Nursery Industry
BEST MANAGEMENT PRACTICES for Phytophthora ramorum
- to prevent the introduction or establishment in California nursery operations
Version 1.0

ENDORSEMENTS
CA Association of Nurseries and Garden Centers
Nursery Growers Association
CA Farm Bureau
San Diego Flower and Plant Association
Garden Rose Council
CA Oak Mortality Task Force
California Center for Urban Horticulture, UC Davis
Horticultural Research Institute

PHOTO ACKNOWLEDGEMENTS
KAREN SUSLOW, Hines Horticulture, Inc.
JOHN KELLER, Monrovia Growers
HEATHER SCHECK, Santa Barbara County Dept. of Agriculture
KEN PEEK, Alameda County Dept. of Agriculture
STEVE TJOSVOLD, University of CA Cooperative Extension
ANN CHASE, Chase Horticulture Research, Inc.
CHERYL BLOMQUIST, CA Department of Food and Ag

COVER PHOTO
Briggs Nursery in Bonsall, CA.
ERIC LARSON, photographer
The following voluntary recommended Best Management Practices (BMPs), designed for growers and/or interstate shippers of host and associated host plants of *Phytophthora ramorum* (*P. ramorum*), consist of biosecurity guidelines created to assist nursery crop producers in developing an effective monitoring and action plan to reduce the risks associated with *P. ramorum*. The control of *P. ramorum* is based on minimizing the risk of introduction and preventing the establishment of the pathogen within the nursery. The Horticultural Research Institute (HRI), the research arm of the American Nursery & Landscape Association (ANLA), convened a national working group to develop a basic menu of nationally applicable BMPs for *P. ramorum*. The group was comprised of diverse representatives from the nursery industry and key technical and research experts from the United States Department of Agriculture’s (USDA) Agricultural Research Service (ARS), the USDA Animal and Plant Health Inspection Service (APHIS), the Cooperative State Research Education and Extension Service (CSREES) and representatives of State Departments of Agriculture through the National Plant Board (NPB).

The national working group evaluated and fine-tuned existing BMP plans from California, Oregon and other regions. Individual management practices were considered for their conformance to a set of key “filters” or criteria including scientific validity, operational practicality, national relevancy, relevancy to multiple types of production, practicality in terms of cost and benefit and conformity with existing rules or regulations. Individual nurseries are encouraged to review these practices and apply some or all of them, depending upon their production systems, physical location, nursery type, regional climatic conditions, geographical location and the plants grown.

The BMPs are organized into five main sections including: Pest Prevention/Management, Training, Audits, Record Keeping and Documentation. Also, each individual BMP has a set of check boxes that can be used to denote if the nursery will employ that BMP (specific to nursery); will not employ that BMP (n/a); or if the BMP is required by current regulation (regulated).

The USDA APHIS has asked that interested states conduct a test pilot of these BMPs. Formal evaluations of the BMPs are currently being planned in Oregon and California, utilizing third-party evaluations and audits of the BMPs. The HRI working group will reevaluate and revise these BMPs as additional research and results from pilot programs become available. The BMPs, the supporting documents and any future modifications can be accessed at:

http://www.hriresearch/P.ramorumBMPs

---

**Background**

The following voluntary recommended Best Management Practices (BMPs), designed for growers and/or interstate shippers of host and associated host plants of *Phytophthora ramorum* (*P. ramorum*), consist of biosecurity guidelines created to assist nursery crop producers in developing an effective monitoring and action plan to reduce the risks associated with *P. ramorum*. The control of *P. ramorum* is based on minimizing the risk of introduction and preventing the establishment of the pathogen within the nursery. The Horticultural Research Institute (HRI), the research arm of the American Nursery & Landscape Association (ANLA), convened a national working group to develop a basic menu of nationally applicable BMPs for *P. ramorum*. The group was comprised of diverse representatives from the nursery industry and key technical and research experts from the United States Department of Agriculture’s (USDA) Agricultural Research Service (ARS), the USDA Animal and Plant Health Inspection Service (APHIS), the Cooperative State Research Education and Extension Service (CSREES) and representatives of State Departments of Agriculture through the National Plant Board (NPB).

The national working group evaluated and fine-tuned existing BMP plans from California, Oregon and other regions. Individual management practices were considered for their conformance to a set of key “filters” or criteria including scientific validity, operational practicality, national relevancy, relevancy to multiple types of production, practicality in terms of cost and benefit and conformity with existing rules or regulations. Individual nurseries are encouraged to review these practices and apply some or all of them, depending upon their production systems, physical location, nursery type, regional climatic conditions, geographical location and the plants grown.

