Severity Of Short-Interval Reburn Mediates Compositional Shifts In Fire-Adapted Montane Shrublands

Deborah Nemens1,2, J. Morgan Varner2, Kathryn R. Kidd3, and Jesse K. Kreye1

1Department of Environmental and Forest Sciences, University of Washington, Seattle, WA 98195 USA.

2USDA Forest Service Pacific Wildland Fire Sciences Laboratory, Seattle, WA 98103 USA.

3Arthur Temple College of Forestry & Agriculture, Stephen F. Austin State University, Nacogdoches, TX 75962, USA.

Montane chaparral is a shrub community dependent on fire for its persistence in areas where it intergrades with the dry mixed-conifer forests of northern California. In these fire-prone regions, irregular patterns of mixed-severity fire on the landscape historically created forest gaps and clearings where shrublands could persist. Decades of fire exclusion facilitated the invasion of conifer forests into these gaps, reducing the extent of shrub-dominated ecosystems. Recent evidence exists that large, stand-replacing wildfires may be reversing this trend in some areas. Previous studies have documented vegetative type-conversion from mixed-conifer forest to chaparral occurring where high-severity fires occur. These state shifts are especially persistent in short-interval reburn areas, where conifer regeneration is often limited, and post-fire strategies of chaparral species enable shrub dominance. Regeneration mechanisms of chaparral species are often broadly grouped into a) species that rely on soil seed banks for post-fire germination and b) species that store carbohydrates in underground structures to facilitate post-fire sprouting. While burn severity- and interval-dependent vegetative shits are well studied, little attention has been given to the effects of these disturbance characteristics on the species composition of subsequent plant communities. In order to assess the effects of differential severities on these groups, we examined shrub abundance and species composition across a spectrum of burn severity combinations in a 9,000 ha reburn area with a 12-year interval between wildfires in the Lassen National Forest, CA. Species with the capacity to resprout after stand-replacing wildfire were advantaged over those that depend on fire-cued germination from latent seedbanks after two high-severity burns, while the latter group dominated stands with higher burn severity in the reburn fire. Our results indicate that post-reburn reponse is not only interval-dependent, but varies with combined burn severity following reburns. The findings have implications for future fire behavior and landscape heterogeneity and resilience in the context of a warmer and drier climate in California.

Presenter bio:

Deborah was recently awarded a Master's degree in forestry with a focus in fire ecology from the University of Washington. She has worked in the field as a restoration ecologist, botanist, land manager, prescribed fire professional and field grunt. Her research interests include the effects of fire on vegetation, conservation of fire-dependent species and habitats, and the use of prescribed fire as a restoration tool in degraded ecosystems.