United States Department of Agriculture, Forest Service

Pacific Southwest Research Station

Sierra Nevada Research Center

Plumas Lassen Administrative Study: Vegetation Module Forest Restoration in the Northern Sierra Nevada: Impacts on Structure, Fire Climate, and Ecosystem Resilience.

The Research:

A century of fire suppression, forest management practices, and a warmer and moister climate have left Sierran forests with many dense stands of small diameter, shade-tolerant, fire-sensitive trees. These changes has shifted the fire regime from frequent low-intensity, small-scale ground fires to large-scale, intense crown fires. These fires pose a threat to rural communities and can convert forested landscapes to persistent shrub fields. One approach to restoring forests and reducing fire intensity is to use thinning and gap-creation to increase the proportion of large fire-resistant trees and encourage more shade-intolerant regeneration. We focus on the effects of fuels treatments on forest structure, composition, understory microclimate, and succession, because changes in these conditions will define how fire and the forests responds to restoration.

Thinning alters stand structure, modifying the forest microclimate and affecting whether trees, shrubs or grass grow back. The intensity and quality of light determines whether fire tolerant pines, or fire intolerant trees, grow back. There is surprisingly little information on the effects of thinning on microclimate in Sierran forest. One oft-cited reference on this topic conjectures that "the greater the stand opening, the more pronounced the change in microclimate is likely to be" (Weatherspoon 1996). Microclimate (e.g., temperature, wind speed, and humidity) directly affects fuel moisture and fire behavior, and is an important input to fire models. Understanding how thinning and other forest restoration actions affect forest succession across resource gradients in the northern Sierra landscape is essential for determining the long-term effects of fuel treatments.

Photo: P. Stine

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Our Mission:

Sierra Nevada Ecosystems are complex and our knowledge of them is incomplete. As a result, the long term outcome of any given land and resource management strategy is uncertain. We will provide assistance to land managers and policy makers by addressing this management dilemma through targeted research, emphasizing an integrated, ecoregional approach to examine particular physical, ecological, and socio-economic issues, across a range of appropriate spatial and temporal scales specific to each issue.

This unit will represent the collective research expertise and interests of scientists located in Fresno, Davis and Albany as well as other scientists within the Pacific Southwest Research Station. With a full spectrum of research, from long term, fundamental research to short-term, tactical applications, this Center is intended to support conservation, restoration, and sustainable utilization of the lands within the Sierra Nevada ecoregion.

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Objectives:

Improve understanding of the relationship between forest canopy cover, fire climate, and understory plant dynamics in northern Sierran mixed conifer forest.

Investigate the resilience of mixed conifer forest to harvest disturbance across the landscape gradients of precipitation and soil type.

Photo: S. Bigelow

Application of Research Results:

Our studies will provide better understanding of how current thinning prescriptions influence fire risk, successional processes, and forest resilience across Plumas and Lassen National Forest landscapes. It will document how reductions in canopy cover will affect microclimate, which will help managers anticipate the probability of successfully regenerating desired species under the various treatments. Finally, it will investigate how measures of canopy cover and canopy closure obtained with a variety of instruments relate to one another.

Location:

Ponderosa pine, mixed conifer, and east-side pine forests within the Plumas and Lassen National Forests.

Photo: S. Bigelow

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