The BMPs are organized into five main sections including: Pest Prevention/Management, Training, Audits, Record Keeping and Documentation. Also, each individual BMP has a set of check boxes that can be used to denote if the nursery will employ that BMP (specific to nursery); will not employ that BMP (n/a); or if the BMP is required by current regulation (regulated).

The USDA APHIS has asked that interested states conduct a test pilot of these BMPs. Formal evaluations of the BMPs are currently being planned in Oregon and California, utilizing third-party evaluations and audits of the BMPs. The HRI working group will reevaluate and revise these BMPs as additional research and results from pilot programs become available. The BMPs, the supporting documents and any future modifications can be accessed at:

http://www.hriresearch/P.ramorumBMPs
The following recommended Best Management Practices for nurseries without *P. ramorum* were developed using the North American Plant Protection Organization’s Regional Standard for Phytosanitary Measures (RSPM) Number 24.

I. Pest Prevention/Management
   a. Exclusion of Pathogen
   b. Moisture Management
   c. Nursery Layout
   d. Cleaning and Sanitation/
      Plant Debris Handling and Disposal
   e. Weed Control and Established Nursery Plants
   f. Inspection

II. Training

III. External Monitoring/Audits

IV. Records/Traceability

V. Documentation of Program Procedures

VI. Criteria for Interstate Shippers of Host and Associated Plants (HAP) of *P. ramorum*

VII. Definitions

VIII. Legal Disclaimer

IX. Acknowledgements

X. References

XI. BMP Record Keeping
Section I: Pest Prevention/Management

Exclusion of Pathogen

CONFIRM NURSERY STOCK IS PROPAGATED FROM MATERIALS OBTAINED ON SITE, OR THAT THE BUY-INS ARE RECEIVED FROM NURSERIES THAT ARE LICENSED AND/OR CERTIFIED ACCORDING TO ALL APPLICABLE PHYTOSANITARY LAWS AND REGULATIONS.

GOAL: REDUCE THE POTENTIAL INTRODUCTION AND SPREAD OF P. RAMORUM THROUGH NURSERY TRADE

RATIONALE: First line of defense - know your supplier. Grower priority should be to ensure that potentially contaminated stock is not purchased or allowed to enter the production site

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery practices
AVOID PRODUCT RETURNS OF NURSERY STOCK FROM A RECEIVER IN A QUARANTINED AREA OR FROM NURSERIES THAT ARE NOT UNDER *P. RAMORUM* COMPLIANCE. IF UNAVOIDABLE, ISOLATE THE MATERIAL AND INSPECT PLANTS FOR *P. RAMORUM* SYMPTOMS. CONTACT REGULATORY OFFICIAL IF SYMPTOMS ARE NOTED.

GOAL: REDUCE THE POTENTIAL INTRODUCTION AND SPREAD OF *P. RAMORUM* THROUGH NURSERY TRADE

RATIONALE: Avoids possible cross contamination. Returned stock may have been exposed to *P. ramorum* prior to return

REQUIREMENT FOR EXTERNAL AUDIT: Nursery map, Documentation of nursery practices
AVOID COMMINGLING INCOMING HOSTS AND ASSOCIATED PLANTS (HAP) WITH EXISTING STOCK.

GOAL: REDUCE THE POTENTIAL INTRODUCTION AND SPREAD OF P. RAMORUM THROUGH NURSERY TRADE

RATIONALE: Avoids contamination of clean with potentially diseased material. Assists with inventory control and tracking of plant material in the nursery

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery practices
FOR HIGH RISK (HR) BUY-INS, SUSPEND THE USE OF *PHYTOPHTHORA*-ACTIVE FUNGICIDES ON 10% OR 100 PLANTS, WHICHEVER IS FEWER, FOR A TWO-MONTH PERIOD. THIS IS TO DETERMINE IF FUNGICIDES THAT MAY HAVE BEEN USED BY THE SELLER WERE SUPPRESSING SYMPTOM EXPRESSION.

GOAL: REDUCE THE POTENTIAL INTRODUCTION AND SPREAD OF *P. RAMORUM* THROUGH NURSERY TRADE

RATIONALE: This recommendation correlates with Section I.a3 (on the previous page) and supplements isolation efforts

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery practices
Exclusion of Pathogen

**AUTHORIZED AND TRAINED PERSONNEL SHOULD VISUALLY INSPECT ALL INCOMING NURSERY STOCK (BUY-INS, TRANSFERS, AND RETURNS), REGARDLESS OF ORIGIN, FOR SYMPTOMS OF P. RAMORUM PRIOR TO INTRODUCTION INTO THE NURSERY FACILITY.**

**GOAL:** REDUCE THE POTENTIAL INTRODUCTION AND SPREAD OF P. RAMORUM THROUGH NURSERY TRADE

**RATIONALE:** Because not all areas of the country can be certified P. ramorum-free, this visual evaluation of off-site nursery stock can provide a major screening defense to the introduction of the pathogen

**REQUIREMENT FOR EXTERNAL AUDIT:** Documentation of nursery personnel training, Documentation of nursery practices
OFF LOAD INCOMING HR PLANT SHIPMENTS TO AN AREA THAT CAN BE CLEANED OF LEAFY DEBRIS. SWEEP INCOMING PLANT DEBRIS FROM THE RECEIVING AREA AND THE DELIVERY TRUCK. COLLECT DEBRIS AND DISPOSE OF APPROPRIATELY.

