

## ABSTRACT

Spatial Modeling of Succession in a Subtropical Savanna. (August 1993)

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A spatial modeling technique integrating conventional modeling with modern computer technologies is presented. The purpose of this study is to utilize geographic information systems (GIS) and rule-based expert systems to spatially model secondary succession on a savanna woodland site in southern Texas, USA.

The study site was a 600 m X 600 m area which consists of mesquite clusters distributed on a grassy matrix. Cluster distribution found in the 1941 aerial photograph was used to recreate the initial landscape for the study site. Relative growth rates for clusters in various size classes were determined from data obtained from the 1960 and 1983 aerial photographs. A rule base containing factors which believed to have regulated landscape development was linked to the growth model using computer programs written in the C language. Landscape patterns were then generated, analyzed and displayed through manipulation of a raster-based GIS software [Geographical Resources Analysis Support System (GRASS)]. The simulation result was compared to the most recent (1990) photograph to evaluate model performance. Different fire control scenarios were also introduced to predict the landscape change from 1990 to 2040.

The simulation result verified the roles of annual rainfall and soil characteristics. It also suggested that with proper control, the landscape could be maintained at its current state. On the other hand, if cluster development continues at its present rate, succession from open savanna to closed-canopy woodland would occur.