

Hotter, more frequent droughts threaten California's iconic blue oak woodlands

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2016 drought in California triggered widespread tree cover loss and die-offs of a variety of species in the region. A new study in the open access journal *Frontiers in Climate* is the first to show that California's iconic blue oak (*Quercus douglasii*) woodlands have also decreased by more than 1,200 km². By another metric, which reflects the altered or deteriorating condition of the tree cover, the blue oak range has lost over 600 km² in addition. These findings highlight the need to raise awareness about the vulnerability of these ecosystems and to adapt conservation strategies to increasing climate extremes.

"Our findings indicate that droughts that last several years, and which occur along with warmer than historically normal temperatures, pose serious threats to the blue oak woodlands," says first author Dr. Francis Dwomoh, of ASRC Federal Data Solutions, a contractor to the US Geological Survey Earth Resources Observation and Science Center in the United States. "Acting in concert with wildfires, these harsher climatic conditions may lead to major tree cover loss, with [negative consequences](#) on the plants and wildlife that depend on them, as well as the goods and services we derive from this ecosystem."

Endemic to California

Blue oak woodlands are only found in California and they are considered one of the largest remaining examples of native old-growth woodlands (pre-European settlement) in the region. This ecosystem is also one of

the most biologically diverse in California, and it is home to more than 300 vertebrate animal species.

To better understand how this ecosystem has been responding to climate warming and associated disturbances such as wildfires, the research team used new models of land change based on the extensive record from the Landsat satellite series to specifically estimate both complete tree cover loss as well as conditional change. Conditional change—which shows partial disruption or degradation—indicates the health, productivity and susceptibility of the woodlands. But past studies have not had the resources to distinguish between these two states.

Major woodland loss, even in absence of fires

The team combined the new annual data from the U.S. Geological Survey Land Change Monitoring, Assessment and Projection (LCMAP) project with climate and wildfire records in the timeframe of 1985—2016. From this, they found that the 2012—2016 drought was associated with tree cover loss and conditional change both with and without forest fires. Unsurprisingly, the loss due to fire was particularly high during the driest and hottest years.

Given that these results are based on models and satellite measurements, fieldwork would provide a more complete picture of the state of these woodlands. Nevertheless, this approach, along with the LCMAP data that is available for 48 states in the US, may provide a useful tool for monitoring future changes and developing conservation strategies in California and elsewhere.

"We hope that our research findings will be useful for identifying and prioritizing the most vulnerable areas of the woodlands for appropriate management interventions," explains Dwomoh. "Furthermore, our results might be helpful to plan for more resilient blue oak woodlands

and similar landscapes as the harsher climatic conditions of 2012—2016 are likely to be more common in the future."

More information: Hotter Drought Escalates Tree Cover Declines in Blue Oak Woodlands of California, *Frontiers in Climate*, [DOI: 10.3389/fclim.2021.689945](https://doi.org/10.3389/fclim.2021.689945) , www.frontiersin.org/articles/10.3389/fclim.2021.689945/full

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