GOAL: REDUCE THE POTENTIAL INTRODUCTION AND SPREAD OF P. RAMORUM THROUGH NURSERY TRADE

RATIONALE: Basic sanitation to remove possible sources of disease inoculum. Leaf litter has been shown to be a potential source of introduction of inoculum

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery practices
MONITOR SANITATION PRACTICES OF DELIVERY TRUCKS THAT SHIP HR PLANTS. ASSURE THAT TRUCKS ARE PROPERLY CLEANED OF PLANT DEBRIS, INCLUDING MUD OR SOIL, FROM TIRES AND TRUCK BODY BETWEEN SHIPMENTS.

GOAL: REDUCE THE POTENTIAL INTRODUCTION AND SPREAD OF P. RAMORUM THROUGH NURSERY TRADE

RATIONALE: Trucks may be a source of inoculum if not cleaned properly

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery practices
AVOID OVERHEAD IRRIGATION OF HR PLANTS. IRRIGATE IN A MANNER TO AVOID PROLONGED LEAF WETNESS.

GOAL: MINIMIZE MOISTURE CONDITIONS CONDUCIVE TO P. RAMORUM

RATIONALE: Properly time irrigation events to reduce conditions favorable for disease development. Extended leaf wetness (such as overnight) is conducive to infection by the pathogen

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of irrigation practices
MONITOR, AND ANNUALLY TEST, UNTREATED IRRIGATION WATER FROM ANY SOURCE OTHER THAN A WELL OR A MUNICIPAL WATER SUPPLY TO CONFIRM THAT IT IS FREE FROM THE PATHOGEN.

GOAL: MINIMIZE MOISTURE CONDITIONS CONducIVE TO P. RAMORUM

RATIONALE: For growing operations that utilize open irrigation water sources (ponds, lakes, streams), or blend both well and surface water sources for irrigation purposes, proper water treatment (i.e., ozonation, chlorination or other water disinfection program) is recommended.

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of water sources and testing of sources if necessary.
DIVERT SOIL AND WATER MOVEMENT FROM ADJACENT PROPERTIES THAT ARE POPULATED WITH P. RAMORUM HOST PLANTS TO PREVENT CONTAMINATION OF THE NURSERY AND NEIGHBORING NURSERIES.

GOAL: MINIMIZE MOISTURE CONDITIONS CONducive TO P. RAMORUM

RATIONALE: Keep possible off-site contamination from entering the production location. Unless the off-site area has been properly surveyed and determined to be P. ramorum-free, the grower cannot assume that runoff from off site is not contaminated with spores of P. ramorum

REQUIREMENT FOR EXTERNAL AUDIT: Nursery site inspection
AVOID OR MINIMIZE ACCUMULATION OF STANDING SURFACE WATER IN HR PLANT BEDS.

GOAL: MINIMIZE MOISTURE CONDITIONS CONDUCIVE TO *P. RAMORUM*

RATIONALE: *Phytophthora spp.* are transmitted via water. Repeat finds occur more often in HR plant beds where standing water accumulates. The pathogen may potentially enter through the roots or by splashing onto leaf surfaces.

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery site inspection
REDUCE POTENTIAL INOCULUM DISPERsal FROM HIGH RISK (HR) PLANTS TO OTHER CROPS.

A. Create a physical barrier between HR plants and all other crops or
B. Create a two-meter break between HR plants and all other crops or
C. Interplant with non-host plants to the genus level

GOAL: REDUCE POTENTIAL INTRODUCTION AND MINIMIZE THE SPREAD OF P. RAMORUM THROUGH NURSERY OPERATIONS

RATIONALE: Many positive plants have been associated with nurseries that have also had positive Camellias and/or Rhododendrons

REQUIREMENT FOR EXTERNAL AUDIT: Nursery site inspection
Section I: Pest Prevention/Management

C Nursery Layout

BREAK UP LONG SECTIONS OF HOST AND ASSOCIATED PLANTS (HAP) WITH NON-HAP MATERIAL TO THE GENUS LEVEL.

