Fire history to guide restoration of a landscape at the piñon-juniper/ponderosa pine ecotone

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Piñon-juniper (PJ) covers approximately 8 million hectares in Arizona and New Mexico, but there is little data describing the historical role of fire, particularly for PJ savannas. The goal of my research was to reconstruct the history of fire and forest structure on a 30,000 ha mesa landscape at the PJ/ponderosa pine (PIPO)/grassland ecotone on Rowe Mesa, NM. I collected fire scars and quantified forest structure in plots with approximately 7-km spacing. Half of the plots were PIED-dominated and half were PIPO-dominated. From 70 trees (11% PIED and 87% PIPO) I crossdated 401 fire scars that burned during 90 unique fire years (1546-1899). Most fires occurred in the late-spring-early summer. Mean fire interval (MFI) of all fires was 4.35 years. This is similar to the seasonality and frequency of lightning ignitions in the study area in recent decades (87% April – July, MFI = 2.0 years, 1973 -2009). MFI of fires recorded by > 25% of the trees was 24.85 years, which is interpreted as the frequency of widespread fires having an estimated fire area greater than 4,000 ha based on simulated historical fire perimeters. Evidence of high severity fire (e.g., even-aged cohorts coinciding with fire scar dates) was not observed. Instead, variability in PIED and PIPO tree establishment was negatively correlated with fire frequency. I conclude that frequent, low-severity fires maintained a relatively open structure in both the PJ and PIPO forest and late 19th century fire cessation resulted in the current structure dominated by young PJ species (< 100 years old).