



**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
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Briggs Nursery in Bonsall, CA.
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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>

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a Exclusion of Pathogen



1 **BMP**

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.

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

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

Exclusion of Pathogen

a



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

BMP 2

REGULATED

SPECIFIC TO NURSERY

N/A

a Exclusion of Pathogen



3 BMP

AVOID COMMINGLING INCOMING HOSTS AND ASSOCIATED PLANTS (HAP) WITH EXISTING STOCK.

REGULATED

SPECIFIC TO NURSERY

N/A

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

Exclusion of Pathogen

a



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

BMP 4

REGULATED

SPECIFIC TO NURSERY

N/A

a Exclusion of Pathogen



5 BMP

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

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

Exclusion of Pathogen

a



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

BMP 6

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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REGULATED

SPECIFIC TO NURSERY

N/A

a Exclusion of Pathogen



BMP

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.

REGULATED

SPECIFIC TO NURSERY

N/A

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

Moisture Management

b



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

BMP 8

REGULATED

SPECIFIC TO NURSERY

N/A

b Moisture Management



9 **BMP**

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

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

Moisture Management

b



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

BMP 10

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

b Moisture Management



1 1 BMP 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

REGULATED

SPECIFIC TO NURSERY

N/A

Nursery Layout

C



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

BMP 12

REGULATED

SPECIFIC TO NURSERY

N/A

C Nursery Layout



3 BMP

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

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

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

Nursery Layout

C



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

BMP 14

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

d Cleaning & Sanitation/Plant Debris Handling & Disposal



5 BMP

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

REGULATED

SPECIFIC TO NURSERY

N/A

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

Cleaning & Sanitation/Plant Debris Handling & Disposal

d



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 OPTIONS²

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

BMP 16

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

d Cleaning & Sanitation/Plant Debris Handling & Disposal



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.

REGULATED

SPECIFIC TO NURSERY

N/A

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

Cleaning & Sanitation/Plant Debris Handling & Disposal

d



USE NEW OR CLEAN AND PROPERLY DISINFESTED POTS FOR HR PLANT PRODUCTION. REFERENCE USDA LIST OF APPROVED DISINFECTANT OPTIONS²

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

BMP 18

REGULATED

SPECIFIC TO NURSERY

N/A

Don't use dirty pots for HR plants. Use new or clean and properly disinfected pots for HR plant production



DON'T!

d Cleaning & Sanitation/Plant Debris Handling & Disposal



19 BMP

REGULATED

SPECIFIC TO NURSERY

N/A

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

Cleaning & Sanitation/Plant Debris Handling & Disposal

d



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

BMP 20

REGULATED

SPECIFIC TO NURSERY

N/A

d Cleaning & Sanitation/Plant Debris Handling & Disposal



21 **BMP**

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

REGULATED

SPECIFIC TO NURSERY

N/A

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!



Don't place containers directly on native soil. Insert a barrier between the native soil and the container to prevent splash dispersal

Cleaning & Sanitation/Plant Debris Handling & Disposal

d



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

BMP 22

REGULATED

SPECIFIC TO NURSERY

N/A

Don't use infested soil. Use growing media components that are from a *P. ramorum*-free area



DON'T!

e

Weed Control & Established Nursery Plants



23 BMP

ADEQUATELY CONTROL WEEDS ON THE NURSERY SITE AS THEY MAY POTENTIALLY HARBOR THE PATHOGEN.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

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!



Don't allow excess weediness. Control weeds on the nursery site as they may potentially harbor the pathogen

Weed Control & Established Nursery Plants



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

BMP 24

REGULATED

SPECIFIC TO NURSERY

N/A

f Inspection



25 BMP

INSPECT HR PLANTS MONTHLY THROUGHOUT THE GROWING SEASON. SEE SECTION II.

REGULATED

SPECIFIC TO NURSERY

N/A

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

BMP 26

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

f Inspection



27 **BMP**

ROUTINELY MONITOR INCOMING HAP (BUY-INS, RETURNS, TRANSFERS) FOR SYMPTOMS OF *P. RAMORUM*.

REGULATED

SPECIFIC TO NURSERY

N/A

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

BMP 28

REGULATED

SPECIFIC TO NURSERY

N/A



29 BMP

REGULATED

SPECIFIC TO NURSERY

N/A

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

On line at the USDA website: http://www.aphis.usda.gov/plant_health/plant_pest_info/pram

Or on line at COMTF website: <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

BMP 30

REGULATED

SPECIFIC TO NURSERY

N/A



31 BMP

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

REGULATED

SPECIFIC TO NURSERY

N/A

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

BMP 32

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

33 **BMP**

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

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

34 **BMP**

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REGULATED	SPECIFIC TO NURSERY	N/A

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.

Criteria for interstate shippers of host & associated plants (HAP) of *P. ramorum*

Quarantined	Regulated County/State	Non-HAP grower in regulated state
CURRENTLY IN PLACE		
Annual Nursery Inspection of all plants. Focus on <i>P. ramorum</i> -like symptoms and mandatory testing of a minimum of 40 samples	Annual Nursery Inspection of all plants. Focus on <i>P. ramorum</i> -like symptoms and mandatory testing of a minimum of 40 samples	Annual Nursery Inspection of all plants. Focus on <i>P. ramorum</i> -like symptoms and testing of symptomatic plants
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 <i>P. ramorum</i>)		
Mandatory/regulated BMPs as outlined in USDA <i>P. ramorum</i> Compliance Agreement*	Mandatory/regulated BMPs as outlined in USDA <i>P. ramorum</i> Compliance Agreement*	
*USDA <i>P. ramorum</i> Compliance Agreement	*USDA <i>P. ramorum</i> Compliance Agreement	*On list of approved non-host shippers
*Buy-ins from nurseries with <i>P. ramorum</i> Compliance agreements or inspected and sampled based on visual symptoms	*Buy-ins from nurseries with <i>P. ramorum</i> Compliance agreements or inspected and sampled based on visual symptoms	
*Sampling and testing of HAP during time of year when pathogen is most prevalent	*Sampling and testing of HAP during time of year when pathogen is most prevalent	
*Record keeping for 24 months	*Record keeping for 24 months	*Record keeping for 24 months

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*”.

(http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/downloads/pdf_files/usdaprlist.pdf)

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**Section VIII**

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)**
Regional Standards for Phytosanitary Measures No. 24 – Integrated Pest Risk Management Measures for the Importation of Plants for Planting into NAPPO Member Countries, October 16, 2005.
<http://www.nappon.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
http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/downloads/pdf_files/fr_doc_07-892.txt

IMPLEMENTATION DATE	PROCEDURES FOLLOWED
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BMP 1

BMP 2

BMP 3

BMP 4

BMP 5

BMP 6

BMP 7

BMP 8

IMPLEMENTATION DATE PROCEDURES FOLLOWED

9 BMP

10 BMP

11 BMP

12 BMP

13 BMP

14 BMP

15 BMP

16 BMP

IMPLEMENTATION DATE	PROCEDURES FOLLOWED
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BMP 17

BMP 18

BMP 19

BMP 20

BMP 21

BMP 22

BMP 23

BMP 24

IMPLEMENTATION DATE PROCEDURES FOLLOWED

25 BMP		

26 BMP		

27 BMP		

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34 BMP		