

Effects of post-fire climate and stand age on montane forest plant communities in Glacier National Park, Montana

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Background/Question/Methods

Climate change predictions for Glacier National Park (GNP) are for increased temperatures and either increases or decreases in precipitation. Climate change, coupled with increased fire frequency, is likely to affect species distribution and composition of the montane forest types, some of which are declining, and are found only in GNP in the Rocky Mountains. We located thirty plots in GNP in locations representing older (early 20th Century) or more recent fires that were either followed by three wetter or drier than usual growing seasons in order to measure species richness, diversity and abundance. Size and density of all tree species was also recorded, along with environmental variables such as slope, aspect and edaphic conditions. We used Independent Samples t-tests, Canonical Correspondence Analysis (CCA), and regression to detect significant differences in richness (S), evenness (E), and diversity (H) in moist vs. dry post-fire sites and recent vs. older fires, as well as differences in community composition.

Results/Conclusions

Sites with wetter post-fire climate had significantly higher species richness (mean wet S = 33.7, mean dry S = 26.5; $\alpha = 0.05$). Older burned sites had higher richness (mean older S = 37.6, mean recent S = 23.8; $\alpha = 0.05$) and evenness (mean older E = 0.735, mean recent E = 0.627) than did the more recently burned stands. Species richness and diversity were significantly influenced by stand age ($p < 0.001$), post-fire climate ($p < 0.001$ and $p = 0.005$ respectively), and elevation ($p < 0.001$). Community analysis (CCA) indicated that wetter or drier post-fire conditions only weakly influence community composition ($r^2 = 0.20$) and that other factors such as aspect, elevation, and stand age were more important ($r^2 = 0.60$). Post-fire climate influences species richness, diversity and abundance, but overall community composition is influenced more strongly by other factors.