

Spatial considerations in fire management: the importance of heterogeneity for maintaining diversity in a mixed-conifer forest

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This study examines the factors controlling fine-scale distributions of herbs, shrubs, and tree seedlings in the Sierra Nevada mixed-conifer forest. The goals of this project are 1) to determine the importance of within-fire heterogeneity in fire effects to maintaining plant diversity, and 2) to compare alternative fire restoration strategies—spring prescribed fire, fall prescribed fire, and prescribed natural fire (PNF)—in terms of their ability to create a heterogeneous environment that allows diverse suites of species to coexist. We have collected high-resolution (1 meter) botanical and environmental data along 256-meter transects in the Fire/Fire Surrogates plots and recent PNFs at Sequoia National Park. We introduce a novel spatial statistical approach, wavelet analysis, to identify relationships between species and their environment while accounting for the fact that different environmental variables exert their influence on plants at different spatial scales. Preliminary results show that, in the absence of fire, understory species distributions are controlled by local variability in topography and soil moisture at scales greater than 64 meters. We are in the process of testing whether variability in fire effects leads to finer scale patterning of species distributions after fire. Once identified, the types and scales of fire-generated environmental variability that matter to plants can be incorporated into fire restoration plans.