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Contacts:
Phil van Mantgem

Email:
pvanmantgem@usgs.gov

Phone:
707-825-5189

USGS Western Ecological Research Center | Redwood Field Station | 1655 Heindon Road, Arcata, CA 95521

Trees Already Stressed by Drought May Be More Likely to Die from Fire

Climate change is expected to amplify both droughts and wildfires across the western United States. A study published in *Ecology Letters* suggests that the effects of drought and fire work in combination, such that forests experiencing drought will see more dead trees in the aftermath of wildfires.

USGS, U.S. Forest Service and National Park Service researchers studied conifer forests in areas that had recently experienced prescribed fire across Arizona, California, Colorado, Montana, Oregon, New Mexico and Utah, examining data from 1984 to 2005 for more than 7,000 individual coniferous trees, including familiar species such as ponderosa pine, white fir, and Douglas fir.

The analysis found more trees dying at sites where high temperatures were lengthening the duration of summer drought. This relationship between climate and fire was present appeared to influence the effects of crown and stem injuries. Climate and fire interactions did not vary substantially across geographical regions, major genera and tree sizes.

These findings support recent physiological evidence showing that both drought and heating from fire can impair xylem conductivity.

The analysis did not consider other factors that could also exacerbate climatic warming effects on tree deaths, such as tree pathogens and insect pests. Also, the forest data were solely drawn from prescribed fire events.

However, the results could potentially inform forest management strategies and prescribed burns. If forest managers wish to reduce the density of an overstocked forest, prescribed burning might actually be more effective when done during dryer than normal periods.

Management Implications

- Pervasive climatic warming can lead to chronic stress on forest trees, which may contribute to mortality resulting from fire-caused injuries.
- Warming may also increase forest fire severity (the number of trees killed) independent of fire intensity (the amount of heat released during a fire).
- Forest managers wishing to reduce the density of an overstocked forest could consider prescribed burning during dryer than normal periods.

THIS BRIEF REFERS TO:

van Mantgem, PJ, JCB Nesmith, M Keifer, EE Knapp, A Flint, L Flint. 2013. Climatic stress increases forest fire severity across the western United States. *Ecology Letters*. doi: 10.1111/ele.12151

<http://www.werc.usgs.gov/ProductDetails.aspx?ID=4956>
<http://www.werc.usgs.gov/vanmantgem>



Eric Knapp/USFS

A study on forest plots across the western U.S. demonstrated a link between postfire forest mortality and climatic variables.