

#### **4.18) Impact of Fire and Grazing on Diversity and Invasion in Sierran Forests**

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Disturbances that create a disequilibrium in distribution of resources may alter species composition through shifts in resource availability, which in turn may create conditions favoring invasion of non-native species and deletions of native species. Two important disturbance factors in the Western U.S. are grazing and fire and both have been linked to plant invasions.

Recent USGS research in the southern Sierra Nevada shows that grazing by different types of livestock (horses on NPS lands, cattle on BLM lands) in foothill woodlands alter species composition and distribution of plant functional types. However, these systems have already been so heavily invaded by non-native grasses and forbs that livestock grazing at low to moderate stocking densities is not tied to shifts in the native/non-native dominance.

This research program has concentrated a significant amount of attention on the role of fire in both ponderosa pine and mixed coniferous forests. Across these sites species richness is not immediately altered by fire but within the first three years, high fire-intensity patches exhibit highly significant increases in species richness. Concomitantly, these patches are also the ones most susceptible to invasion by non-native plant species.

In these Sierran ecosystems, the threat of invasives is most profound in the lower elevations and decreases with elevation. Part of the explanation for this pattern is the fact that the preponderance of invasives in this region are annual plants and this growth form declines in both species number and dominance with elevation. The lower elevation ponderosa pine forests are potentially most susceptible to new invasions and particularly troublesome is the apparently recent expansion of cheatgrass (*Bromus tectorum*) in these forests in Kings Canyon National Park. As is the case with species richness in general, the expansion of cheatgrass is strongly correlated with localized patch-level fire intensity. Because of this apparent relationship between fire and cheatgrass, prescribed burning has been temporarily halted in these forests. Early control of this apparent invasion is of concern to resource managers in these parks and a more detailed study of fire and other perturbations on cheatgrass invasion is currently being studied by USGS.