

# Drought and climate change fuel high-elevation California fires, study finds

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A small fire in this high-elevation Sierra Nevada forest was followed by a beetle infestation, which killed trees and left the forest more vulnerable to an even larger wildfire. Credit: U.S. Forest Service

Wildfires in California's fabled Sierra Nevada mountain range are increasingly burning high-elevation forests, which historically have seldom burned, reports a team of researchers led by the John Muir Institute of the Environment at the University of California, Davis.

The phenomenon—likely driven by [climate change](#), forest-management practices and other factors—may influence the rate at which forests in this ecosystem are altered by the [effects of climate change](#), the researchers suggest. It also may have implications for how forests are restored after fires.

Findings from the study, which analyzed data spanning 105 years, are reported July 23 in the journal *Ecosphere*, published online by the Ecological Society of America. The open-access article is available online.

## **Several high-Sierra fires now occur annually**

"The increase of higher-elevation forest fires is yet another harbinger of climate change," said lead investigator Mark Schwartz, a professor of environmental science and policy as well as director of the John Muir Institute of the Environment at UC Davis.

"And with California currently in the midst of a four-year drought, low snowpack in the mountains and related forest stress are further increasing the chances of large, destructive fires that move high into the Sierra," he said.

Schwartz and colleagues found that early in the 20th century, Sierra Nevada forest fires rarely burned above the 8,000-foot elevation. At that time, fires primarily occurred at lower elevations, where forest fuel was drier and more abundant. Over the past three decades, however, several fires each year have burned at or above the 8,000-foot level.

Warming temperatures associated with climate change may be increasing tree density in the high, subalpine forests, building up the amount of fuel in those forests while also reducing its moisture content, the researchers suggested. Additionally, reduced efforts in recent decades to extinguish fires at the upper elevations may be contributing to the trend, they say.

## Expected impacts of high-elevation fires

Because fire is a primary driver of forest change in the Sierra Nevada, the increase of wildfires at higher elevations may speed the impacts of changing climate on forest composition, structure and function, Schwarz noted.

More fires at the high elevations could accelerate shifts in vegetation, destroying existing growth and increasing opportunities for lower-level plant and tree species to migrate upward, he said.

"The findings will likely not impact the way high-elevation forest fires are managed, because safeguarding human life and protecting property, will continue to dominate how [forest fires](#) are managed," Schwartz said. "We suspect, however, that the study results may influence how forest managers respond in restoring a forest after a fire," he said.

He noted that these restoration decisions include whether or not to seed locations that have burned and which species to seed in restoration efforts.

**More information:** "Increasing elevation of fire in the Sierra Nevada and implications for forest change." *Ecosphere* 6:art121–art121.

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