GOAL: REDUCE POTENTIAL INTRODUCTION AND MINIMIZE THE SPREAD OF *P. RAMORUM* THROUGH NURSERY OPERATIONS

RATIONALE: Mixing or alternating of HAP and non-HAP plant material in production beds may help eliminate large contiguous monocultures of plants that are *P. ramorum* susceptible

REQUIREMENT FOR EXTERNAL AUDIT: Mapping of stock location

DON’T!

Don’t lay out large contiguous monocultures. Break up long sections of HAP with non-HAP material to the genus level.
MAINTAIN A SEPARATE CULL PILE FOR HR PLANTS AND ASSOCIATED POTTING MIX. DO NOT REUSE SOIL FROM HR PLANTS. IF INFESTED PLANTS ARE FOUND, THE PILE MUST BE QUARANTINED AND TREATED, OR DISPOSED OF, ACCORDING TO REGULATORY REQUIREMENTS.

GOAL: REDUCE POTENTIAL INTRODUCTION AND MINIMIZE THE SPREAD OF *P. RAMORUM* THROUGH NURSERY OPERATIONS

RATIONALE: Proper sanitation measures reduce the risk of spreading the pathogen in the recycled soil within and outside the nursery

REQUIREMENT FOR EXTERNAL AUDIT: Nursery site inspection
Section I Pest Prevention/Management

Cleaning & Sanitation/Plant Debris Handling & Disposal

**BMP 5**

**REMOVE AND DISPOSE OF LEAF DEBRIS FROM HR PLANT PRODUCTION AREAS.**

**GOAL:** REDUCE POTENTIAL INTRODUCTION AND MINIMIZE THE SPREAD OF *P. RAMORUM* THROUGH NURSERY PRACTICES

**RATIONALE:** General sanitation practices

**REQUIREMENT FOR EXTERNAL AUDIT:** Nursery site inspection
AFTER EVERY CROP ROTATION, DISINFECT PROPAGATION MIST BEDS, SORTING AREAS, CUTTING BENCHES, MACHINES AND TOOLS TO MINIMIZE THE SPREAD OR INTRODUCTION OF PATHOGENS. REFERENCE USDA LIST OF APPROVED DISINFECTANT OPTIONS

GOAL: REDUCE POTENTIAL INTRODUCTION AND MINIMIZE THE SPREAD OF P. RAMORUM THROUGH NURSERY PRACTICES

RATIONALE: Basic sanitation practices should be followed using registered products in accordance with label instructions to reduce possible points of entry/contamination in the production cycle

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery practices and personnel training
IF A KNOWN *P. RAMORUM*-INFESTED AREA HAS BEEN VISITED, WASH AND SANITIZE SHOES, TOOLS AND VEHICLES THAT MAY HAVE CONTACTED CONTAMINATED SOILS BEFORE TRAVELING TO DISEASE-FREE AREAS.

GOAL: REDUCE POTENTIAL INTRODUCTION AND MINIMIZE THE SPREAD OF *P. RAMORUM* THROUGH NURSERY PRACTICES

RATIONALE: The pathogen can be introduced into the nursery production site by individuals who have visited infested areas. If an individual has visited infested areas, appropriate sanitation measures (washing and steam cleaning of trucks, etc.) as recommended by regulatory authorities should be undertaken.

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery practices
USE NEW OR CLEAN AND PROPERLY DISINFESTED POTS FOR HR PLANT PRODUCTION. REFERENCE USDA LIST OF APPROVED DISINFECTANT OPTIONS

GOAL: REDUCE POTENTIAL INTRODUCTION AND MINIMIZE THE SPREAD OF P. RAMORUM THROUGH NURSERY PRACTICES

RATIONALE: This measure reduces the potential of any unknown residual contamination by P. ramorum on the container and possible further dissemination of the pathogen throughout the nursery. New pots should be stored and handled in such a manner as to avoid contact with potential sources of P. ramorum. Recycled pots should be thoroughly cleaned of any residual substrate and disinfected before reuse. Recycled pots should also be stored and handled in such a manner as to avoid contact with potential sources of P. ramorum.

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery sanitation practices

Don’t use dirty pots for HR plants. Use new or clean and properly disinfected pots for HR plant production.
ENSURE RUNOFF FROM ALL CULL PILES IS DIRECTED AWAY FROM MEDIA COMPONENTS, MEDIA MIXING AREA, AND GROWING BEDS TO PREVENT CONTAMINATION. ENSURE CULL PILE IS CLEARLY SEPARATED FROM MEDIA MIX COMPONENTS.

GOAL: REDUCE POTENTIAL INTRODUCTION AND MINIMIZE THE SPREAD OF P. RAMORUM THROUGH NURSERY PRACTICES

RATIONALE: Reduces risk of cross contamination. If growers cull infested material, sanitation methods should be established to clean and disinfect trucks, wagons, and tools that are used to move infested material

REQUIREMENT FOR EXTERNAL AUDIT: Nursery site inspection

DON’T!

