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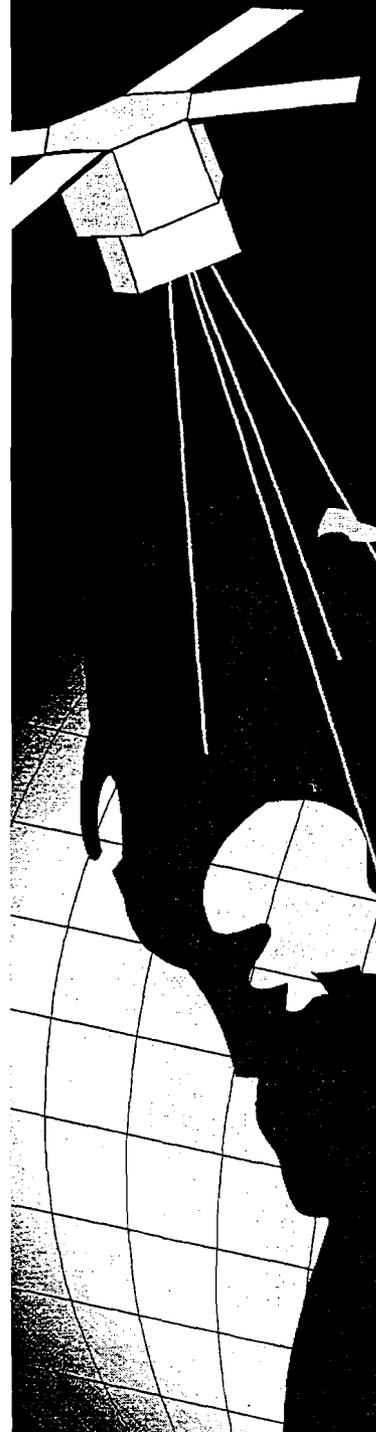
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GIS '98



COMPARISON OF PRESETTLEMENT AND PRESENT VEGETATION COVER OF MARION COUNTY, ILLINOIS USING A GEOGRAPHIC INFORMATION SYSTEM

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ABSTRACT

The vegetation types of Marion County, Illinois prior to European settlement, which were derived from soil association surveys, were compared to a satellite map of current vegetation types to quantify their change over time. GIS analysis indicates that 10% of presettlement prairie is currently grassland, 2% of presettlement prairie has been converted to forest, 32% of original prairie has been converted to agriculture and urban use, 17% of presettlement forest remains intact, grassland comprises 18% of presettlement forest while 21% of presettlement forest has been converted to agricultural and urban use.

INTRODUCTION

Much has been discovered about the earth's physical and biological environment. There is an understanding of how complex ecosystems interact, including the relationships among species of animals, species of vegetation, and species of animals and vegetation. However, with all of this understanding there is still much to learn. Ecologists today use much of the information they

collect from current research studying present day ecosystems. However, there is much to learn from past ecosystems. For instance, what was the vegetation like 100 or 200 years ago. With documentation of past ecosystems, it becomes easier to make inferences on historical and future vegetation patterns. With more information about past vegetation types, we can begin to define trends in vegetation patterns and also see how humankind has impacted these patterns through different forms of land use.

One historical shift in vegetation occurred when European settlers began to move across North America and modify the land for their own use. This draws one to consider such things as: what was the vegetation of this land like before the arrival of European settlers, what do current vegetation patterns have in common with historic patterns, and how have vegetation patterns been altered in the past 200 years.

The use of GIS technology in ecological studies is a relatively new approach, but is rapidly becoming mainstream in several areas of biological research (Stow 1993). However, literature is currently lacking on research that involves GIS in scientific studies of ecosystems on the landscape scale (Davis and Dozier 1988). Most of the literature has been focused on resource-management applications rather than ecological studies (Kessel and Cattelino 1978; Yool, et al. 1985).

The purpose of this study was to: (1) document the vegetation types of Marion County, Illinois (Figure 1) at the time of European settlement using current soil surveys; and, (2) compare the derived presettlement vegetation cover types to present vegetation cover types mapped by satellite imagery.



Figure 1. Location of Marion County in Illinois.

