

THE ALCOVY RIVER AND SWAMP INTERPRETIVE CENTER: AN APPLICATION OF GEOGRAPHIC INFORMATION SYSTEMS TECHNOLOGY IN SITE ANALYSIS

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Abstract. This study demonstrates the analytical and mapping capabilities of ARC/INFO Geographic Information System (GIS) software in site selection and graphic presentation of study results. Project goals were to protect a significant Piedmont wetland and to promote public education for natural resource conservation and preservation. The Alcovy River and Swamp System in Newton County, Georgia, was identified as the project site. Data analyses identified special interest and environmentally sensitive areas, potential facilities and parking sites, and pathway and boardwalk areas.

INTRODUCTION

Wetlands in the Piedmont primarily exist within the narrow floodplains adjacent to rivers and streams. The biological, socioeconomic, aesthetic, educational, and research benefits of alluvial river and swamp ecosystems are well documented. (The National Wildlife Federation, 1987; Wharton, 1970) Even so, the natural functioning of these riverine systems is threatened by development pressures accompanying population growth in the Georgia Piedmont. (Kundell and Woolf, 1986) Destruction or interruption of riverine wetland systems may have detrimental effects on downstream environments, resulting in lower biological productivity and decreased water quality and quantity. Wharton et al., 1982)

Study Goals

For Georgia citizens to have meaningful involvement in political processes which affect local natural resources, they must be well-informed regarding the values of these resources. To this end, the dual goals of this project were protection of a significant Georgia Piedmont wetland and promotion of public education for natural resource conservation and preservation. To address these goals a proposed wetlands interpretive center and outdoor trailway system were located in a portion of the Alcovy River basin in Newton County, Georgia.

THE STUDY AREA

The Alcovy River originates in the east-central portion of Gwinnett County, flows south through Gwinnett, Walton, and Newton Counties, and empties into Jackson Lake

approximately ten miles south of Covington, Georgia. In general, the Alcovy River flows through a sparsely developed rural landscape; however, the river is within an hour drive of Atlanta. "The Alcovy River is ideally suited for educational uses: it is essentially unpolluted, it is located within easy driving distance of a large metropolitan area but is unaffected by it; and contains a unique swamp ecosystem found nowhere else in the Georgia Piedmont." (Wharton 1970)

The project study area is a portion of the Alcovy basin located approximately two miles east of Covington, Georgia. A unique natural area on site is Cornish Creek Swamp. The swamp, typically covered by several inches of water, supports a 45-acre stand of tupelo gum, the northernmost pure stand of tupelo in the Georgia Piedmont.

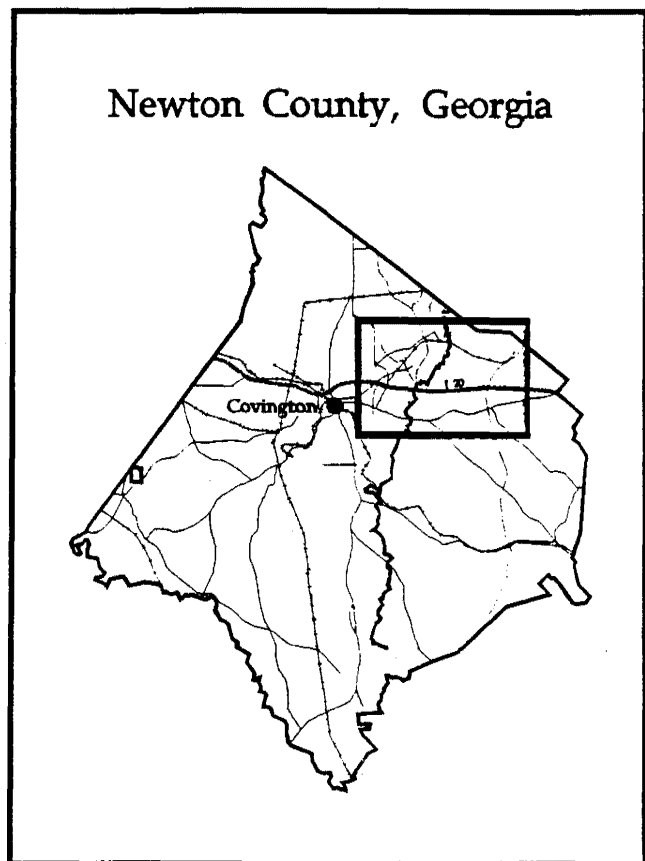


Figure 1. Study area context map.

