

# 79 years of monitoring demonstrates dramatic forest change

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Long-term changes to forests affect biodiversity and how future fires burn. A team of scientists led by Research Ecologist Dr. Eric Knapp, from the U.S. Forest Service's Pacific Southwest Research Station, found dramatic differences in forests today compared to historic conditions prior to logging and fire suppression. The team conducted their research in the Forest Service's Stanislaus-Tuolumne Experimental Forest on the Stanislaus National Forest in the central Sierra Nevada, remeasuring three large historical plots originally established in 1929 to evaluate the effects of different logging methods. Trees were counted and their diameters measured across entire plots and in neighboring unlogged areas with the same fire history. Understory vegetation (tree seedlings, shrubs, and leafy plants) was quantified to determine changes over a 79-year period. They also collected fire scar samples from nearby stumps and dead trees to pinpoint dates of previous forest fires.

As in many forested areas in the western U.S., fire is much less frequent than it once was. Results showed that the study area had not burned since 1889. Prior to 1889, the forest burned on average every six years.

The forest currently contains 2.4 times more trees than it did in 1929—mostly in the small and intermediate size classes. The excess density was nearly identical in the plots logged in 1929 and plots without a history of logging, suggesting that over the long-term other factors, including [fire suppression](#), may be exerting more influence than past logging on forest density and the current susceptibility to uncharacteristically severe fire. Historical logging removed many of the

largest trees and often targeted the most fire-resistant pines. Very large trees were still less abundant than in the old-growth condition in 1929. The forest today also contains more fir and cedar and fewer pines than it once did. Shrubs, which provide food and cover for wildlife, covered 29 percent of the forest floor in 1929. Currently, the same shrubs cover only two percent of the [forest floor](#) —a decline that appears to be the result of higher tree density.

"The forest changes we found in this study are emblematic of similar changes that have occurred in the absence of fire throughout the western U.S., and help to explain why fires such as the nearby Rim Fire burn as intensely as they now do," said Dr. Knapp.

The plots measured in this study are among the oldest known to still exist on Forest Service lands in California, and the historical data showing what the forest once looked like provide valuable information about how to restore greater fire resilience and improve biodiversity in forests today.

**More information:** The full report can be found at: [treearch.fs.fed.us/pubs/45212](https://treearch.fs.fed.us/pubs/45212)

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