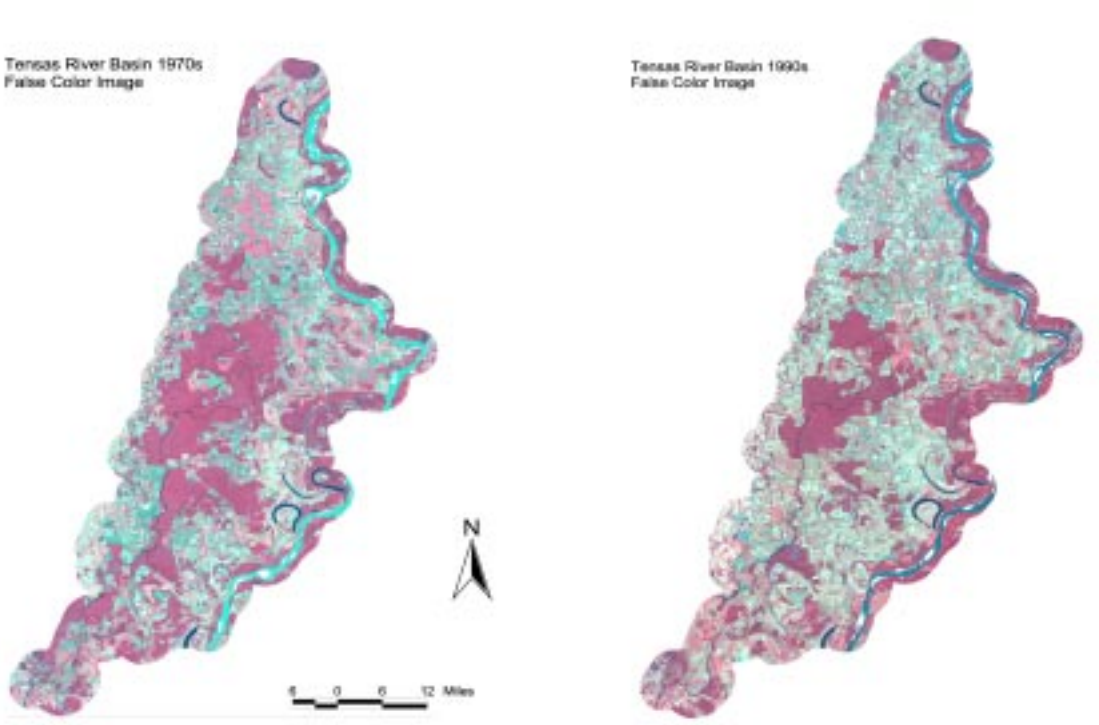
EXECUTIVE SUMMARY
TENSAS RIVER BASIN - A LANDSCAPE APPROACH TO COMMUNITY-BASED ENVIRONMENTAL PROTECTION



These images illustrate the 12% decrease in total forested landcover between the early 1970s and the early 1990s.

Tensas River Basin

The purpose of this document is to give the results of an ecological assessment using landscape ecology and water quality methods in the Tensas River Basin, Louisiana. This assessment can be used as a tool to estimate the impact of human land use practices that are being currently implemented to improve environmental quality. It can be also used for ecosystem targeting to help people make good decisions on the best location for restoration sites. The U.S. EPA's Office of Research and Development, Landscape Ecology Branch did this work under the guidance of U.S. EPA Region 6, the Louisiana Department of Environmental Quality and the U.S. EPA Gulf of Mexico Program by way of the Regional Applied Research Program (RARE).

The Tensas River Basin encompasses approximately 930,000 acres of Mississippi River alluvial flood plain in Northeast Louisiana. Historically, most of the Basin was covered with bottomland hardwood forested wetlands. The bottomland hardwood wetlands of the Tensas River Basin have been described as one of the richest ecosystems in the country in terms of diversity and productivity of plant and animal species. At the same time, these cleared lands are recognized as some of the Nation's most productive farmland for grain and fiber. The result is a conflict of land use between traditional row crop agricultural interests and a concern for a healthy, diverse, and stable ecosystem.