Don’t allow cull piles to drain towards growing beds. Direct runoff from all cull piles away from media components, media mixing area and growing beds
FOR PLANTS THAT ARE PRONE TO DISEASES, CHEMICALLY TREAT CROP IN THE FIELD PRIOR TO TAKING CUTTINGS, TAKE CUTTINGS ONLY FROM HEALTHY PLANTS AND DIP CUTTINGS IN AN APPROVED DISINFECTANT SOLUTION BEFORE STICKING.

GOAL: REDUCE POTENTIAL INTRODUCTION AND MINIMIZE THE SPREAD OF *P. RAMORUM* THROUGH NURSERY PRACTICES

RATIONALE: Treatment of stock plants with registered disinfectant(s) before cutting of the propagation material can reduce the possible introduction of contaminated plant material into the propagation cycle and protect the open wounds from possible pathogen infection

REQUIREMENT FOR EXTERNAL AUDIT: Nursery pesticide application reports
Section I. Pest Prevention/Management

Cleaning & Sanitation/Plant Debris Handling & Disposal

**INSERT A BARRIER (E.G. RAISED BENCHES, GRAVEL LAYER) BETWEEN NATIVE SOIL AND CONTAINERS TO PREVENT SPLASH DISPERSAL OF PATHOGEN FROM POTENTIALLY INFECTED GROUND.**

**GOAL:** REDUCE POTENTIAL INTRODUCTION AND MINIMIZE THE SPREAD OF *P. RAMORUM* THROUGH NURSERY PRACTICES

**RATIONALE:** To protect container media from contamination by the pathogen through lateral movement of water or contact with infested soil

**REQUIREMENT FOR EXTERNAL AUDIT:** Nursery site inspection

---

Don't place containers directly on native soil. Insert a barrier between the native soil and the container to prevent splash dispersal
ENSURE THAT GROWING MEDIA IS FROM AN AREA KNOWN TO BE FREE FROM *P. RAMORUM*.

**GOAL:** REDUCE POTENTIAL INTRODUCTION AND MINIMIZE THE SPREAD OF *P. RAMORUM* THROUGH NURSERY PRACTICES

**RATIONALE:** Given that *P. ramorum* may contaminate potting media, it is critical for the grower to reduce any sources of contamination in the substrates such as peat, bark, and other organic components

**REQUIREMENT FOR EXTERNAL AUDIT:** Documentation of growth substrate origin

Don’t use infested soil. Use growing media components that are from a *P. ramorum*-free area
Adequately control weeds on the nursery site as they may potentially harbor the pathogen.

Goal: Reduce the potential for inoculum buildup of *P. Ramorum* in weeds and established nursery plants.

Rationale: Maintaining a weed-free production site and surrounding area may eliminate possible reservoirs of *P. ramorum* pathogen. Since it is not known if insect vectors can also carry *P. ramorum*, weed removal will reduce opportunities for insect infestations and contamination in the nursery.

Requirement for external audit: Nursery site inspection.

Don’t allow excess weediness. Control weeds on the nursery site as they may potentially harbor the pathogen.
REMOVE OVER STORY OR UNDER STORY OF KNOWN HOSTS OF *P. RAMORUM* GROWING IN THE NURSERY LANDSCAPE OR MONITOR REGULARLY FOR THE PRESENCE OF *P. RAMORUM*.

GOAL: REDUCE THE POTENTIAL FOR INOCULUM BUILDUP OF *P. RAMORUM* IN WEEDS AND ESTABLISHED NURSERY PLANTS.

RATIONALE: Reduce contamination by *P. ramorum* into the production site by establishing a regular monitoring program for HAP within the nursery. Monitoring programs should be based upon the time of year when the pathogen best expresses disease symptoms within a specific growing region.

REQUIREMENT FOR EXTERNAL AUDIT: Nursery site inspection
INSPECT HR PLANTS MONTHLY THROUGHOUT THE GROWING SEASON. SEE SECTION II.

GOAL: REGULARLY INSPECT PLANTS IN AND AROUND NURSERY TO ENSURE EARLY DETECTION OF *P. RAMORUM* INFECTION.

RATIONALE: *Camellia* and *Rhododendron* species have comprised the majority of the total positive plants in nursery settings throughout the regulated area.

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery practices
REGULATORY OFFICIALS ARE REQUIRED TO INSPECT HR PLANTS TWICE A YEAR.

GOAL: REGULARLY INSPECT PLANTS IN AND AROUND NURSERY TO ENSURE EARLY DETECTION OF *P. RAMORUM* INFECTION.

