

***Phytophthora ramorum* Technical Working Group responses to third set of questions**

<p>1) If the <i>P. ramorum</i> mock nursery research site is established and the necessary site components (lab and field) are in place to conduct research: (a) Would you have an interest in conducting research at the site and submitting a proposal? (b) Do you know of any funding sources or projected funding support, other than APHIS, that could be utilized/leveraged to support this research effort for the suggested 5-year time period or beyond? (c) If there was a source of funds for research, what would you propose to investigate?</p>		
No.	Comments	Suggestions/Recommendations
1.	(a) <i>No, because we are a state regulatory agency. However, we are very interested in any results from research projects.</i>	(b) <i>CSREES and NRCS. CSREES has integrated pest management grant dollars available.</i> (c) <i>1. What role does potting media really play in disease movement/spread between and within nurseries? 2. How important is oil contamination for spread/persistence within a nursery? 3. Which BMPs really work? 4. Which provides superior risk mitigation for consumers, a systems approach to managing <i>P. ramorum</i> and other <i>Phytophthoras</i> in nurseries or the current “test our way out” strategy? 5. Three critical control points have been identified. What other CCPs are out there, particularly for the introduction of non-native species? 6. Can <i>P. ramorum</i> survive the tissue culture process (e.g. cuttings taken from an asymptomatic plant eventually enter the production system)? 7. How important are root infections to disease spread and which hosts can support such infections?</i>
2.	(a) <i>No</i>	(b) <i>IR4 would probably support fungicide testing and since this would be one of the few places permitted for actual whole plant trials out doors, support should be available. Also, SAF-ANA (Society of American Florist and American Nursery Associations) has developed an initiative with USDA to support floriculture and nursery research.</i>
3.		(c) <i>Rich Snieszko and Susan Frankel (US Forest Service) may be interested in doing some genetic resistance work with both tan oak and California live oak with propagules that are acorns or rooted-cuttings.</i>
4.	(a) <i>Yes</i>	(b) <i>CPHST would seem logical since they need a scientific basis for making regulations. Also, HRI, new multistate project, regional IPM grants, Rhododendron Foundation, Oregon Association of Nurseries, Oregon Department of Agriculture, CDFA, WSNLA, US Forest Service, and Canadian Dept. of Food and Agriculture. Many of these sources are already being tapped for related work, so this funding would come at the expense of other projects. Travel to and from the research site from out of state will consume a considerable part of the research funding. There would need to be a collaborating plant pathology researcher on-site to coordinate and oversee experiments.</i> (c) <i>Epidemiological studies on pathogen infection, spread, and survival. Physiological studies with inoculated trees to determine how <i>P. ramorum</i> causes disease. Screening species or cultivars for resistance.</i>

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5.	(a) No	(b) <i>USDA Specialty Crops Research Initiative (SCRI) Program.</i> (c) <i>Efforts should be directed toward identifying how to eliminate P. ramorum from contaminated substrate in a nursery below an infected plant in-pot. As well as a better understanding of how roots of ornamental plants become infected with P. ramorum; how plant to plant infection occurs through the root zone.</i>
6.	(a) <i>No. There are many research needs and a number of lists of projects have been generated over the years. The size of the nursery, the number of cooperators and funding will dictate the number of projects that can be conducted.</i>	(b) <i>HRI</i> <i>Projects should be reviewed, ranked and approved by a technical advisory committee of regulators, researchers and knowledgeable industry representatives. As to projects, I would like to see: 1. The validation of DEFRA's in-field use of a RT-PCR. This would facilitate speedy and sufficient delimitation surveys. 2. Investigate the utility of using Kalmia and Viburnum davidii as indicator or sentinel plants. These plants may be able to help growers identify a problem more quickly. 3. Investigate the symptomatology of Pieris and try to uncover some diagnostic characteristics of infection. We have yet to identify good, reliable expressions of infection. Perhaps we need to look at different analyses, such as spectral analysis, chlorophyll or nutrient analysis, etc. 4. Investigate solarization as a method of substrate mitigation. Several studies have shown that solarization is as effective as fumigants in suppressing soil-borne Phytophthora infestations, even in cold, cloudy WA and OR.</i>
7.	(a) <i>Naturally and unavoidably, the site is not very accessible to those on the East coast because of the distance, but I fully support others in the area conduction investigations.</i>	(c) <i>Here in the east, we are interested in the survival potential of various forms of P. ramorum (including as a saprophyte or harmless endophyte on resistant hosts). The hybridization potential and practical methods for elimination of P. ramorum from a relatively small contaminated natural environment. What is the fate over time of a small population if no apparent pathogenic activity is detected and nothing is done to ameliorate? Work out West may not tell us anything specific about the fates under eastern conditions, but it should help at least define the critical elements favoring or discouraging long-term survival.</i>
8.	(a) <i>Some members of CRIS project would be interested- Nina Shishkoff and Tim Widmer who are working on ways to reduce P. ramorum in soil using various chemicals and antagonists.</i>	(c) <i>Mitigation of P. ramorum from soil and soil water sources. Spread of P. ramorum from plant to plant in a nursery setting. Sporulation capacity of P. ramorum on nursery plants.</i>

