Fire severity and productivity influence diversity patterns in

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Topic: Managing fire regimes in a changing world (good fire/bad fire)
Proposal Type: Symposium - select this if you are part of an organized session

Abstract:
In subalpine forests of the North American Mediterranean climate zone, climate-fueled changes in snowpack and growing season are contributing to larger and more frequent fire events. Changing fire regimes have resulted in biodiversity declines in lower elevation mixed conifer forests, which have low resilience to large patches of high severity fire. However, the risk of high severity fire to diversity in Mediterranean-type subalpine systems is uncertain. The influence of disturbance severity on species diversity is expected to depend in part on ecosystem productivity, but this theory has not been adequately tested in the context of fire and forest ecosystems. This study aims to help elucidate the effect of productivity on the species richness-fire severity relationship as well as to understand the effect of fire severity on species richness in Mediterranean-type subalpine forests. To answer these questions, we sampled understory richness in plots spanning a wide range of fire severity and across 13 fires in California's subalpine forest. In general, post-fire species richness increased with fire severity and decreased with productivity. The interaction between fire severity and productivity was also significant, with species richness increasing more across the fire severity spectrum in high productivity plots than in low productivity plots. Further, high severity plots had 3 times as many unique species as unburned plots and 2 times as many as low severity plots, suggesting that increased richness in high severity plots is driven by flora that can take advantage of the post-fire environment. Accordingly, the number of species with the classic colonizer traits of short lifespan and long-distance dispersal ability increased significantly with fire severity. Our results suggest that ecosystem productivity is an important predictor of the richness-fire severity relationship and that the projection of potentially higher fire severity in high elevation forests may be neutral to positive for species richness.