

# EBENEZER CREEK: A WATERSHED PROTECTION DEMONSTRATION PROJECT

Jonathan P. Ambrose<sup>1</sup>, Chris G. Canalos<sup>2</sup>, Susan R. Crow<sup>3</sup>, and Robert A. Scott<sup>4</sup>

**AUTHORS:** <sup>1</sup>Ecologist, <sup>2</sup>Geographic Information Systems Specialist, Georgia Department of Natural Resources, Wildlife Resources Division, Natural Heritage Program, 2117 Hwy. 278 SE, Social Circle, Georgia 30279; <sup>3</sup>Natural Resource Specialist, Institute of Community and Area Development, The University of Georgia, Athens, Georgia 30602. <sup>4</sup>Environmental Engineering Program Manager I, Georgia Department of Natural Resources, Environmental Protection Division, Atlanta, Georgia 30334.

**REFERENCE:** *Proceedings of the 1995 Georgia Water Resources Conference*, held April 11 and 12, 1995, at The University of Georgia, Kathryn J. Hatcher, Editor, Vinson Institute of Government, The University of Georgia, Athens, Georgia.

**Abstract.** Progress on an EPA-funded watershed protection demonstration project for Ebenezer Creek in Southeast Georgia is reported. Problems with eutrophication of this ecologically significant stream have been observed in recent years. A technical working group involving multiple cooperators is investigating the problems with a watershed-based approach. Biodiversity assessments, digital database development, land use trends analysis, sediment oxygen demand evaluation and public outreach are elements of the demonstration project.

Work on this Wetlands Protection Development Grant project began in August of 1993. The major work elements of the project are as follows: 1) conducting a biodiversity assessment of lower Ebenezer Creek and its associated wetlands; 2) developing a digital database of landcover, hydrology, geology, soils, elevation, and rare species locations for the watershed; 3) analyzing recent land use trends in the watershed; and 4) physical and chemical sampling of water and sediments in Ebenezer Creek swamp.

## INTRODUCTION

In 1993 the Georgia Department of Natural Resources (DNR) sought funding from the U.S. Environmental Protection Agency Region IV Wetlands Protection Development Grant Program to conduct a watershed-based study of Ebenezer Creek, a blackwater stream that discharges into the Savannah River in Effingham county (Figure 1). The lower portion of Ebenezer Creek is characterized as a "backwater swamp" environment, in which water levels in the flat creek basin are influenced greatly by the rise and fall of the Savannah River (Wharton, 1978). This portion of the creek contains an old-growth baldcypress-water tupelo swamp, and has been designated both a Georgia Scenic River and a National Natural Landmark.

In the past ten years Ebenezer Creek has exhibited signs of rapidly advancing eutrophication. The swamp has experienced extremely low levels of dissolved oxygen, fish kills, and blooms of aquatic weeds. The goals of the watershed protection demonstration project are: 1) to determine the eutrophication status of Ebenezer Creek; 2) to identify, if possible, all significant sources of allochthonous nutrients and their relative contributions to the problem; 3) to evaluate possible restoration alternatives; and 4) to assess watershed management strategies to protect this important natural resource in accordance with state and federal laws and local needs.

