Tree mortality in Blue Oak Woodland during extreme drought in Sequoia National Park

Authors: Adrian J. Das, Nicholas J. Ampersee, Anne H. Pfaff, Nathan L. Stephenson & Tedmond J. Swiecki.
Madróño, 2019, 66(4): 164-175

Summary by: Gabriel Santiago Ortiz Barbosa, Ph.D. candidate Plant Pathology. University of California Riverside (UCR). gorti010@ucr.edu

Significance Statement

Blue oak has been the focus of conservation efforts of California woodlands. Current work by Das and colleagues shows that blue oak is particularly susceptible to drought which, coupled with a lack of recruitment and increasingly warming climate, might lead to unviable populations in the future. I found this study relevant for current species conservation efforts in California as drought events and increasing temperatures are becoming more prevalent every year.

Summary:

Das and colleagues assessed blue oak populations inside Sequoia National Park throughout areas of blue oak woodland alliance. This type of woodland is characterized by the presence of blue oak (*Quercus douglasii*), interior live oak (*Q. wislizeni*), California buckeye (*Aesculus californica*), California ash (*Fraxinus dipetala*), and mountain mahogany (*Cercocarpus betuloides*). Woodland plant species such as the blue oak are a fundamental part of the ecosystem and they currently face multiple threats.
Prior research shows that blue oak seedling populations will not be able to sustain current ones in the future. Some reasons are that smaller trees must compete with other species under shrinking habitats, fire suppressed land, and changes in land use. Also, a warming climate increases drought events and reduces suitable areas where trees can grow and survive.

In their research, Das and his collaborators surveyed 30 plots in Sequoia National Park. Researchers took note of the size and species of the trees to identify any differences in their response to drought. They also compared their results with those obtained before the 2012–2016 drought to determine how it affected tree mortality. For their estimates, researchers also included dead trees and used observations on leaf and twig retention to determine which trees had died more recently.

Interestingly, their results showed that 18% of the recently dead trees were oaks. The number of dead trees is 3–5 times higher in the current assessment when compared with pre-drought datasets. Their observations on foliage and twig retention showed that 14% of all trees had died recently.

Their results confirm there has been recent drought mortality in blue oaks since nearly 20% of them have recently died. Drought affected less other woodland species like the California buckeye and the California ash. It is still important to remember that in prior data sets, blue oaks had smaller pre-drought populations compared to the ones found in this study.

Das and collaborators found that a substantial percentage of blue oak succumbed during drought periods in Sequoia National Park. In the long term, these mortality events can have drastic consequences for the regeneration of the woodlands. Ecosystems like this one are particularly susceptible to drought and warming climate. Continuous monitoring of adult trees is required to design future conservation and management strategies.