The Tensas River Basin is a target watershed of several U.S. Environmental Protection Agency environmental studies including the Nonpoint Source Management Program, U.S. EPA Region 6, and the Gulf of Mexico Program. The Nonpoint Source Management Program has identified watersheds in Louisiana which have been impaired by nonpoint pollution and where land use practices contribute to these pollutant problems. This program identified specifically what types of best management practices need to be implemented to improve environmental conditions. Using the existing data and with the cooperation of landowners, the Tensas River Basin offered a unique opportunity to implement best management practices that could help reduce the concentration of sediment, excess nutrients, or pesticides leaving the Basin. The nutrients leaving the Tensas River Basin, combined with other Mississippi Valley watersheds, are of concern to the Gulf of Mexico Program because research has shown that excess nutrients cause hypoxia (<2 mg/l oxygen) in the bottom waters of the Gulf of Mexico. This

condition represents a threat to the coastal marine ecosystem and fisheries in this region of the Gulf. Landscape Ecology methods provide a tool to assess the impact of human landuse practices that are being implemented to improve environmental quality.

In years past, the freshwater marshes, stream bank areas, and bottomland swamps of the Tensas River Basin were under strong development pressures. Large portions of forest near streams and in backwater swamp areas were converted to agriculture. This loss of forested areas decreased filtering capacity that normally removes pollution and nutrients before they enter streams, lakes, and estuaries. Wetland forests also dissipate energy and nutrients associated with extreme precipitation events and therefore reduce damage to downstream farms and cities resulting from floods. The Tensas River Basin is unique in that natural levees along the riparian vegetation lie on the highest ground in the Basin. This causes drainage water to run parallel to streams for many miles before actually entering the stream and river water channels. Wetlands and backswamps then become the vegetation filtering areas for pollutants and nutrients. Preserving or restoring wetland forests have other economic benefits including wetland-based recreation, including hunting and harvesting wetland plants. The people who live within the Tensas River Basin realize that the vegetation along a stream and in backswamp areas can influence the condition of both the stream bank and the water in the stream. Restoration efforts began in the early 1990s.

The strip of vegetation along streams is known as the riparian vegetation zone. It is commonly described by the types of vegetation it contains and by the presence of water. In an ideal situation, many pollutants and fertilizers will be intercepted or absorbed by the riparian vegetation and it's root system. This helps to keep the streams clean. Bank erosion is also mitigated by intact riparian vegetation. The conditions of the riparian ecosystem over a whole watershed can be studied in order to learn where, for example, a restoration project would most improve water quality. Similarly, a characterization of riparian conditions over the entire Tensas River Basin can help to identify which areas of the Basin are most likely to see improved water quality as a result of riparian vegetation improvements.

Land cover is the product of past land uses on the backdrop of the biophysical setting. A map of land cover is essentially a picture of the dominant vegetative, water, or urban cover in an area. The images of land cover in the Tensas River Basin for 1972 and 1991 (see above) are based primarily on images taken by the Landsat Multispectral Scanner satellite since the early 1970s. The land cover map was based on the North American Landscape Characterization (NALC) data, a Federal effort to create similar data for the entire country. The resolution of the land cover data is 60 meters, so each pixel (picture element) represents an area about the size of a football field. Although individual pixels are far too small to be rendered accurately here, the visual impression of broadscale regional patterns is readily apparent. Forest vegetation shows up on the image as red in color, agriculture shows up as light red, grey, light blue and white and almost always shows a pattern with rows or right angles typical of farm fields.

These images were then classified for landuse. The classifications were forest, human use (urban and agriculture) and water. Through the use of computerized Landscape analyses, the 1972 image was compared to the 1991 image and changes in forest areas and human use areas were calculated. As the images show, there was a tremendous forest loss over that time period. In 1972 the land cover types forest and agriculture covered an area of about 34% and 65% of the area, respectively. In 1991 the land cover types forest and agriculture covered an area of about 22% and 77% of the area, respectively. Where forests have been removed, agriculture and urban land covers become more dominant, this can be seen by comparing the images to observe the forest loss over 20 years.

The images also show how the forest, agriculture and urban land cover vary across the landscape of the Tensas River Basin. Understanding the variation of landcover with respect to landscape features, such as cities, roads, lakes and streams, is the foundation of the landscape ecological assessment. Other landscape indicators include: population density and change, human use index, roads, roads along streams, percentage of forest cover, forest fragmentation, percent of the watershed in the largest forest patch, forest analysis of the Tensas River Basin, vegetation change, vegetation change by subwatershed, forest and crop land along streams, watershed indicators, riparian analysis, vegatation change along the Tensas River Reach, backswamp area analysis, soil erodibility analysis, and wetland restoration analysis.

The Tensas River Basin is one of 2,099 individual watersheds located across the United States. Many people throughout the United States are restoring riparian vegetation areas and are in need of GIS and landscape methods to help them make good decisions on the best locations for restoration sites.