IDENTIFYING INTERPRETIVE OPPORTUNITIES

Distinct habitat types and natural and cultural features were regarded as interpretive opportunities. The process for locating potential interpretive opportunities involved two basic steps: first, locating distinct habitat types and natural and cultural features, and second, removing undesirable areas from consideration. Literature review, site visits, and local experts assisted in identifying special and unique interpretive opportunities on-site. Special features included bottomland hardwood forests, forested wetlands, the Alcovy River and streams, a rock outcrop, specimen loblolly pine, remnant agricultural terraces, a borrow area from construction of Interstate 20, and a reservoir mitigation site (a wetlands restoration attempt, partial mitigation for the Cornish Creek Reservoir about three miles upstream of the study area). The unique natural area on-site is Cornish Creek Swamp.

Some areas of the site were judged undesirable as potential interpretive areas because they might invade the privacy of local residents, interfere with the comfort of visitors, or threaten the safety of visitors. Commercial and residential areas and airplane landing strips were located and removed from consideration. Buffer zones were created around existing structures, local roads and highways. These areas also were removed from the potential interpretive areas.

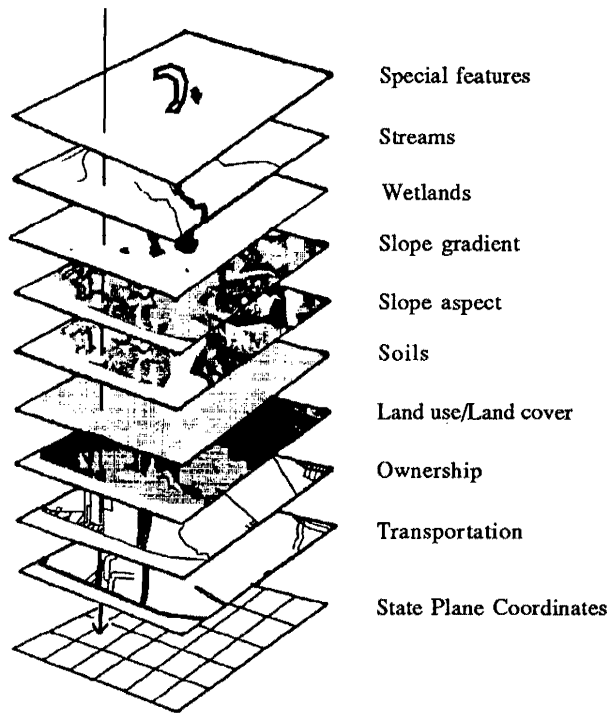


Figure 2. Some project database layers.

STUDY METHOD

Vector-based ARC/INFO software was used in this project for data capture, analysis, and map composition. Traditionally, geographic data have been presented for analysis in map form. Presently, computer technology is replacing manual mapping with the more efficient digital format. This study employed Geographic Information Systems (GIS) technology to develop a digital database and computer models for site analysis. The technology was used because GIS has the capacity to integrate data of various scales and formats, to manipulate spatial data sets and corresponding attribute information, to perform complex spatial analyses incorporating different data types, and to output high quality map products.

Literature review, case studies, and site visits with local experts guided development of project components (including space for offices and a regional education center, parking, and pathways and boardwalks), functional relationships among the project components, and design criteria, and directed development of a digital database of site resource information. The database included cultural and natural resource information digitized from paper maps and aerial photographs. Methods and standards were established to ensure digital data accuracy.