METHODOLOGY

The presettlement vegetation coverage used in our analysis was based on soil association boundaries which are an indicator of past ecosystems. The soil association data which were made available by the Illinois State Geological Survey (ISGS) and were originally represented as vector polygon coverages were converted to a grid coverage for analysis. The soil association coverage provided was reclassified into vegetation patterns of prairie or forest based on their soil associations characteristics. (Figure 2).

An Illinois Department of Natural Resources (IDNR) Critical Trends Assessment Program (CTAP) geographic database was used to develop a map of present land use including vegetation coverage. The original coverage which consisted of data from Landsat TM satellite imagery acquired during 1991-1995 included 19 cover classes ranging from municipalities, row crops and grasslands to forests. These cover classes were reclassified into three broad classes of forest, grassland, and other (Figure 3). Forest was made up of classes originally termed deciduous-closed, deciduous-open, coniferous, and forested wetland. Grassland was derived from the original class of rural grassland which included rural pasture, highway margins, and fence rows. Other included classes such as urban developments and row crops.

The presettlement vegetation coverage was then overlain with the present vegetation coverage to ascertain the percent change in vegetation cover classes over time (Figure 4).

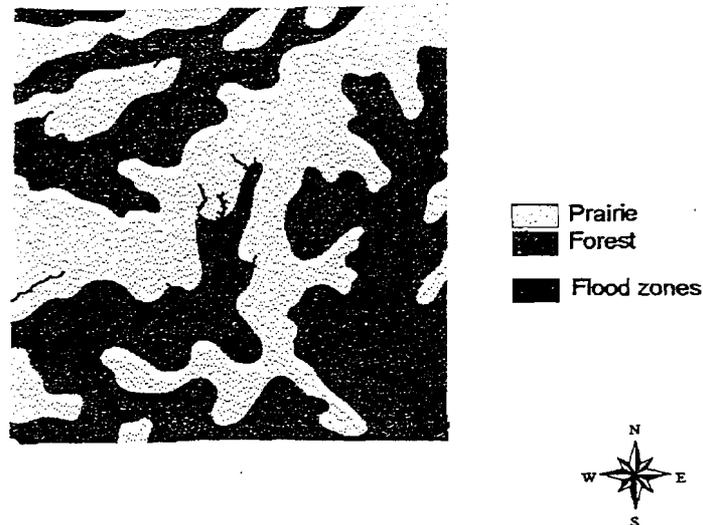


Figure 2. Reclassified coverage of soil associations of Marion County, Illinois as defined by the Illinois Natural History Survey to represent presettlement vegetation types. Also included are major flood zones to represent drainage patterns.

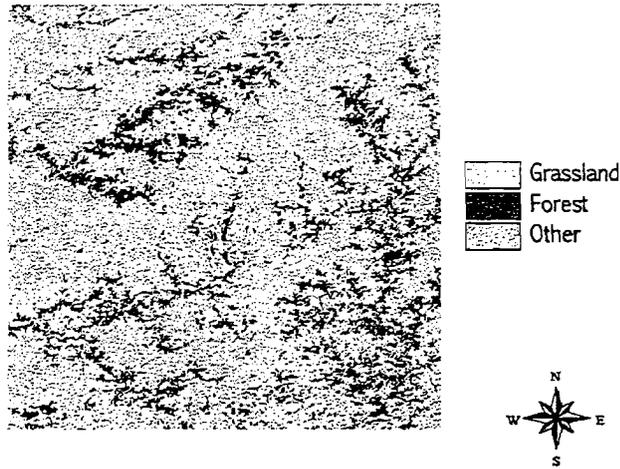


Figure 3. Reclassified coverage of land cover classifications of Marion County, Illinois from the Illinois Department of Natural Resources Critical Trends Assessment Program to represent present vegetation types.

