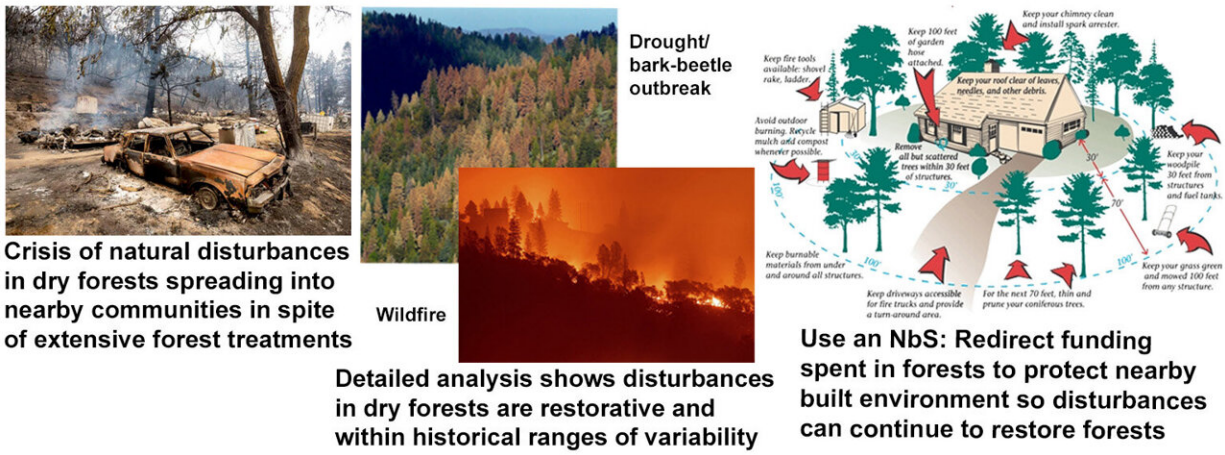
A nature-based solution to restore and adapt western US dry forests to climate change

January 19 2024, by William L. Baker, Chad T. Hanson, and Dominick A. DellaSala



Overview of the natural disturbance situation and its nature-based solution. Credit: Public domain

Nature effectively "managed" forests through millennia of major climate changes and episodes of natural disturbances (e.g., wildfires, droughts, bark-beetle outbreaks), so why would nature not now be best able to restore and adapt forests to climate change?

We focused on this question while investigating lower-elevation dry forests of the western U.S. dominated by ponderosa pine (Pinus ponderosa) or similar pines and dry mixed-conifer forests, in addition to

other trees.

Dry forests cover 25.5 million ha (63 million acres) of the western U.S. These forests have altered structure (e.g., tree density) from extensive logging, livestock grazing, and fire suppression.

Dry forests are also recently experiencing more natural disturbances. Wildfires have at times become almost unstoppable, overwhelming firefighters and spilling over into the built environment. These trends continue in spite of billions of dollars spent annually to reduce fuels (e.g., thinning) and suppress fires and other disturbances in federal forests.

These failing command-and-control approaches (CACA) are leading to calls for new approaches in dry forests.

Working with natural processes is the premise of nature-based approaches. We recognize widespread concern that disturbances in dry forest are outside historical variability, so they are damaging. However, we found they are not; instead, they are effectively restoring and adapting dry forests to climate change.

The central constraint on using natural disturbances is an insufficiently protected nearby built environment, which can be remedied by redirecting CACAs to focus on protecting the built environment.

A formal Nature-based Solution (NbS), defined by the International Union for Conservation of Nature, has eight essential properties. These include societal benefits, biodiversity and ecosystem integrity, good governance, adaptive management, sustainability, and integration into existing jurisdictions.

We focused on the feasibility of an NbS, how long it may take, could it

better restore and adapt dry forests to climate change, and what is needed to protect the built environment so an NbS is feasible and more broadly acceptable?

Is there enough natural disturbance to restore and adapt dry forests? To assess this, we calculated recent rates (2010–2019), using federal datasets on a study area of ~16 million ha (40 million acres) of dry forests on federal land in 11 western states.

Nature-based disturbances, including wildfires, combined droughts and bark-beetle outbreaks, annually affected 2.07% of the study area; it would require 48 years to affect an area equal to the study area. CACAs, including prescribed fires and mechanical (e.g., thinning) treatments, annually affected 0.79% of the study area, requiring 126 years to affect an area equal to the study area.

Disturbance severity is classified as low, moderate and high severity, based on levels of tree mortality. Low- and moderate-severity fires, 82% of total fire area from 2010–2019, are widely accepted as ecologically restorative and adaptive.

Only the 18% of total fire area that was high severity is controversial, but we have shown that high-severity fire is recently operating at rates and patterns within the range of historical variability. Nearly all drought/beetle effects have also been low to moderate severity, with