



LAND INFORMATION *Bulletin*

from the National Consortium for *Rural Geospatial Innovation*s

Mid-South, University of Arkansas

The Delta Wetlands of Arkansas

GIS-Based Analysis of Arkansas' Natural Resources

Wetlands are transitional habitats between land and water, often making wetland characterization and mapping a complex process. Geographic information systems (GIS) make it possible to provide an overview of wetland analysis at the watershed level, which gives wetland specialists in state agencies up-to-date information. Identifying, quantifying, and subsequent analysis of watershed wetland resources allows wetland specialists to evaluate and prioritize existing wetlands to be considered for protection and/or restoration. In Arkansas, a methodology to analyze wetland data was co-developed by the Multi-Agency Wetland Planning Team (MAWPT) and the Center for Advanced Spatial Technologies (CAST).

Figure 1

A typical cypress-tupelo swamp found in the Arkansas Delta and elsewhere in the southeastern United States.



Wetland managers increasingly are facing challenges associated with wetland protection and restoration. Solutions to complex management issues are not easy; they often involve multi-disciplinary approaches and analytical modeling techniques. Huge quantities of spatial and temporal data must be stored, managed and analyzed. Today's modeling approaches, coupled with GIS, are helping Arkansas' wetland managers in the decision-making process and, ultimately, paving the way for the protection of our wetlands now and in the future.

What are Wetlands?

Most definitions of wetlands contain three components: 1) water, 2) unique soils different from upland areas, and 3) vegetation adapted to wet environments. Variations of the definition confuse even scientists, creating problems in identifying and managing wetlands.

What we know for certain is that wetlands are a critical indicator of an ecosystem's health and they serve many functions: provide flood control, improve water quality by removing pollutants as water flows through them, and provide a safe haven for many species of fish, waterfowl and other wildlife.

Wetlands are also an economic asset. Bottomland hardwood and cypress lumber from the swamps of the southeastern United States is worth an estimated \$8 billion. Besides lumber, wetlands are the basis for a booming eco-tourism economy, draw birdwatchers, hunters and other visiting recreationists who help boost local businesses.

A Long-Term Strategy

The Arkansas Wetland Strategy (1997) was developed by the Arkansas Multi-Agency Wetland Planning Team (MAWPT)—an organization comprised of six Arkansas state agencies: Arkansas Natural Heritage, Soil & Water Conservation Commission, Forestry Commission, Cooperative Extension Service—University of Arkansas, Department of Environmental Quality, and the Arkansas Game and Fish Commission. The goal of the Strategy is to develop information on Arkansas' wetlands, define state agency roles, especially with regard for opportunities for coordination, and formulate specific steps to address wetland needs and concerns within the state. Outlined in this document is a 10-point strategy, describing the state's wetland planning efforts:

- 1) **Achieve “no net loss” and a long-term net gain of wetlands in each watershed region.**
- 2) **Characterize baseline land information on Arkansas wetlands: the composition (hydrology, soil characteristics, etc.) , function and landscape patterns.**
- 3) **Identify priority wetland protection and restoration sites.**
- 4) **Develop better understanding of wetland hydrology, composition, structure, functions, and values as well as techniques for management and restoration.**
- 5) **Increase the quantity and enhance the quality of Arkansas' wetlands on public lands through coordinated acquisition and improved stewardship.**
- 6) **Educate the public and landowners about the benefits of wetland conservation on private lands, and create incentives for wetland protection, restoration, stewardship, and enhancement.**
- 7) **Help create urban riparian/wetland greenbelts for public use, education, and urban wildlife habitats.**
- 8) **Increase wetlands education for local governments, the public and schools.**
- 9) **Develop administrative organizational structure for private and public mitigation activities.**
- 10) **Develop state capacity for tracking activity and long-term monitoring of wetland restoration and protection efforts.**

GIS Methods Set the Stage for Recovery

The methodology below, as outlined in The Standard GIS Methodology for Wetland Analysis, describes the various ecological criteria and basic processes used to prioritize wetlands in Arkansas:

- 1) Assemble appropriate data on ecosystem components needed for decision-making with emphasis on existing watershed-scale geographic data.
- 2) Review maps of ecosystem components (water, soil, vegetation) to explore wetland patterns, problems and potentials in the watershed.
- 3) Prepare component overlay maps to investigate relationships between individual wetland components. *Example:* to what extent does existing forest occur on hydric soils?

Figure 2
This image shows details of soil layers along the main stem of the L'Anguille River watershed in St. Francis County.



- 4) Develop general wetland goals and objectives of the project, emphasizing measurable and mappable structural attributes. *Example:* If the highest-priority goal is establishing a naturally vegetated corridor along a main branch of the river, an objective may be to restore a minimum 60-meter-wide buffer along ditches.
- 5) Implement GIS-based procedures to generate priority maps of protection and restoration priorities based on objective, clearly stated criteria.
- 6) Review priority maps, verify on-ground as needed, evaluate resulting maps and revise criteria if necessary.
- 7) Synthesize knowledge of watershed characteristics and wetland protection programs into a strategy for wetland protection and restoration based on goals developed for the state and watershed.
- 8) Develop monitoring and evaluation plan for the watershed strategy.

