Exploring Interactions among Disease, Fuel Loads, and Fire Intensity in Sonoma County Oak Woodlands

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Understanding the impacts of disease and fire on forested ecosystems is a major challenge facing scientists, land managers, policy makers and landowners. Due to difficulty in predicting wildfire, few studies of ecological effects of fire are based on both pre- and post-fire data. The goal of our research is to use a large scale and long-term plot network with both pre- and post-fire data in eastern Sonoma County to determine the ecological impacts of an exotic pathogen (*Phytophthora ramorum*) and wildfire on oak-woodland forest communities.

We aim to answer the following questions: 1) Do plots with higher inoculum loads and disease prevalence have greater pre-fire fuel loads? 2) Do plots with greater mortality due to disease have greater burn severity? and 3) How do disease and wildfire restructure community composition and vegetation recovery post-fire?

In 2003, 197 15 x 15 plots were established within a 275 km^2 heterogeneous region in eastern Sonoma County to study *P. ramorum* (Meetenmeyer et al. 2008). Every two years until 2016, measurements of microclimate, disease prevalence, tree growth, mortality and survival of the three most abundant host species, coast live oak (Quercus *agrifolia*), California black oak (*Quercus kelloggii*), and California bay laurel (*Umbellularia californica*) were taken. In 2016, microclimate and fuels loads were quantified using standard forestry protocols (Brown 1974). In 2017, the Central LNU (Lake Napa Unit) Complex fires burned 44,806 ha in Sonoma, Napa and Lake Counties during which approximately half of these study plots burned. In 2018, microclimate data, tree mortality and survival, and fuel loads were quantified across 95 plots (51 burned, 44 unburned). In burned plots, we observed a higher level of root sprouting in *U. californica* post-fire than in oak species. Preliminary results exploring fuel loads and fire indicate that duff depth has a significant effect on fire intensity ($LRX^2 = 4.15$, $p = .0416$). In addition, the interaction between *U. californica* disease prevalence and total downed woody debris is also significant ($LRX^2 = 4.397$, $p = .0360$). Current and future work will continue to explore these relationships and assist with management of oak-woodlands in light of future drought and increased fire risk.

References

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