2)Regarding regulations:		
(a) Is it possible to scientifically define an optimum geographic unit for regulation of <i>P. ramorum</i> at the within-state level? (We realize it may be difficult not to consider the political, enforcement issues related to this question based on boundaries, but please consider the question as it is framed). Possible elements to consider: defining features, such as terrain, watersheds, geography, vegetation/ hosts, different climate extremes in close proximity, location/size of positive sites, or other?		
(b) What would be the science based conditions or circumstances to determine and maintain the defined unit to be regulated?		
No.	Comments	Suggestions/Recommendations
1.	<p>(a) <i>This is difficult because there are so many factors involved. In CA, where no or very little disease management is being conducted, the worst case scenario for disease spread in the natural environment has been jumps up to 33.5 km. In OR, where the disease is being treated aggressively and the host composition and environmental conditions are different, epidemiological studies show it can jump up to 4 km. In FL, MS, GA and WA, P. ramorum has been recovered from soil within nurseries or in nearby water sources. Yet, there appears to be little spread into the natural environment from these sources (for now).</i></p> <p><i>We have a better handle on what happens when the pathogen gets into the forest canopy than if the pathogen is found only in soil or water. Without knowing the importance of those soil and water infestations, it would be hard to define a boundary for those states.</i></p>	<p><i>However, if we use the data from CA and OR, we can assume that the disease may make jumps up to 33.5-km in the natural environment if left untreated and up to 4-km in the natural environment if an aggressive management program is in place. Then, it would be a matter of deciding if those distances provide an adequate buffer zone for disease spread, or if those distances should be doubled/tripled/etc. Whether or not this should be applied to states where the infestation is only within soil or water remains to be seen.</i></p> <p>Possible elements to consider... <i>In OR and CA the common factor seems to be host presence. In CA, the presence of California bay laurel is the primary driving factor for new infections/spread. In OR, where the pathogen spore load is too low to infect bay, the driving factor is tanoak. Moisture levels (humidity, rain or fog) play a significant role. As a result, science based conditions would be hosts present, average moisture levels within the area and disease management strategies.</i></p>
2.	<p>(a) <i>Based on the disease triangle, geographic units where climate is unfavorable for infection and hosts do not occur could be a basis for wildland and forest areas. Nurseries have their own favorable microclimate so they will continue to need regulation or approved best management practices (self-regulation).</i></p>	
3.	<p>(a) <i>No, I think it has to be decided on a case by case basis, taking the defining features stated above into account (terrain, watersheds, geography, vegetation, climate, etc.).</i></p>	<p>(b) <i>A local/regional committee of scientists and state department of agriculture members should make a recommendation to APHIS on a case-by-case basis. The decision should be based on terrain, watersheds, local weather patterns (fog distribution), vegetation/hosts, roads, public access/land recreational use, and transportation and processing of infected plant material (location of mills or green waste treatment facilities).</i></p>
4.	<p>(a) <i>Yes, it is done frequently with fruit flies.</i></p>	<p><i>However, you would need to come up with a standard survey protocol that would give you assurance that you could find it if it was there. That is more problematic with plant disease because they are so environmentally dependent.</i></p>
5.	<p>(a) <i>Possibly. It may have to be modified if there are no efforts to suppress P. ramorum and the area expands.</i></p>	<p>Possible elements to consider... <i>Wind patterns</i></p>