RATIONALE: *Camellia* and *Rhododendron* species have comprised the majority of the total positive plants in nursery settings throughout the regulated area.
ROUTINELY MONITOR INCOMING HAP (BUY-INS, RETURNS, TRANSFERS) FOR SYMPTOMS OF *P. RAMORUM*.

GOAL: REGULARLY INSPECT PLANTS IN AND AROUND NURSERY TO ENSURE EARLY DETECTION OF *P. RAMORUM* INFECTION.

RATIONALE: First line of defense - grower priority should be to ensure that potentially contaminated stock is not allowed to enter the production site.

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery practices.
ROUTINELY INSPECT HAP IN THE LANDSCAPE ON THE GROWING GROUNDS AND IN THE SURROUNDING AREA FOR SYMPTOMS OF *P. RAMORUM*.

GOAL: REGULARLY INSPECT PLANTS IN AND AROUND NURSERY TO ENSURE EARLY DETECTION OF *P. RAMORUM* INFECTION.

RATIONALE: HAP plant material should be visually screened on a regular basis for any abnormalities. Special attention should be given to those times when the pathogen is most prevalent.

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of nursery practices
Section II: Training

**NURSERY PERSONNEL TO ATTEND ANNUALLY ONE OR MORE APHIS-APPROVED *P. RAMORUM* TRAINING SESSIONS CONDUCTED BY QUALIFIED PERSONNEL OR DOCUMENT SELF-TRAINING VIA THE APHIS-APPROVED WEBSITE.**

**GOAL:** ENHANCE PROMPT DISEASE RECOGNITION.

**RATIONALE:** Responsibility for management of *P. ramorum* on nursery site should be the responsibility of a specified group of trained nursery personnel. These individuals should be trained in all aspects of the management of the disease. Special attention should be given to staying informed of new research findings regarding the disease and any changes in regulations regarding plant sampling, testing or shipping of product. Training is available through the USDA, US Forest Service, CA Oak Mortality Task Force, state agriculture departments, county agricultural commissioners offices or through selected universities.


Or on line at COMTF website: [http://www.suddenoakdeath.org](http://www.suddenoakdeath.org)

**REQUIREMENT FOR EXTERNAL AUDIT:** Documentation of training
EDUCATE NURSERY PERSONNEL TO RECOGNIZE AND REPORT PEST OR DISEASE PROBLEMS.

GOAL: ENHANCE PROMPT DISEASE RECOGNITION.

RATIONALE: Personnel should be trained to not only look for symptoms of P. ramorum, but also to look for any symptoms of plant abnormality in the production system. Early detection is critical for plant disease management.

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of training.
Section II: Training

EDUCATE APPROPRIATE EMPLOYEES AND MANAGERS ABOUT THEIR COMPANY’S IMPLEMENTED BMPS.

GOAL: ENHANCE PROMPT DISEASE RECOGNITION.

RATIONALE: Educating nursery employees is essential to insure that BMPs are implemented at their site.

REQUIREMENT FOR EXTERNAL AUDIT: Documentation of training
Regulatory officials are required to conduct an annual nursery inspection of all plants in the nursery with a focus on P. ramorum-like symptoms. Inspection includes mandatory testing of at least 40 symptomatic samples.

Goal: Regularly inspect plants in and around the nursery to ensure earliest possible detection of P. ramorum infection.

Rationale: Since the host list continues to expand all plants need to be inspected for P. ramorum-like symptoms. Current Federal regulations require a minimum of 40 samples to be taken and tested.

Requirement for external audit: Annual nursery inspection report.
Section IV: Records/Traceability

MAINTAIN FOR A MINIMUM OF TWO YEARS: ACCURATE SHIPPING DOCUMENTATION IDENTIFYING HAP PRODUCT, AMOUNT, DATE AND ORIGIN OF RECEIVER FOR THE PURPOSE OF IDENTIFYING TRACE BACKS AND TRACE FORWARDS.

GOAL: KEEP RECORDS OF INCOMING AND OUTGOING PLANTS FOR THE PURPOSE OF IDENTIFYING WHERE PLANTS ORIGINATED AND WHERE PLANTS HAVE BEEN SENT IN THE EVENT THE NURSERY IS FOUND POSITIVE FOR P. RAMORUM.

RATIONALE: Proper documentation protects not only the grower, but also the receiver of plant material. Production personnel should investigate methods for quick recording and retrieval of documentation. Disease monitoring and scouting results should be integrated with inventory control to provide rapid trace forward and back of suspected infested nursery stock.

REQUIREMENT FOR EXTERNAL AUDIT: Nursery inspection of shipping records

ESTABLISH A TRACKING SYSTEM FOR MOVEMENT OF HR PLANTS WITHIN THE NURSERY, FROM PROPAGATION (OR BUY-IN) TO SALES.

