

***Phytophthora ramorum* Detection Surveys for Forests in the United States¹**

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Abstract

Diseases caused by *Phytophthora ramorum* in forest landscapes of North America are presently confined to areas of the Pacific coast in the states of CA and OR. However, the vulnerability of other ecosystems is suggested by the discovery in Europe and the U.K. of disease in hosts which are abundant in oak-dominated ecosystems of eastern North America; successful greenhouse inoculation trials of these and other potential eastern tree and shrub hosts; and brisk domestic and international trade in woody ornamental hosts. Overlay analysis was used to project low, moderate or high risk of *P. ramorum* diseases to U.S. forests using spatial estimates of overstory and understory host presence and density, climatic variables, and potential pathways of pathogen introduction (Smith and others 2002). The results showed a band of high risk along the length of the Pacific coast including WA, OR and CA, which included currently infested areas, but most of the high-risk area was in the East, centered in the Southern Appalachian Mountains.

Federal and state forest management agencies in seven eastern states encompassing most of the high risk area joined in pilot tests of early detection survey methods in 2003. Objectives were to field test survey methodology, develop diagnostic capacity, and determine *P. ramorum* status. The risk map guided sampling intensity. *Rhododendron* spp. and *Kalmia latifolia* were examined for foliar symptoms and *Quercus* spp. bark for bleeding cankers on 4-100 meter transects per survey location. Diagnosis for the presence of *P. ramorum* was by nested PCR (Hayden and others 2004) conducted on symptomatic tissue at laboratories located in six of the seven cooperating states. Foliar samples consisted of a 10-leaf composite while bark samples came from single cankers. Quality assurance of diagnostic results was

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accomplished on replicate samples from half of all transects at a separate laboratory. Over 1,100 bark and foliage samples were collected from the forested perimeter of 54 woody ornamental nurseries and from 118 general forest areas during the growing season of 2003 (Table 1). *P. ramorum* was not detected in any sample.

Survey methods were slightly modified and implemented in a greatly expanded survey in 2004 in response to the discovery that *P. ramorum*-infected ornamental nursery stock had been shipped throughout the United States during the previous year. The target host list was expanded to eight foliar and three bark host genera. Top survey priority was assigned to the perimeters of trace forward woody ornamental nurseries. A total of 36 states encompassing all of the projected high and moderate risk area conducted surveys in 2004. The cumulative total of locations surveyed is now 1,119, and 5,633 symptomatic tissue samples have been tested. *P. ramorum* was detected by these methods during 2004 only in two samples from *Q. agrifolia* growing in Golden Gate Park, San Francisco, CA. This area is in the heart of the CA quarantine area surrounded by the infested counties of Marin, Contra Costa, Alameda and San Mateo. These results strongly suggest that *P. ramorum* is not native to eastern North American oak forests. Further, they demonstrate that the pathogen is not yet widely established in forest landscapes outside of currently regulated areas on the Pacific coast, even in close proximity to woody ornamental nurseries located in high risk areas receiving infected stock.

Table 1—Number of locations surveyed, samples collected, and diagnostic results for *Phytophthora ramorum* detection surveys in U.S. forests in 2003 and 2004.

Year of survey	Location type	Number of locations	Number of samples	<i>P. ramorum</i> positive
2003	Nursery perimeter	54	279	0
	Forest	118	837	0
	Subtotal	172	1,116	0
2004	Nursery perimeter	681	3,207	0
	Forest	266	1,310	2 ¹
	Subtotal	947	4,517	2
Grand total		1,119	5,633	2

¹*P. ramorum* detected in San Francisco County, CA

References

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