



ABSTRACT

The purpose of this study is to analyze the environmental impacts of land-use change on biodiversity with focus on a particular species. This study highlights the importance of conservation of wetlands for restoration of floodplain mature growth forests, for providing intrinsic components for establishing a dynamic ecosystem vital for biodiversity. The question addressed is: How has the quantity and location of the Ivory Billed Woodpecker habitat in Cache River, Illinois changed through time and what are the prospects for increased habitat through restoration? Our aim is to evaluate the relationship of how a species may respond temporally and spatially to physical environmental changes, in particular those resulting from human interaction with the land. Investigations should also further our knowledge into how to sustain biodiversity within a fragmented ecosystem.

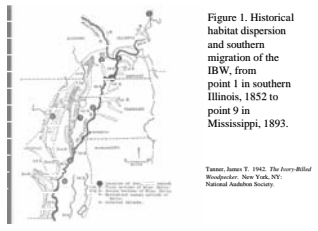


Figure 1. Historical habitat dispersion and southern migration of the IBW, from point 1 in southern Illinois, 1852 to point 9 in Mississippi, 1893.

Source: James T. 1982. *The Ivory-Billed Woodpecker*. New York, NY: National Audubon Society.

BACKGROUND

The Ivory Billed Woodpecker (*Campephilus principalis*), presumably extinct since the 1940s, is known to have been the largest woodpecker in North America. Figure 1 shows the historic locations of the Ivory Billed Woodpecker (IBW). Southern Illinois represents the northern extent of its range. From the late 1800s to the mid-1900s, the woodpeckers' range shifted southward. The hardwood bottomland forests and swamps of the Cache River, IL, the northernmost cypress and tupelo swamps of the U.S., provide ideal habitat conditions for the IBW. However, changes in surrounding land cover and landuse, as well as alterations in hydrology, climate, and settlement have impacted the Cache River composition and corresponding habitat and species diversity. A portion of Township 14 South - Range 1 East in Pulaski County, IL was chosen as the study area (Fig. 2), with emphasis on changes in land-use from 1806 to 2001 surrounding the Buttonland Swamp region of the Cache River wetlands.

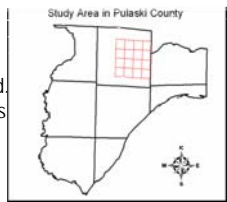


Figure 2. Study area in Pulaski County, Township 14 S - Range 1E, Sections: 9-12, 16-13, 21-24, 28-25.

METHODOLOGY

1806-1809 Pulaski County land survey notes of vegetation and landscape, obtained from the Pulaski County Courthouse, were mapped as point data using ArcMap 9.2 and ArcView 3.3 to represent pre-settlement vegetation of the study area. 1938 aerial photographs, acquired through the Illinois Geospatial Clearinghouse, and 1971 aerial photographs from the SIUC Map Library were both subset with ERDAS IMAGINE 8.7 software. Images from 1938 and 1971 were then georeferenced using ArcMap 9.2 to mosaic the study region. The U.S. Geological Survey provided 2001 satellite imagery to complete the timeline of historical habitat changes surrounding Buttonland Swamp within the Cache River. Ivory Billed Woodpecker habitat requirements and distribution were researched for further analysis of species biodiversity change through time.

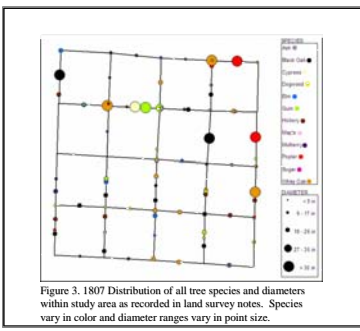


Figure 3. 1807 Distribution of all tree species and diameters within study area as recorded in land survey notes. Species vary in color and diameter ranges vary in point size.

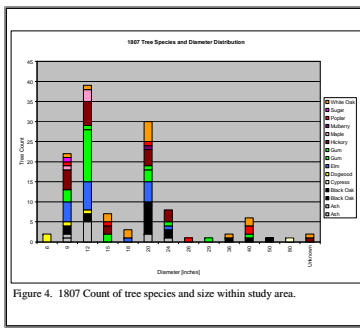


Figure 4. 1807 Count of tree species and size within study area.

RESULTS

The generated maps show evident changes in the intensity and size of bottomland forest and wetlands of the Cache River. The 1807 land notes were used to generate a map of varying tree species and diameter, depicting the pre-settlement vegetation and size of each species (Fig. 3). This map alongside the species distribution graph (Fig. 4) provides insight into the age of trees through diameter measurements, with most trees of the region falling within the range of 9 in. - 20 in. in diameter. There are, however, multiple areas of old growth, in particular near the current Buttonland Swamp region, with recorded tree diameters of 30 in - 80 in. Aerial photographs and imagery from 1938, 1971, and 2001 (Fig. 5, 6, 7 respectively) provide a timeline of landuse change. These maps demonstrate the increase in agricultural practices, loss of bottomland forest, and alterations in hydrology. Large forest tracts in the southern portion of the study area have been significantly eliminated since 1938, with most of the region being replaced with agricultural land by 2001. The loss of forest density within Buttonland Swamp is also apparent in each year observed, a result of both land alteration and modifications in hydrology. These changes have ultimately resulted in the loss of biodiversity within this region.



CONCLUSIONS

Results illustrate the changes in landscape from that of the natural pre-settlement vegetation to the land composition today. This information is necessary to understand patterns in landuse change and consequent woodpecker habitat loss. This research provides documentation of baseline habitats which can serve as insight for natural landscape restoration and management. Maintaining old growth forests is crucial for supporting the IBW. Though the bird is expected to be extinct, many other species of flora and fauna depend on restoration of these physiographic conditions. This case study of the Ivory Billed Woodpecker and the Cache River serves as an example of how anthropogenic disturbances can result in loss of crucial habitat. Documentation and mapping of baseline vegetation can provide inspiration for restoration and sustainable use of the land.

ACKNOWLEDGMENTS

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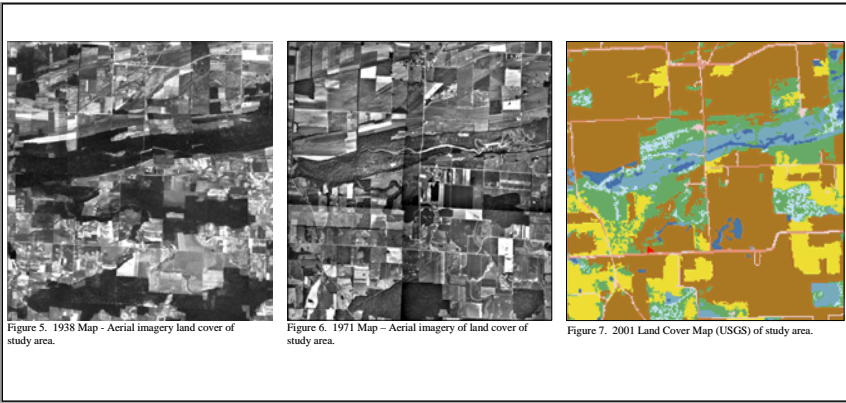


Figure 5. 1938 Map - Aerial imagery land cover of study area.

Figure 6. 1971 Map - Aerial imagery of land cover of study area.

Figure 7. 2001 Land Cover Map (USGS) of study area.

