan 1020 Busan 1180 Busan 1236 Metam Vapam	Metam can be applied through irrigation. Tarping can increase efficacy. All application must be made in accordance with labeling.

RESIDENTIAL PROTOCOL VERSION 2.0

Fumigant	Trade names	Comments
Methyl Bromide	Tri-Con Terr-O-Gas Preplant Soil Fumigant Pic-Brom	Colorless and odorless. Usually combined in various concentrations with Chloropicrin (tear gas). Use is restricted due to ozone depletion potential.

Physical Treatment of Soil:

- Mitigation of infested soil in the destruction block can also be achieved by installing permanent impermeable, impervious barriers that consist of cement, concrete, or asphalt 3 inches in depth and extending 6 feet beyond the infested area. These barriers must be constructed so that no native soil. The barriers should be graded such that no standing water can be observed.

Equipment and Personnel:

- Access to infested areas and quarantine areas should be limited or minimized. Everyone entering and leaving the residential or commercial site must scrape off loose pieces of soil into the destruction block. Those working with, or in contact with suspected infested material (including plants), must wash hands using soap or approved disinfectant immediately after completion of task. There are no products currently labeled for use on porous materials for *Phytophthora* control.
- Any activity in the destruction block must be conducted wearing a disposable shoe covers and they must be disposed of immediately upon exiting from the area. The disposable shoe covers must be properly disposed of. If shoe covers are not used, shoes must be cleaned and disinfected upon leaving the area.
- The tires (or other parts in contact with the soil or plants, such as the bed of trucks) of vehicles must be cleaned of loose soil and plant debris and disinfested with the appropriate labeled products before leaving the infested site. If at all possible, vehicles should not be allowed in the destruction blocks. Any efficacious product labeled for use on non-porous surfaces may be used on tires or vehicle undercarriages.
- Do not visit other sites or areas in potentially contaminated work clothing and footwear.