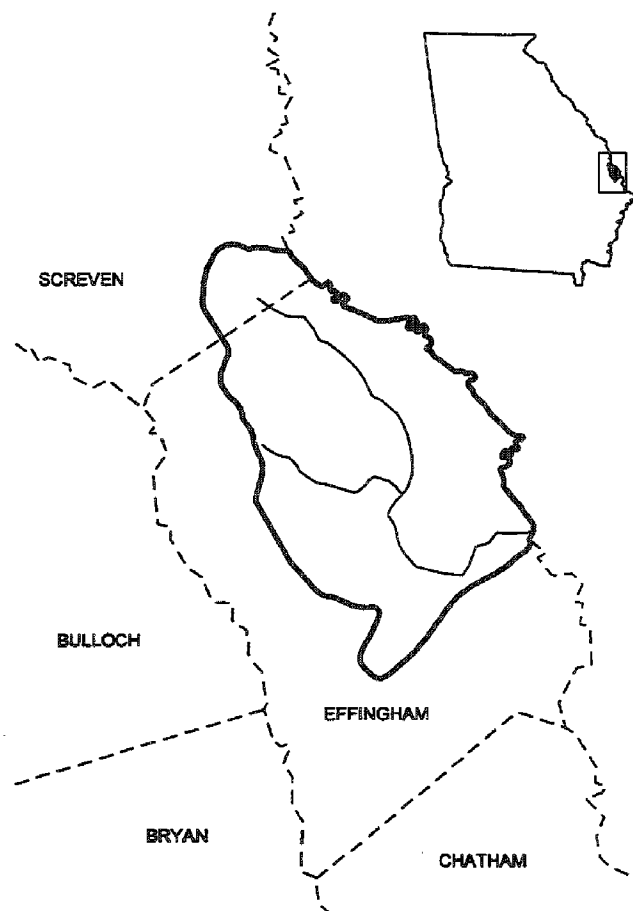


Figure 1. Location of Ebenezer Creek study area.

The project involves cooperation with two other state-funded agencies, Georgia DNR's Environmental Protection Division (EPD) and The University of Georgia's Institute of Community and Area Development (ICAD), as well as members of Scenic Ebenezer Inc., the Georgia Conservancy, and an ad hoc committee known as the Ebenezer Creek Technical Working Group.

## METHODS

### Biodiversity Assessment

Prior to the commencement of field work, location data for rare species and natural communities were compiled for the Ebenezer Creek watershed. These data were obtained from the biological and conservation database of the Georgia Natural Heritage Program (GNHP), from natural history museums, and from various survey reports and articles about the Ebenezer Creek watershed. A list of known and potentially-occurring rare species and significant natural communities was developed for the Ebenezer Creek watershed, and was distributed to all individuals involved in the biodiversity assessment.

Field work associated with the biodiversity assessment began in April of 1994; GNHP staff conducted an initial survey of natural communities within the study area, and began documenting occurrences of rare vascular plants and vertebrates. In July, three biologists were contracted to conduct surveys for birds, amphibians, reptiles, and rare vascular plants. The majority of the fieldwork is being conducted within four natural community types in the lower Ebenezer Creek watershed: blackwater creek swamp, cypress-water tupelo swamp, bluff/ravine forest, and pine flatwoods. Other natural communities that are being sampled include cypress ponds, bay swamps, and hardwood hammocks. These survey efforts will continue through summer of 1995. Surveys of mammals, fish, and aquatic invertebrates in the Ebenezer Creek Watershed during this period will also be conducted.

### Development of Digital Database

Geographic information system technology is being used to develop a digital database for the study. Staff at GNHP investigated the availability of digitized wetland data from the US Fish and Wildlife Service National Wetland Inventory. Since no digitized NWI data were available for the study area, the GNHP staff digitized these from published 1:24,000-scale maps. Wetland categories were generalized, resulting in eleven landcover classes. Distinctions between vegetative types were maintained, while generalization as to hydrologic regime was used.

Existing satellite-based data derived from a statewide landcover survey completed in 1991 were used to produce a draft landcover map of the study area. In the next several months, the GNHP staff will be adding data layers for soil associations, geologic units, biological elements of concern, pollution point sources, and political subdivisions. Staff at ICAD digitized the study area boundary, transportation networks, utility features, and most streams within the study area. Road surface and right-of-way information obtained from the Effingham County Tax Assessor will be incorporated into the digital database. The ICAD and GNHP staff will maintain the digital database for the Ebenezer Creek watershed on Sun workstations, and will provide map copies of the data for additional field work.

### Land Use Trends Analysis

To support the project, ICAD is preparing a land use trends analysis for the Ebenezer Creek Watershed. In addition to digital landcover data developed by GNHP, ICAD is developing contemporary and historical land use/landcover data layers. Two years of USDA Agricultural Stabilization and Conservation Service (ASCS) photography, 1958 and 1971, will be interpreted and digitized. The 1958 and 1971 photographs are black and white, 9" x 9" format with an approximate scale of 1:20,000.