Data analyses were accomplished using ARC/INFO OVERLAY operations. Three computer models were developed to:

- identify interpretive opportunities,
- locate facilities and parking sites, and
- locate potential pathway and boardwalk areas.

LOCATING FACILITIES AND PARKING SITES

Principal components of the siting process for facilities and parking were:

- delimiting a general area within which facilities and parking sites would be located,
- identifying areas to avoid,
- responding to environmental factors for siting facilities,
- responding to environmental factors for siting parking,
- considering functional requirements for facilities and parking sites, and
- selecting the preferred sites.

The siting process first sought to focus the site search by establishing a context area based on site access, proximity to unique interpretive opportunities, and adherence to the Newton County Land Use Plan. Within this context area existing structures, road rights-of-way, utility easements, and significant natural and cultural features were removed from consideration as potential sites. Environmental factors including soil, slope gradient, slope aspect, and land cover were incorporated in the model to define areas suitable for development of facilities and parking. Functional requirements including space requirements and proximity of parking to the facilities were applied, reducing the number of potential sites to two. Selection of the recommended facilities and parking sites was based on site configuration and potential for views of Cornish Creek.

LOCATING PATHWAYS AND BOARDWALKS

The third computer model was developed to locate potential interpretive pathway and boardwalk areas. Principal components of the analysis process included:

