

Patterns of Tanoak Acorn Production in *Phytophthora ramorum* Infested and Uninfested Stands in Big Sur, California, With Insights From Girdled Tanoaks¹

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Abstract

Although tanoak (*Lithocarpus densiflorus*) acorns are a valuable source of food for many species of wildlife few data on tanoak acorn production exist. We conducted studies of acorn production in tanoaks to understand the potential impact of *Phytophthora ramorum* on acorn availability to wildlife. In 2002 we established 3-ha seed-trap grids in redwood-tanoak habitat to estimate acorn production at the stand level. We established one grid in Pfeiffer Big Sur State Park (PBS), where *P. ramorum* has caused high levels of tanoak morbidity and mortality, and another in the Landels-Hill Big Creek Reserve (BCR), where *P. ramorum* has not yet been found. In 2004, we established an additional 3-ha grid in Julia Pfeiffer Burns State Park (JPB), where *P. ramorum* is present, but most tanoaks are still asymptomatic. Each grid consisted of an array of 0.5-m² seed traps placed at 25-m intervals, and was checked weekly during the period of acorn fall (Sept-Dec). To estimate acorn production by individual trees, we also identified 25 focal trees at our study sites in PBS and BCR, and 40 focal trees at our site in JPB. For each focal tree, we used a spotting scope to sample 5 m² of crown for acorns in late summer, and monitored two 0.5-m² seed traps placed beneath the crown. Focal trees at the infested site in PBS significantly out-produced those at BCR in both 2003 and 2004 (Wilcoxon Rank Sum; P 's < 0.01). Because several of the more productive trees in PBS were clearly dying from Sudden Oak Death (SOD) in this period, we hypothesized that their high levels of acorn production may have been at least partly a reproductive response to infection with *P. ramorum*. To examine whether girdling by *P. ramorum* infections may lead to increased reproductive effort in tanoaks, we studied acorn production in tanoaks that had been mechanically girdled in Whitethorn, Humboldt County, CA, in January 2003. Because tanoak acorns require a full year to develop, acorns produced in 2004 were from the first crop of flowers fertilized after girdling. On 31 August 2004, we conducted visual surveys of acorn production in 20 girdled and 20 ungirdled trees at the study site. For each tree, two observers using binoculars conducted simultaneous 15-sec counts of acorns in the crown. Both counts were averaged to

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provide an estimate of acorn production. Acorn counts of girdled trees (mean \pm SE = 21.1 \pm 3.0 acorns/15 sec) were significantly higher than acorn counts of ungirdled trees (mean \pm SE = 3.8 \pm 2.2 acorns/15 sec; Wilcoxon Rank Sum, $P < 0.0001$). These results suggest that infection by *P. ramorum* could theoretically trigger increased acorn production in trees girdled by the pathogen. To better understand the relationship between infections and acorn production in tanoaks, we are monitoring symptom progression in our focal trees at our three study sites in Big Sur, as we continue to measure acorn production in these trees. We are also analyzing data from a 2004 survey of acorn production in 300+ tanoaks in infested and uninfested stands in Big Sur, to understand patterns of spatial synchrony in tanoak acorn production. Collectively, these data will provide us with a clearer picture of natural patterns of acorn production in tanoaks, and changes in these patterns that may result from SOD.