Monitoring *Phytophthora ramorum* Distribution in Streams Within Coastal California Watersheds[1]

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Abstract

One hundred eighty-seven sites were established in perennial watercourses and sampled for one to four years between 2004 and 2007 to monitor for the presence of *Phytophthora ramorum* throughout coastal central and northern California watersheds as well as portions of the Sierra Nevada mountain range. In 2007, 132 sites were monitored, including 65 new sites. The majority of the monitored watersheds have limited or no *Pr* at this time, but are near the epidemic range of *P. ramorum* and/or are considered high-risk for invasion by *P. ramorum.* Three currently infested watersheds in Sonoma, Humboldt, and Monterey Counties were included as a baseline for successful recovery of *Pr*. *Rhododendron* leaves were placed in mesh bags and secured in watercourses for one- to three-week intervals to bait for *Phytophthora* species. Recovered symptomatic leaves were plated on *Phytophthora*-selective medium (PARP-H) and monitored microscopically.

Phytophthora ramorum has been detected at 37 total stream monitoring sites, including all sites with a priori knowledge of nearby forest infestation. *Phytophthora ramorum* was detected at 23 streams sites without prior knowledge of adjacent forest infestation in Humboldt, Contra Costa, Mendocino, Monterey, and Santa Cruz counties. Forest infestations have thus far been confirmed at only nine of these sites; surveys are underway to identify the source(s) of inoculum for the other sites. Additionally, *P. ramorum* was recovered as far as 25km downstream from known forest infestations. This year (2007) was an unusually dry year in California which impacted our recovery of *P. ramorum* from watercourses. *Phytophthora ramorum* was detected in only 15 streams this year; seven of those were new sites for 2007. We recovered no *P. ramorum* from four streams that were positive for *P. ramorum* in 2006. At the most heavily infested sites, the frequency and quantity of recovery of *P. ramorum* was greatly reduced in 2007.

Stream monitoring has extended the southern range of *Pr* in Monterey County and the northern range in Humboldt County. All sites in the Sierra Nevada remain negative for *Pr*. With culturing and molecular sequencing we have identified several other *Phytophthora* species within these watersheds; *P. gonapodyides* is the most commonly detected species and was isolated from at least 60 sites. Streams were monitored year-round in 2004 and 2005 and revealed a distinct seasonality associated with *P. ramorum* recovery. Therefore, in 2006 and 2007 watersheds were monitored monthly, February through June, during the peak seasonal period.

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