

INFLUENCE OF HISTORICAL LAND USE AND PHYSIOGRAPHY ON
CURRENT FOREST COMPOSITION AT THE POST WILDLIFE SANCTUARY,
MCDONOUGH COUNTY, ILLINOIS

An Abstract of
A Thesis Presented to the
Department of Geography
Western Illinois University

In Partial Fulfillment
of the Requirement for the Degree
Master of Arts

BY BABITA GURUNG
MAY 2011

ABSTRACT

The existence of forest composition results from a combination of species' individual responses and their interactions along physiographical and historical disturbance gradients. The purpose of this research is to examine the extent to which historical and physiographic factors affect forest composition in the Ira and Reatha T. Post Wildlife Sanctuary (Post Wildlife Sanctuary). 40 circular sampling plots, 0.06 ha, were selected randomly throughout the site, utilizing Geospatial Modeling Environment to measure the tree species' density. Current overstory forest composition and tree species as response variables were derived with Non-metric Multidimensional Scaling Ordination using PC-ORD. The slope angle, slope aspect, and stream distance were considered as the physiographic predictors. The same circular plot centers were used to measure the slope angle and slope aspect using suunto clinometer and compass. The stream network was determined using a Digital Elevation Model based on a single-flow algorithm of the water accumulation map throughout the forest, and the distance between the plot center and the stream bed was calculated in the ArcGIS. The past land use, past forest cover, and historical forest matrices were the historical predictors. The past land use was delineated in a 1941 aerial photo, and the forest cover was extracted using Feature Analyst 4.2. Historical forest metrics (mean shape index, mean patch size, and edge density) were derived using Patch Analyst 5. 30 different tree species and six forest assemblages were identified. These variables' multiplicative interactions were examined in ecological modeling using the Nonparametric Multiplicative Regression's coefficient: $Cross R^2$ in HyperNiche. Out of 30 tree species, three tree species - eastern redbud (*Cercis canadensis* L), green ash (*Fraxinus pennsylvanica* Marsh.), and sugar maple

(*Acer saccharum* Marsh.) - showed the significant, yet different, relationships. However, the rest of the 27 tree species and forest assemblages showed different but poor relationships.