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“Development on the margin”

Assessment of Post-fire Forest Structural Diversity Using Neighbourhood Based Parameters in the Sierra Madre Oriental, Mexico

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Abstract

In order to determine the effect of fires on forest structural diversity the goal of this research was to characterise the post-fire spatial structural patterns in a *Pinus hartwegii* forest in the Sierra Madre Oriental, Mexico, affected by the 1998 forest fire. We defined three fire severity classes based on the degree of consumption of the pine canopy (low, medium, and high). Three samplings plots of 40 m × 40 m were established on each fire severity. The variables obtained for all trees with diameter at breast height (DBH) \geq 5 cm at each plot were: DBH in cm (1.30 m), total height (m), spatial location by azimuth and distance (m) from plot centre to each tree. To describe the stand structure three groups of indices were employed: “contagion” and “distances” (W_i and D_i), “dominance” (U_i) and “size differentiation” (TD_i and TH_i). An ANOVA was performed to detect differences between dasometric parameters by severity. For the statistical analysis the R-statistical Software was used. The neighbourhood-parameters were conducted using the Winkelmass program. Statistical analysis show significant differences in the dasometrics parameters (basal area, diameter and height) between the low, medium and high severities. The average values of W_i for the three fire severity classes (0.528, 0.550 and 0.594, respectively) confirm a tendency to aggregate. Mean values of distance (D_i) between trees was 6.49 m, 5.63 m and 6.33 m for low, medium and high severity, respectively. The mean dominance values with respect to the diameter and height (U_i) for low, medium and high severity were 0.504, 0.483 and 0.475 and 0.500, 0.491 and 0.453, respectively. The average values of the differentiation in diameter and height were $TD_i = 0.17, 0.28, 0.33$ and $TH_i = 0.11, 0.18, 0.27$, respectively. The results show that with increasing fire severity increases the degree of clustering as well as the differentiation in diameter and height. On the other hand, the dominance of size decreases with increasing severity. Continuing research on forest structure in forests of the Sierra Madre Oriental, including not only neighbourhood-parameters but also point pattern analysis, is needed in order to have a higher accuracy in spatial modelling.

Keywords: Forest structure, *Pinus hartwegii*, Sierra Madre Oriental