Research shows advisability of replanting conifer forests sooner rather than later after wildfires

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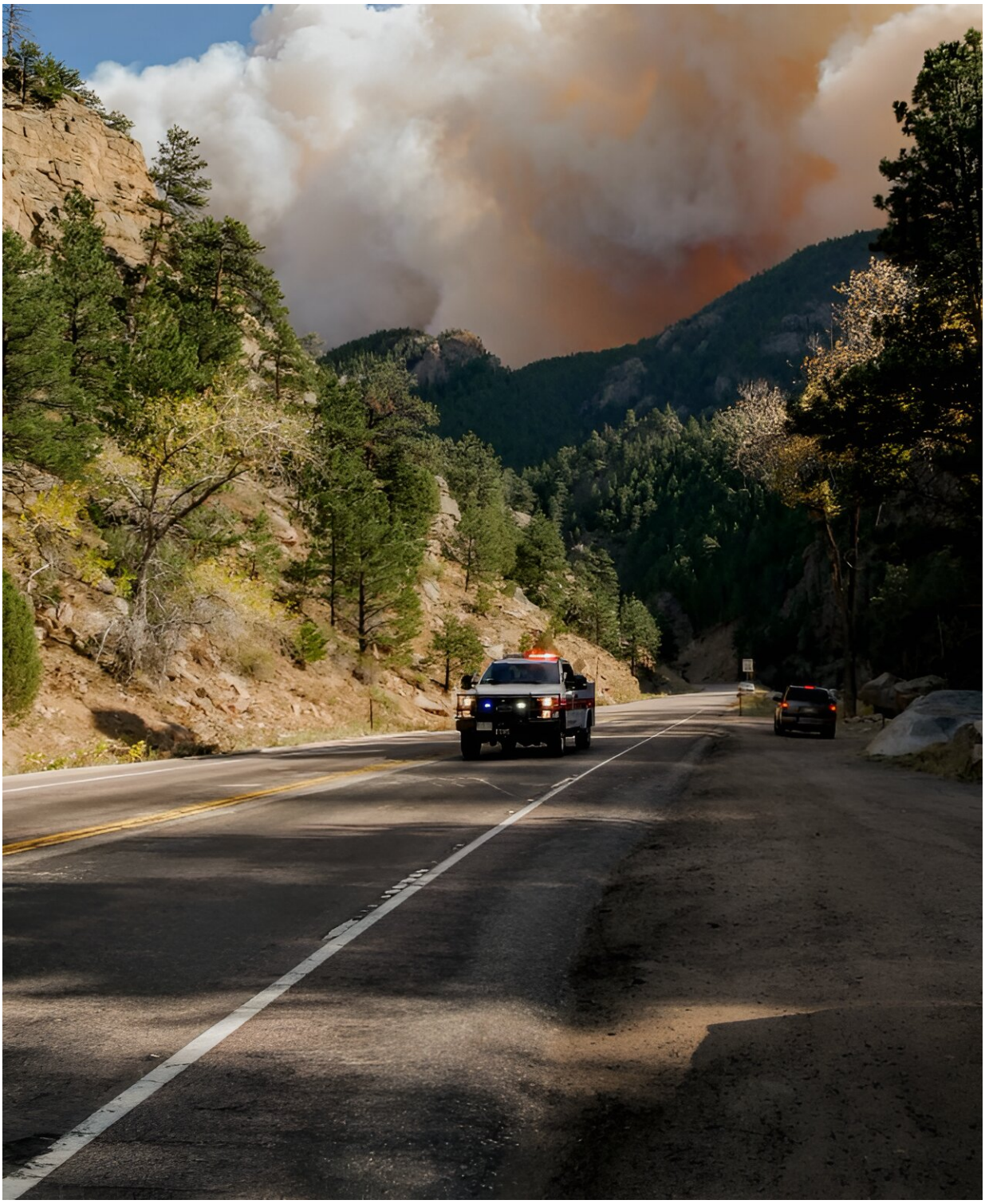

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Warmer and drier climate conditions in western U.S. forests are making it less likely that trees can regenerate after wildfires. Scientists at The University of New Mexico are experimenting and learning about reforestation and the challenges presented by environmental factors in the semi-arid southwestern United States where planted conifer seedling survival is typically low after a wildfire.

In a recent article titled "Ability of seedlings to survive heat and drought portends future demographic challenges for five southwestern US conifers," published in *Tree Physiology*, Joseph Crockett, who recently received his Ph.D. in Biology at UNM, and Department of Biology Professor Matthew Hurteau, looked at how hot and dry conditions are likely to influence future seedling survival. Crockett earned his master's degree at the University of California, Merced, where he studied extreme drought and related disturbances of the western United States in the 20th and 21st centuries.

"I started this research because I was interested in how southwestern forests may change with the hotter temperatures and longer droughts anticipated with climate change in the next century," said Crockett.

"We in the southwest are reliant on healthy forests for everything from the water we drink to recreation opportunities and forest loss from wildfire can have big impacts on large numbers of people. Determining the conditions under which conifer seedlings can survive is central to our understanding of the risks that southwestern forests may face in the future and that knowledge can help us focus reforestation efforts where they are more likely to succeed."

Crockett took seedlings of five common southwestern US tree species —piñon, ponderosa pine, Douglas-fir, white fir, and Engelmann spruce—and subjected them to high temperatures and drought in growth chambers. The researchers obtained seedlings grown from locally

sourced seeds from the New Mexico State University John T. Harrington Forestry Research Center in Mora, N.M.

Crockett then used climate model projections of future climate and to determine how much of the current range of each of these species will not support tree seedling establishment later this century.

Hurteau said that changing climate will constrain where these tree species are capable of reproducing and that will alter where we have forests and what type of forests are in different places.

"For species like ponderosa pine and piñon, the lower half of their current elevation range is likely to experience heat and drought conditions that kill seedlings frequently in the future. The results have implications for forest management across the southwest. One of them is that we need to get seedlings planted now so that they can establish before conditions become too hot and dry for them to survive.

"We have a window now where we can still plant these species across most of their current range and they will survive. It is important we take advantage and work on reforestation now, rather than try and reforest these burn scars 10 or 20 years from now," Hurteau noted.

This research will be used to inform the efforts of the New Mexico Reforestation Center, which is a partnership between New Mexico Division of Forestry, New Mexico State University, New Mexico Highlands University, and UNM. Going forward, Crockett will be working to understand challenges at the intersection of forests, disturbances, and populations.

More information: Joseph L Crockett et al, Ability of seedlings to survive heat and drought portends future demographic challenges for five southwestern US conifers, *Tree Physiology* (2023). DOI:

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