GOAL: KEEP RECORDS OF INCOMING AND OUTGOING PLANTS FOR THE PURPOSE OF IDENTIFYING WHERE PLANTS ORIGINATED AND WHERE PLANTS HAVE BEEN SENT IN THE EVENT THE NURSERY IS FOUND POSITIVE FOR P. RAMORUM.

RATIONALE: This will help to facilitate the delimitation survey if one is required on the production site.

REQUIREMENT FOR EXTERNAL AUDIT: Written nursery plan which tracks the movement of HR plants within the nursery
GOAL: PROVIDE PROOF THAT THE NURSERY’S BMPS ARE DOCUMENTED AND IMPLEMENTED.

TYPES OF INFORMATION TO INCLUDE IN A NURSERY’S MANUAL ON BEST MANAGEMENT PRACTICES:

1) Employee training records
2) Internal systems review procedure
3) List of implemented BMPs that are appropriate for your site based upon the nurseries specific production systems, physical location, nursery type, regional climatic conditions and the plants grown.
### Section VI: Criteria for interstate shippers of host and associated plants (HAP) of *P. ramorum*

<table>
<thead>
<tr>
<th>Quarantined</th>
<th>Regulated County/State</th>
<th>Non-HAP grower in regulated state</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CURRENTLY IN PLACE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Nursery Inspection of all plants. Focus on <em>P. ramorum</em>-like symptoms and mandatory testing of a minimum of 40 samples</td>
<td>Annual Nursery Inspection of all plants. Focus on <em>P. ramorum</em>-like symptoms and mandatory testing of a minimum of 40 samples</td>
<td>Annual Nursery Inspection of all plants. Focus on <em>P. ramorum</em>-like symptoms and testing of symptomatic plants</td>
</tr>
<tr>
<td>Monthly inspection of HAP by county and/or state ag. dept., sampling and testing as needed – as required in 7CFR 301.92 (Federal Quarantine for <em>P. ramorum</em>)</td>
<td>Mandatory/regulated BMPs as outlined in USDA <em>P. ramorum</em> Compliance Agreement*</td>
<td>Mandatory/regulated BMPs as outlined in USDA <em>P. ramorum</em> Compliance Agreement*</td>
</tr>
<tr>
<td>Mandatory/regulated BMPs as outlined in USDA <em>P. ramorum</em> Compliance Agreement*</td>
<td><em>USDA <em>P. ramorum</em> Compliance Agreement</em></td>
<td><em>USDA <em>P. ramorum</em> Compliance Agreement</em></td>
</tr>
<tr>
<td><em>USDA <em>P. ramorum</em> Compliance Agreement</em></td>
<td><em>USDA <em>P. ramorum</em> Compliance Agreement</em></td>
<td>*On list of approved non-host shippers</td>
</tr>
<tr>
<td>*Buy-ins from nurseries with <em>P. ramorum</em> Compliance agreements or inspected and sampled based on visual symptoms</td>
<td>*Buy-ins from nurseries with <em>P. ramorum</em> Compliance agreements or inspected and sampled based on visual symptoms</td>
<td></td>
</tr>
<tr>
<td>*Sampling and testing of HAP during time of year when pathogen is most prevalent</td>
<td>*Sampling and testing of HAP during time of year when pathogen is most prevalent</td>
<td></td>
</tr>
<tr>
<td>*Record keeping for 24 months</td>
<td>*Record keeping for 24 months</td>
<td>*Record keeping for 24 months</td>
</tr>
</tbody>
</table>

**PROPOSED ADDITIONS FOR HIGH-RISK PLANTS**

| 2 times/year inspection of high risk plants by county or state ag. dept. and test symptomatic plants | 2 times/year inspection of high risk plants by county or state ag. dept. and test symptomatic plants | |
| Selected BMPs (see attached) Those BMPs that are appropriate for a nursery depending upon the type of nursery, physical and geographical location, environment, plants grown... as determined by the nursery and 3rd party auditor (e.g. state agriculture dept) | Selected BMPs (see attached) Those BMPs that are appropriate for a nursery depending upon the type of nursery, physical and geographical location, environment, plants grown... as determined by the nursery and 3rd party auditor (e.g. state agriculture dept) | |
1. **HAP – Host and Associated Plants:**
   Host and Associated host plants listed on the official “APHIS List of Host Plants (HAP): Regulated Hosts and Plants Associated with Phytophthora ramorum”.

2. **HR – High Risk Plants:**
   All species and cultivars of *Camellia* and *Rhododendron* and in the future any other plants that demonstrate the same level of risk.