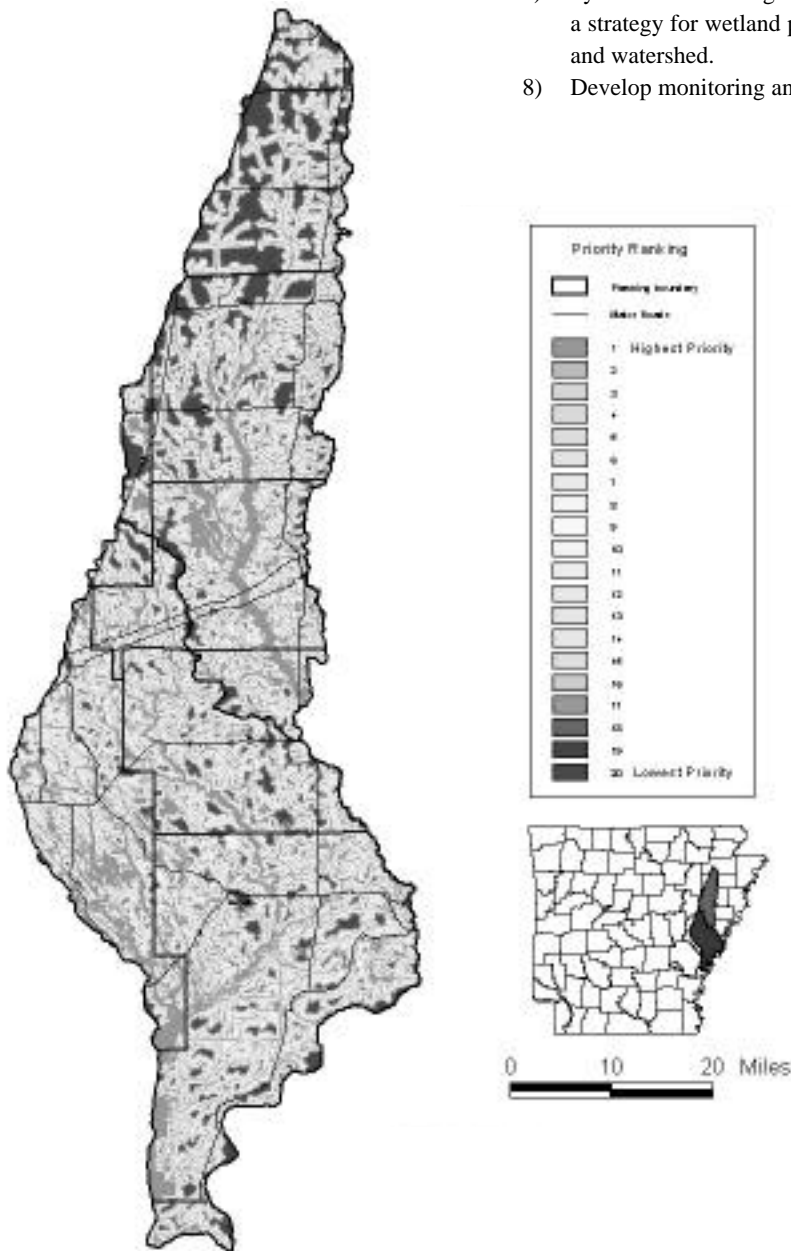


Figure 3
 This map, which comprises two watersheds in eastern Arkansas' delta region, shows the relative ranking of wetland priority. In this map, originally produced in color, the darkest shades show lands of least priority, while the light to medium shades highlight areas of highest priority.

Ken Brazil, of the Arkansas Soil & Water Conservation Commission, emphasizes the importance of GIS as a tool for analyzing Arkansas' wetland resources: "When evaluating new programs and proposals, the ability to combine and view data from multiple sources provide us with a clearer landscape picture of potential conservation emphasis areas and opportunities. Wetland prioritization model results, along with non-point source discharge, mitigation, 404 permit, water quality and quantity, conservation program, and any other GIS data is very useful for ecosystem management."

More State Involvement

As the federal government delegates more control to state and local authorities, state wetland programs become increasingly important. Prioritizing wetland projects within programs such as the Arkansas Wetlands Strategy helps state wetland specialists make more-informed decisions. And although some local communities have wetland-protection programs, state agencies are often better equipped to address wetland protection for the following reasons (Kusler, 1983):

- Wetlands cross governmental boundaries and make local control difficult
- Wetlands in one watershed can affect areas in other jurisdictions
- State agencies generally have more resources and expertise than local agencies
- Many traditional functions of states are already related to wetland protection, such as fish and wildlife protection (Mitsch and Gosselink, 1986).

About RGIS

The National Consortium for Rural Geospatial Innovations–Mid South (RGIS) is located on the campus of the University of Arkansas in Fayetteville. It is a USDA program designed to promote the use of geospatial information and technologies by communities in rural America. RGIS is dedicated to helping communities understand the concepts and benefits of using geospatial data as well as assisting them in all aspects of GIS development.

Protection Now and For the Future

As a national awareness for wetland conservation grows, strategies such as the one discussed here will become increasingly important and will serve as a model for the future protection of wetlands throughout the United States.

Says Kenneth Colbert, Environmental Program Manager for the Arkansas Soil & Water Conservation Commission, "The information from CAST was put to use almost immediately. It has been used to determine site suitability for potential mitigation banks, as well as determining restoration potential in irrigation project areas. In the long run, one of the primary functions of such information will be the maximization of our restoration dollars."

References

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Figure 1, courtesy of The Great Cypress Swamps, by Dennis, J. V., Baton Rouge: Louisiana State University Press, 1988.

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