Contemporary photography selected for the project consists of National Aerial Photography Program (NAPP) 1988 color infrared and 1993 black and white photographs. The 1988 and 1993 photography is 9" x 9" format at approximate scale of 1:40,000. Interpretation of the 1993 black and white photographs will be completed on 18" x 18" enlargements to match the 1:20,000 scale of the historical ASCS photography. The color-infrared photographs covering the study area were taken over the years from 1988 to 1992. These photographs will be used to assist interpretation of the black and white photographs. Other information sources such as the National Wetlands Inventory (NWI) data and historical and current land use/landcover data for Effingham and Screven counties provided by the Central Savannah River and Coastal Georgia Regional Development Centers will inform photo-interpretation. Field checks will be conducted to verify land use/landcover classes and interpretation. The land use/landcover classes used in this study include: residential, mixed urban, cropland and pasture, orchards, dense forest, new-growth forest, clear cut, streams, and water bodies.

To develop the digital database used for trends analysis, each year of photography will be controlled by selecting corresponding built features (or distinct natural features if necessary) on 1:24,000 USGS topographic quadrangles. Intersection points among surface features from other layers

in the database are used to create a point coverage to control the air photos. Land use/landcover polygons will be digitized directly from the interpreted aerial photographs.

Once the land use/landcover digital data layers have been constructed, spatial and statistical analyses will be conducted to reveal trends in land use in the Ebenezer Creek watershed over the past thirty-five years. This information, together with that obtained from the other studies underway, will contribute to our understanding of sources of pollution to Ebenezer Creek.

#### **Chemical and Physical Sampling**

Discussions were held with EPD personnel concerning the appropriate chemical parameters to be measured for assessment of water quality in the lower Ebenezer Creek watershed. Six water sampling stations were established along Ebenezer Creek between the city of Springfield and the Savannah River. Three of the stations are located upstream of the Springfield wastewater treatment plant, and three are downstream of the facility. Water samples are being collected twice a month and shipped to the EPD laboratories in Atlanta for analysis of nutrients (total phosphorus, orthophosphorus, nitrate-nitrite, total Kjeldahl nitrogen, and ammonia). Dissolved oxygen, temperature, and conductivity are being measured at the sampling stations. The water sampling program began in May 1994 and will continue for a full year. Additional sampling stations may be established within the watershed as analytical needs dictate.

Chemical and physical sampling of sediments for the determination of sediment oxygen demand began in the spring of 1995. An attempt will be made to determine the extent and average depth of sediments in the lower Ebenezer Creek swamp by sampling along transects within the swamp. Sediment chambers will then be used to assess the *in situ* oxygen demand created by these sediments under varying field conditions. The field work associated with determination of sediment extent and sediment oxygen demand is expected to continue through the summer of 1995.

#### **DISCUSSION**

A stated goal of the project is to assess watershed management strategies to protect the resource in accordance with state and federal laws and local needs. The Technical Working Group serves as the mechanism for articulating these needs. Quarterly meetings provide the opportunity for updating the Group on progress in database development and analysis, and for gathering public input including reports

on recent developments within the study area that can affect water quality.

Information derived from this project will be used to develop specific management recommendations for the watershed. These recommendations will be forwarded to local government officials, state and federal regulatory agencies, and the general public. Consideration will be given to strategies for strengthening standards and programs for water quality and wetland protection. Following the completion of the project, ICAD will conduct a workshop with a goal of developing a consensus on actions that should be taken to protect the Ebenezer Creek watershed.

The likelihood that management recommendations developed from this project will be implemented to achieve improvement in water quality is related to the level of involvement of all stakeholders in the watershed. If a consensus can be developed as to which restoration recommendations will go forward, then the application of the information developed in the study may prove useful in effecting improvements in the health of the Ebenezer Creek system.

#### **LITERATURE CITED**

- Wharton, C.H. 1978. The natural environments of Georgia. Ga. Dept. of Natural Resources, Atlanta, GA. 227pp.