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## An Analysis of Spatial Forest Structure Using Neighbourhood-based Variables

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### Abstract

The study presents an analysis of forest spatial structure and diversity in the Federal State of Durango where the majority of the forests consist of pure pine stands or pine mixed with oak. Natural forests of greater diversity and of high ecological significance are found only in a few isolated localities in the Santa Bárbara valley. These forests, with rare conifers including the genera *Picea*, *Abies* and *Pseudotsuga* are found on particular sheltered, humid sites. For one such rare site, a detailed analysis of forest spatial structure was made, based on three one-quarter hectare plots where all the trees and their coordinates had been assessed. The objective of the study was to provide a quantitative description of the spatial structure of the plots, using new parameters of spatial diversity and to present a method for comparative analysis of the three forest sites. The analysis is using a new approach for describing complex forest structures in a straightforward manner. To evaluate the spatial attributes, it is not necessary to measure distances between trees or to establish tree coordinates. The spatial characteristics can be established merely on the basis of evaluating the immediate neighbourhood of a given number of reference trees. The variables describe the distributions of spatial mingling, size differentiation and contagion, which can be easily interpreted allowing a better description and reproduction of the ecosystems, quantitative comparisons between complex forest structures, as well as the development of indicators of sustainability of forest resource management. This research was supported by the Consejo Nacional de Ciencia y Tecnología (CONACyT), Project: 41181-Z, and by the Alexander von Humboldt Foundation.

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