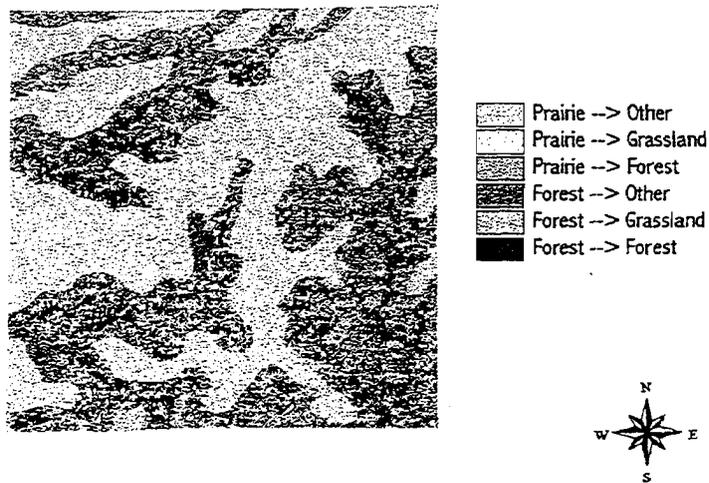


Figure 4. Overlay analysis of the reclassified present and presettlement coverages to represent change in vegetation types of Marion County, Illinois over a period of 175 years.

RESULTS

The reclassification of the ISGS soil associations into two classes of prairie or forest indicates that 44% (65,649 ha) of Marion County, Illinois was covered by prairie grasses, whereas the remaining 56% (83,553 ha) was covered by forest at the time of settlement.

The reclassification of IDNR's 19 original land cover classes into three broad classes of forest, grassland, and other indicates that 18% (26,856 ha) is presently covered by forest. The forested areas are composed of undifferentiated broadleaf deciduous forests of both open and closed canopy, undifferentiated coniferous forests, and forested wetlands. Grassland, which is composed of pastureland, rural grassland, waterways, buffer strips and CRP land, comprises 28% (41,777 ha) of the county. The remaining original land cover classes such as urban and built-up land, crop land, open water, and unforested wetlands all represent the 'other' cover class and constitute a majority of the county at 54% (80,569 ha).

Overlay analysis indicates that 10% (14,920 ha) of what was once prairie is now grassland and possibly could still contain some remnants of original prairie vegetation (Figure 5). The analysis also indicates that 2% (2,984 ha) of the original prairie has been converted to forest. The majority of this conversion exists along major highways where the land is either too narrow between land uses or too poor to produce row crops. The remaining 32% (47,745 ha) of what was prairie at the time of settlement has been converted to some other land use. The greater fertility of prairie soils versus forest soils probably led to the clearing of prairie for the use of row crops such as corn, soybeans, and other tilled crops. The overlay analysis also indicates that 17%

Vegetation Cover Change Over 175 Years

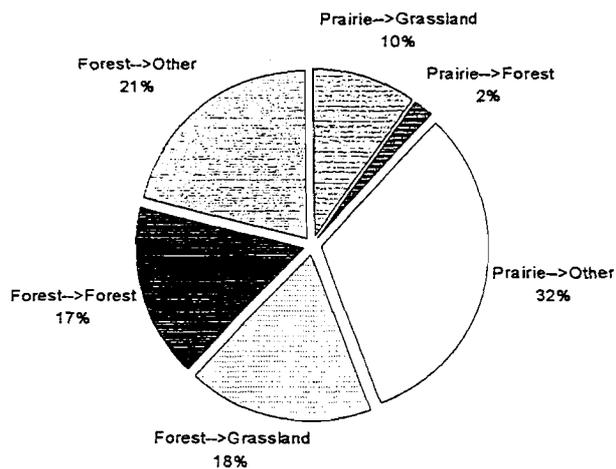


Figure 5. Proportion of vegetation cover change over 175 years.

(25,364 ha) of presettlement forest remains intact in its original position. Here again, this forested coverage lies mainly along the drainage ways and in valleys where there are steeper slopes and more saturated soils that prohibit the production of crops or the building of permanent structures. Grassland presently comprises 18% (26,856 ha) of the area that was forested in the past. This grassland is most likely the result of the clearing of forest for pastureland and lies primarily along forested edges where forest has remained intact. The remaining 21% (31,332 ha) of presettlement forest land has been converted to other forms of land use. As with the conversion of prairie to row crops, the clearing of forest land was most likely attributed to the progression of agricultural practices.

SUMMARY

The objectives of this study were to determine the presettlement vegetation types of Marion County, Illinois and to compare Pre-European vegetation types with current vegetation patterns mapped via satellite imagery to ascertain their change over time. As expected, vegetation types followed topographic characteristics with presettlement upland prairie being dissected by forested valleys and riparian zones and present forest remnants lying mainly along drainage ways. The information obtained from this study will benefit natural resource managers by providing them with the information necessary to better evaluate vegetation trends in terms of species composition and production capabilities.

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