

Impact of Management Activities in the Zuni Mountains CFLR Landscape

Results of forest restoration treatments in the Zuni Mountains show continued progress toward collaborative objectives, including indicators of forest resilience to drought and fire.

Forest Monitoring Background

Zuni Mountains Collaborative Forest Landscape Restoration Program (CFLRP) partners came together in the early 2010s to address a recognized set of needs for forest restoration across the landscape: reduction of uncharacteristic crown fire risk, protection of old and large trees, removal of small trees, and return of fire to the ecosystem at ecologically appropriate intervals. Addressing these needs took the form of multiple forest management activities in the Bluewater watershed project areas, including mechanically thinning forested areas to promote forest structure heterogeneity and conducting prescribed burns.

Evaluating impacts of these forest resilience treatments began with the installation of forest monitoring plots across 6,500 acres in 2005. Data from both control and restoration plots have been collected using USFS Common Stand Exam protocols from the time of installation through current day. Permanent plot data spanning thirteen years were analyzed in a 2020 monitoring summary report produced by the Forest Stewards Guild, Zuni Mountains Collaborative, Three Pines Forest Research LLC, and US Forest Service to determine changes and trends in indicators of ecological function and condition. Following management activities, the authors found that:

- Number of trees per acre was within the resilience envelope (range of acceptance) for bark beetle outbreak, crown fire, and drought.
- The average tree diameter increased across the landscape, signaling the protection of large and old trees.
- Tree canopy bulk density (the density of available canopy fuel in a stand) decreased, indicating decreased potential for uncharacteristic crown fire.



Figure 1: a researcher determines azimuth of a line while laying out a forest inventory transect.

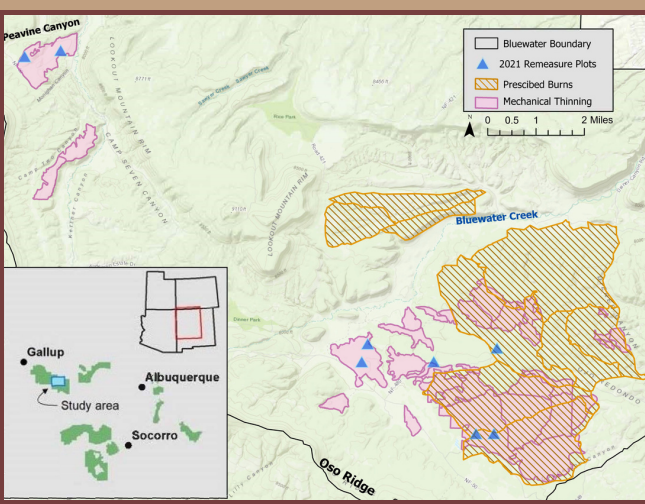


Figure 2: plot locations within the re-entry treatment area

To continue evaluating the impacts of existing and ongoing treatments, seven permanent plots surveyed in 2015 were re-sampled in 2021. Four of these plots received mechanical forest thinning treatment and three received prescribed burning in the intervening years. The Forest Stewards Guild maintained evaluation consistency by monitoring for the same six site condition metrics: basal area, canopy bulk density, quadratic mean diameter, radial growth, stand density index, and trees/acre.

Analysis suggests continued movement toward vegetation management objectives:

- Number of small trees decreased, mature trees were preserved, average diameter of ponderosa pine increased, and overall tree density was reduced.
- Average crown height (vertical distance between the ground and lowest live branches) increased, signaling a lowered probability of surface fire being able to burn into the living canopy.
- Prevalence of large and old trees on the landscape remained steady with 5-6 mature trees (greater than 18" DBH) per acre.

Across the sample area, basal area (the square footage per acre occupied by tree trunks at ground level) and live trees per acre decreased, while ponderosa pine average size increased, signaling that re-entry treatments reduced the number of trees per acre (TPA) while increasing the size of the trees on the landscape (QMD). The remaining less-dense stands will experience decreased competition and increased bioavailability of nutrients and water. These metrics correlated with an increase in crown height and reduction in continuous canopy across the landscape. The 2021 monitoring findings replicate those of the 2020 report: taken as a whole, these changes to stand structure are associated with a substantial reduction in the hazard of uncharacteristic crown fire, an increase in forest resilience to beetles and disease, and an increase in resistance to wildfire induced mortality in ponderosa pine.

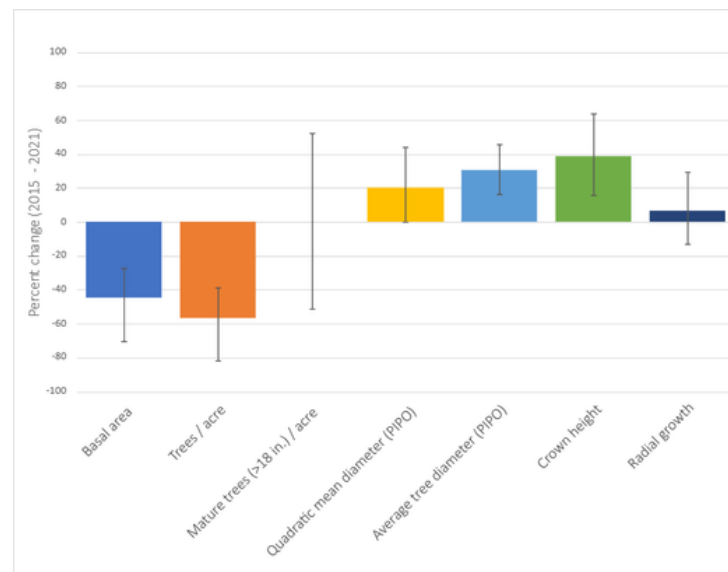


Figure 3: Relative effects of treatments in the Bluewater project area.

The restored forest is more resilient against drought, wildfire, pests, and disease, laying the groundwork for a return to a historical fire regime while preparing for the impacts of climate change in the Zuni Mountains.