

Publication Brief for Resource Managers

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Prescribed Fires Can Have Long-Term Effects on Sierra Nevada Forest Structure

The effects of prescribed fire are often judged by changes in forest structure within a few years following burning. However, prescribed fire might have longer-term effects on forest structure, potentially changing initial treatment assessments and future considerations.

A study published in *Forest Ecology and Management* by researchers from USGS, USDA Forest Service and University of California-Berkeley monitored five old-growth mixed conifer plots in Sequoia National Park, California, before prescribed fires and up to eight years post-fire, detecting effects beyond the initial years.

Stem density decreased an average 67 percent eight years post-fire, although this decline was non-linear and took the entire eight years to reach a presumed plateau. Declines in live stem biomass were also non-linear, although the expected survival of larger trees resulted in shifts in stem diameter distributions.

Tree mortality rates remained significantly above those in nearby unburned plots, for up to six years post-fire. However, prescribed fire did not have a large influence on the representation of dominant tree species. Fire-caused mortality appeared to be spatially random, and prescribed fire in general had very little effect in the diversity in spatial patterns of tree stems (clumped, random or uniform) in these test plots.

Had observations been limited to only one or two years post-fire, much of these prescribed fire effects would have been underestimated. Some forest response factors exhibit non-linear trends in the first five years, taking many more years to stabilize. The findings suggest that up to five years of post-fire monitoring is needed to avoid overlooking the spectrum of responses to prescribed fire in mixed conifer forests.

Management Implications

- Forest trends in initial post-fire years may underestimate prescribed fire effects, and up to five years of post-fire monitoring may be needed to assess the long-term response.
- Fire-induced declines in stem density were non-linear and took up to eight years to reach a presumed plateau.
- Tree mortality rates remained significantly above background rates up to six years post-fire.
- Fire-induced mortality appeared to be spatially random and did not alter tree spatial patterns.

THIS BRIEF REFERS TO:

van Mantgem, P.J., N.L. Stephenson, E. Knapp, J. Battles, J.E. Keeley. 2011. Long-Term Effects of Prescribed Fire on Mixed Conifer Forest Structure in the Sierra Nevada, California. *Forest Ecology and Management* 261(6): 989-994. doi: 10.1016/j.foreco.2010.12.013

<http://www.werc.usgs.gov/redwood>

<http://www.werc.usgs.gov/ProductDetails.aspx?ID=4194>



USGS collaborates with parks and universities on a suite of Sierra Nevada forest fire studies. Image credit: USGS