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# Tree Mortality Patterns Following Prescribed Fire for Pines and Firs Across Southwestern U.S.

Reintroduction of fire to historically fire-prone forests has been repeatedly shown to reduce understory fuels and promote resistance to high severity fire. However, there is concern that prescribed fire may also have unintended consequences, such as high rates of mortality for large fire-tolerant pines in the genus *Pinus*.

To test this possibility, USGS and National Park Service researchers evaluated mortality patterns for two common genera in the western US — pines and fir species in the genus *Abies* — using observations from a national-scale prescribed fire effects monitoring program. The study is published in *Forest Ecology and Management*.

Research plots spanned seven National Park Service units in the southwestern United States: Bandelier, Bryce Canyon, Grand Canyon, Lassen Volcanic, Sequoia, Whiskeytown and Yosemite, with years of prescribed fire ignition from 1984 to 2004. Trees were assessed for mortality immediately post-fire and 5 years post-fire.

Results show that mortality rates of trees 5 years following prescribed fires were similar between *Pinus* (4.6% $yr^{-1}$) and *Abies* (4.0% $yr^{-1}$) in large trees (greater than 50cm DBH). Following burning, both *Pinus* and *Abies* stem diameter distributions shifted towards larger individuals, indicating survival of large trees.

Models of postfire mortality probabilities (accounting for bark thickness of each genera) do suggest that some *Pinus* species maybe slightly more resistant to fire-caused crown injuries. Overall, the results do not suggest unusually high post-prescribed fire mortality for large trees or for *Pinus* relative to *Abies* in the southwestern U.S. Still, forest managers should take care to note the species composition of each region and account for differences in fire-prone traits of each conifer species when designing prescribed fire plans.

## Management Implications

- Prescribed fires do not lead to unusually high mortality in large *Pinus* and Abies *trees* in the southwestern U.S.
- Following burning, both *Pinus* and *Abies* stem diameter distributions shifted towards larger individuals, indicating survival of large trees.
- Models of post-fire mortality probabilities do suggest that some *Pinus* species maybe slightly more resistant to fire-caused crown injuries. Forest managers should take care to note the species composition of each region and account for differences in fire-prone traits of each conifer species when designing prescribed fire plans.

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Studies on tree mortality can help forest managers determine the suitability of prescribed fire to manage forests of different species compositions.