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6.	<p>(a) <i>Where P. ramorum occurs in a wild-land setting, we believe it is possible AND desirable to define an optimum geographic unit for P. ramorum.</i></p> <p>(b) <i>The science base is our understanding of hosts, climate, and the spread gradient.</i></p>	<p><i>However, it requires a well supported infrastructure for a committed early detection program, AND, even with that in place, the recognition of an "uncertainty gradient" around positive sites.</i></p> <p><i>Species composition (host availability) and climatic factors should be used to define an area of concern. This would then be refined to reflect what is currently known about the dispersal gradient AND a desire for this boundary to remain somewhat stable for several years.</i></p> <p><i>Watershed boundaries, at the appropriate scale for the infested area may be the best choice for geographically defining the area; watersheds and sub-watersheds are mapped and named according to national standards and these geo-databases are readily available. Plus, they are in keeping with some biological aspects of pathogen movement; we do see spread patterns up, or down, drainages. In Oregon, use of traditional survey boundaries (Township/Range/Section) appears to work well, particularly when it is desirable to exclude portions of a watershed or include only portions of a watershed. These boundaries are also standard and readily available.</i></p>
7.	<p>(a) <i>Scientifically defining a quarantine zone is a laudable goal but the enormous number of environmental variables that would need to be assessed will make this very difficult. Additionally, our knowledge base is still fairly limited and thus our precision will be somewhat suspect. The pathogen is likely to behave in unpredictable ways on new hosts and/or in different environments.</i></p>	<p><i>Based on these realities, I would lean to regulating an entire watershed, plus a two to five mile buffer around that watershed that uses easily identifiable landmarks, such as roads, power lines, etc. Intensive ground-based perimeter surveys would need to be initiated to validate quarantine zones. Bordering watersheds would need to be surveyed continually to detect potential spread. Stream baiting can be used to identify watersheds that have on-going infections. There are issues with seasonality, yet stream baiting is probably the most cost-effective and sensitive tool for survey. Aerial survey can be used if a good indicator, such as tanoak, is present, but that will not always be the case.</i></p>
8.	<p>(a) <i>The key invasive trigger for regulation appears to be the presence of impacts that reflect "sudden oak death" as opposed to the presence of the pathogen. As such, regulation of areas should be triggered by the presence of disease resulting in environmental or economic impacts. Where these are observed regulations should be applied to protect similar eco-zones by regulating the pathways of movement of the pathogen from the infested area.</i></p>	<p><i>The infested area could be defined as an easily identifiable area using known physical landmarks in which the pathogen is known to occur, which is surrounded by areas where the pathogen does not occur or is not known to cause disease conditions. Environmental and economic impacts could be defined as loss or potential loss of important plant species. So such a definition would regulate the areas where P. ramorum occurs in CA and OR, but would not trigger area regulation at nursery sites found with positive plants or where the pathogen was found on plants in the wild where it was not causing any substantial impact (e.g. where infected under-story plants are found in a wild-land area without any impacts to those plants or the surrounding plants).</i></p>

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9.	<i>Defining the regulated area strictly on a scientific basis and then maintaining it will require a high level of confidence in the methods and the execution of the surveys to back it up. I'm not certain we are there on either one yet. I have a higher level of confidence in the methods than the uniform and responsible execution in all geographic areas where it is needed. Even if funds are made available for widespread survey, it seems capabilities and motivation are lacking in some locations.</i>	
10.	<i>(a) Perhaps consider regions based on concentrations of nurseries, as well as concentration of known host species. Certain arid regions without host species might be excluded.</i>	<i>(b) Numbers of known host species, potential for P. ramorum to get around in waterways or by human means such as hikers or movement of green municipal waste, temperature, and moisture conditions known to be conducive to P. ramorum.</i>