

Disease Ecology of *Phytophthora ramorum* in Redwood Forests in the California Coast Ranges¹

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Phytophthora ramorum, commonly known as sudden oak death (SOD), infects a whole suite of hosts, ranging from oaks, to conifers, to herbs, causing lethal branch or stem cankers, as well as non-lethal foliar and twig infections. In the US, the disease is found on host species (in other words, tanoaks, oaks, redwood, and bay) from the Big Sur coastline in Monterey County, California to Curry County, Oregon, with most *P. ramorum* confirmations and collections being within 30 km of the Pacific coastline. Given its wide host range *P. ramorum* is associated with a number of forest types throughout coastal California and Oregon. Included in these forest types are coast redwood forests with redwood and many associated species in this forest type as hosts of *P. ramorum*. Symptoms and signs on hosts in coast redwood forests vary from host to host. On redwood *P. ramorum* causes needle lesions, cankers on small branches, and tip dieback of sprouts. A total of 120 plots in four locations (30 plots/location) have been established in redwood forests along the California coast ranges to study the epidemiology and ecology of *Phytophthora ramorum* in this forest ecosystem. Our plots represent a north-south gradient of *P. ramorum* populations from Sonoma to Monterey Counties. Our study sites in Sonoma and Marin counties fall into the central redwood forest subregion while our study sites in Santa Cruz and Monterey counties fall into the southern redwood forest subregion. All four locations share similar climate with cool and wet fall, winter, and early spring; conditions favorable for *P. ramorum* which appears to sporulate most actively during December to May. Disease incidence in these four redwood forest locations range from 19 to 32 percent, with three to seven percent of redwoods infected with *P. ramorum*. However, no mortality has been observed to be associated with this disease. Many redwood infected individuals are seedlings, saplings, or sprouts. In two highly infested *P. ramorum* stands, two large redwood individuals (= 45 m tall) were sampled. Samples were taken from the upper, mid, and lower canopy of these trees, in addition bark was also collected. No *P. ramorum* was recovered from any of the needle or bark material from these large individuals. In a canopy contribution experiment we find that redwood becomes infected, will sporulate while the infection is new, but disease generally does not progress much past a small needle or branch lesion. Of course cumulative, year to year infections in *P. ramorum* infested forests may have an effect on redwood individuals and populations. High incidence of *P. ramorum* and mortality of many of the associated species in these forests may lead to structural and compositional changes that will subsequently effect forest dynamics and other ecosystem processes in coastal California redwood forests.

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