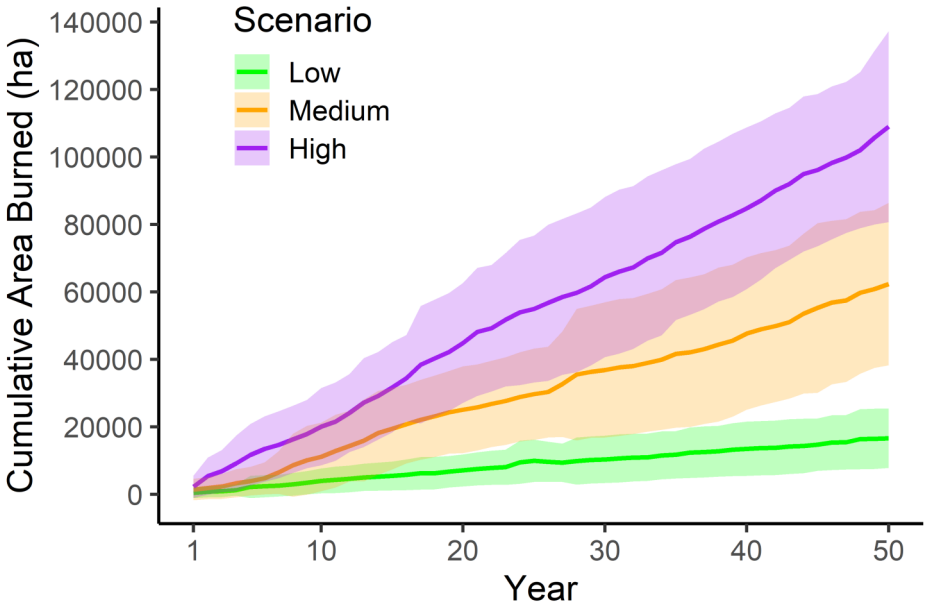
Earth Systems Ecology Lab



Fire Reinforces Forest Conversion to Shrubland

Increasingly large high-severity burn patches in the southwestern US are reshaping forests. Tree seed dispersal into high-severity patches decreases as the distance from live trees increases. Even if dispersal is not limited, high temperatures and drought can reduce seed germination and seedling survival. When trees do establish, future disturbance can cause mortality before they are capable of reproducing. We ran simulations to determine the effects of fire probability on successional development following the 2011 Las Conchas fire, which had large high-severity patches. We evaluated the effects of historical fire probability (high), contemporary probability (low), and the average of the two (medium).

We found that as the fire probability increased from low to high, the size and severity of simulated fires increased. As a result, cumulative area burned increased substantially over the 50-year simulation period (see figure). These results were driven by a feedback where high-severity fire favored resprouting species, such as Gambel oak, which could support subsequent fire quickly because of fast regrowth. We also found that as the probability of fire increased, the fraction of the landscape occupied by mature conifer forest decreased substantially. In the areas of the landscape that experienced the highest number of fires over the 50-year period, vegetation was dominated by resprouting woody species and non-woody species. These vegetation changes caused a large decline in both photosynthetic capacity and carbon storage. Our results suggest that following high-severity fire in southwestern US, the successional trajectory is highly sensitive to the frequency of subsequent fires.

THE UNIVERSITY of NEW MEXICO

Management Implications

Following high-severity fire, subsequent fire can reinforce the transition from forest to non-forest vegetation.

The increase in resprouting species can create a vegetation-fire feedback that supports larger and more severe fires.

More frequent fire has the potential to impact that areas on the landscape where mature forests survived the first wildfire.

Publication:

Keyser, AR, DJ Krofcheck, CC Remy, CD Allen, MD Hurteau, 2020. Simulated increases in fire activity reinforce shrub conversion in a southwestern US forest. Ecosystems. DOI: 10.1007/s10021-020-00498-4.

Funded by: Joint Fire Science Program JFSP-16-1-05-8 & USDA NIFA Grant no: 2017-67004-26486

JOINT FIRE SCIENCE PROGRAM

USDA United States Department of Agriculture National Institute of Food and Agriculture

Contact Information

Matthew Hurteau: mhurteau@unm.edu

Alisa Keyser: arkeyser@unm.edu

www.hurteaulab.org