---

**Legal Disclaimer**

Although the information in these BMPs is believed to be reliable and accurate, they are provided without warranties of any kind, either express or implied, including but not limited to warranties of the accuracy or completeness of information for any particular purpose. Most specifically, adherence to these BMPs is not a guarantee or warranty that introduction of *P. ramorum* will be prevented; rather, these BMPs seek to identify ways in which the introduction or spread of *P. ramorum* may be minimized or controlled. The technical implications of any information or guidance contained in the BMPs may vary widely based on the specific facts involved and should not be used as a substitute for consultation with professional and competent advisors. The BMPs do not necessarily address all applicable health and safety risks and precautions with respect to particular materials, conditions, or procedures in specific applications of any technology. Consequently, HRI recommends also consulting applicable standards, laws, regulations, suppliers of materials, and material safety data sheets for information concerning safety and health risks and precautions and compliance with then-applicable laws and regulations. The use of BMPs is at the user’s own risk.

HRI does not endorse or recommend the use of, nor does it attempt to determine the merits of, any specific technology or technology provider through the BMP. The type of work described in the BMPs should be performed by trained professionals, and federal, state, and municipal laws should be consulted. HRI shall not be liable in the event of any conflict between the BMPs and any law, regulation, and/or ordinance relevant to prevention of *P. ramorum*. Mention of trade names or commercial products does not constitute endorsement or recommendation of use by HRI. The names, trademarks, and logos of HRI may not be used in advertising appearing in these BMPs materials may not be used in any advertising or publicity, or otherwise indicate the sponsorship or affiliation of the HRI with any product or service, without the express written permission of HRI.
These suggested BMPs were developed by the HRI *P. ramorum* industry working group consisting of representatives from the Oregon Association of Nurseries, the California Association of Nursery and Garden Centers, the Horticultural Research Institute and nursery production businesses in California and Oregon. Additional input was provided through review processes with USDA – ARS, USDA – APHIS, state department of agriculture plant regulatory agencies and land-grant university researchers.

1. **NAPPO (North American Plant Protection Organization)**
   [http://www.nappo.org/Standards/NEW/RSPMNo.24-e.pdf](http://www.nappo.org/Standards/NEW/RSPMNo.24-e.pdf)

2. **UNITED STATES DEPARTMENT OF AGRICULTURE**
   Animal and Plant Health Inspection Service,
   7 CFR Part 301, [Docket No. 01-054-3],RIN 0579-AB82
   *Phytophthora ramorum*; Quarantine and Regulations
<table>
<thead>
<tr>
<th>IMPLEMENTATION DATE</th>
<th>PROCEDURES FOLLOWED</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMP 1</td>
<td></td>
</tr>
<tr>
<td>BMP 2</td>
<td></td>
</tr>
<tr>
<td>BMP 3</td>
<td></td>
</tr>
<tr>
<td>BMP 4</td>
<td></td>
</tr>
<tr>
<td>BMP 5</td>
<td></td>
</tr>
<tr>
<td>BMP 6</td>
<td></td>
</tr>
<tr>
<td>BMP 7</td>
<td></td>
</tr>
<tr>
<td>BMP 8</td>
<td></td>
</tr>
<tr>
<td>IMPLEMENTATION DATE</td>
<td>PROCEDURES FOLLOWED</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>9 BMP</td>
<td></td>
</tr>
<tr>
<td>10 BMP</td>
<td></td>
</tr>
<tr>
<td>11 BMP</td>
<td></td>
</tr>
<tr>
<td>12 BMP</td>
<td></td>
</tr>
<tr>
<td>13 BMP</td>
<td></td>
</tr>
<tr>
<td>14 BMP</td>
<td></td>
</tr>
<tr>
<td>15 BMP</td>
<td></td>
</tr>
<tr>
<td>16 BMP</td>
<td></td>
</tr>
<tr>
<td>IMPLEMENTATION DATE</td>
<td>PROCEDURES FOLLOWED</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>IMPLEMENTATION DATE</td>
<td>PROCEDURES FOLLOWED</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>25 BMP</td>
<td></td>
</tr>
<tr>
<td>26 BMP</td>
<td></td>
</tr>
<tr>
<td>27 BMP</td>
<td></td>
</tr>
<tr>
<td>28 BMP</td>
<td></td>
</tr>
<tr>
<td>29 BMP</td>
<td></td>
</tr>
<tr>
<td>30 BMP</td>
<td></td>
</tr>
<tr>
<td>31 BMP</td>
<td></td>
</tr>
<tr>
<td>32 BMP</td>
<td></td>
</tr>
<tr>
<td>33 BMP</td>
<td></td>
</tr>
<tr>
<td>34 BMP</td>
<td></td>
</tr>
</tbody>
</table>