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Structural Development and Woody Species Composition Along a Fire Chronosequence in Mixed Pine-oak Forest of Northeast Mexico

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Abstract

Although forest fires have become a critical question in Mexico following the fire season of 1998, there is little know regarding the effect of the forest fires on forest structure and composition, and dynamics in the mixed pine-oak forest in northern Mexico. Therefore, a chronosequence of sites with increasing time since fire were selected. This approach is very common studying the effects of forest fire on forest structure and succession as it is almost impossible to perform a real time series as one would have to wait for decades to obtain results. The accurate fire history was developed using tree ring analysis and fire scars. Increment cores were taken from *P. teocote* and *P. pseudostrobus*. The objectives of this study were to determinate how fire has shaped forest structure and composition in mixed pine-oak forest and describe trends and stages of structural development. Stand level vegetations characteristics, environmental data (solar radiation, slope, aspect and elevation) were analysed along a 134 year chronosequence at 23 sites in the mixed forest of the Sierra Madre Oriental. Detrended canonical analysis confirmed that the time since fire was correlated to most biotic variables and indicates that the disturbance regime is tightly coupled to ecosystem function. The study revealed that there were important differences between post-fire cohorts in terms of species richness, stand compositions and structure. High woody plant diversity was generally found in young stands, while the intermediate and major stands showed the lowest woody plant diversity. In old stands, woody plant diversity was increased again. In turn, the forest structure was less divers in young stands compared to intermediate, major and old stands. By exploring forest stand structure and composition in the context of ecosystem function we have addressed for the mixed pine-oak forests an overlooked topic in fire ecology science today. Finally, management of this mixed pine-oak forest should include some component of the natural disturbance regime to maintain forest health and a sustainable use of resources.

Keywords: Chronosequence, fire ecology, forest structure, Mexico, Sierra Madre Oriental, structural development