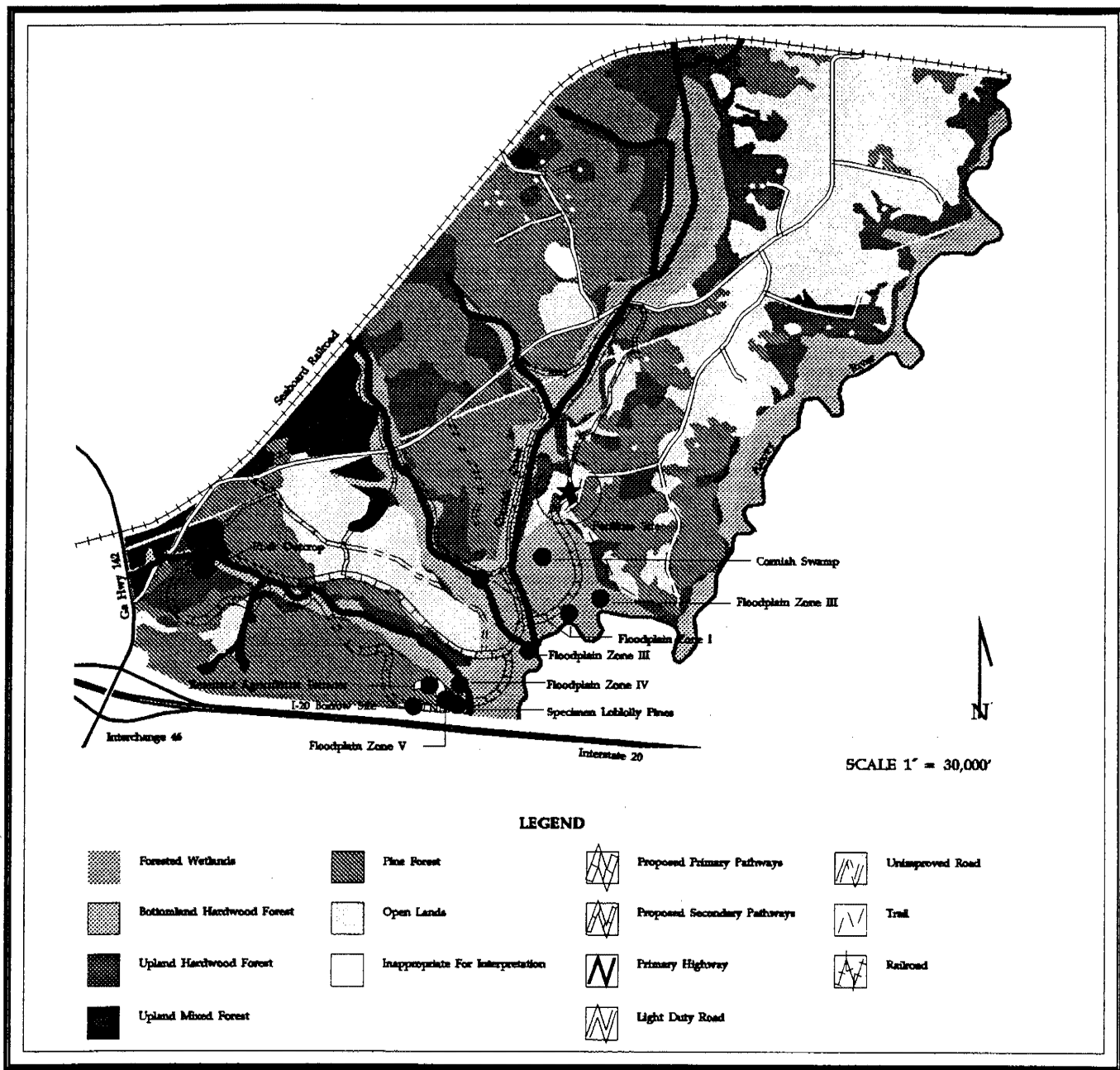


Figure 3. Proposed Alcovy River Wetlands Interpretive Center and Pathway and Boardwalk System

- identifying a context area for the trailways system,
- determining areas to avoid, and
- responding to environmental factors in locating pathways and boardwalks.

As with locating facilities and parking sites, a context area was determined for the interpretive trailways system. Criteria included requiring trails to commence and terminate at the facilities site, to avoid crossing major highways and the Alcovy River, to not extend beyond two miles of the facilities to limit maintenance requirements, to avoid existing commercial and residential areas, avoid crossing lakes and ponds, and maintain some distance from existing structures, roads, and landing strips. Environmental factors including soil, slope, potential drainage problem area,

and environmentally sensitive areas (areas supporting unusual plants or wildlife vulnerable to human disturbance) were incorporated in the model to identify appropriate pathways and potential boardwalk areas.

Once potential pathway and boardwalk areas were delineated, design of the trailways system was undertaken. Trailways configuration underwent various modifications to respond to specific design criteria. General criteria intended to have visitors traverse areas of special or unique habitat types and natural or cultural features. Corridors between these special areas were configured to maximize diversity of landscape types and features within a minimum walking distance. Additional criteria sought to prevent environmental deterioration and to address visitor interest and comfort.

The proposed pathway and boardwalk system provides two levels of trails. The primary pathway and boardwalk configuration seeks to expose visitors to special and unique site resources and to provide a great variety of landscape experiences within a relatively short distance. The secondary pathway seeks to address visitor needs for seclusion and variety, encouraging repeat visitation, and to provide additional opportunities for guided tours and research projects.

Future expansion of the pathway system might take the form of a "greenway" project linking other significant features within the Alcovy River corridor such as the Ulcoufahatchee Natural Area. A greenway project on the Alcovy would respond to important needs of protecting the integrity of the riverine wetlands and providing a wildlife corridor, as natural habitat areas continue to diminish.

SUMMARY

This project promotes the protection of a significant local landscape within the Alcovy River basin and provides an ideal setting for an environmental education program which emphasizes learning about the natural world through first hand experience in the outdoors. The site is an excellent location for exploring wetlands functions and values and needs for resource preservation. In addition, an environmental education center such as the one proposed provides opportunities to study public attitudes about natural resources, particularly wetlands, and to evaluate the effectiveness of interpretive programs in increasing public knowledge, enhancing positive environmental attitudes, and influencing public involvement in the political process with regard to natural resource issues.

The strength of GIS technology for this project was in the areas of analysis and mapping. The existing digital database also provides opportunities for public education and on-site research efforts. For example, the database could be used to develop computer models for public demonstration of flood events, historical land use patterns, changes in river and floodplain resulting from sedimentation and erosion, and a wide variety of other possibilities. Availability of the database also will enhance future resource planning, management, and monitoring efforts.

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