Ogeechee River Basin Management Plan 2001

Georgia Department of Natural Resources
Environmental Protection Division

Georgia River Basin Management Planning Vision, Mission, and Goals

What is the VISION for the Georgia RBMP Approach?

In a nutshell, "Clean water and plenty of it." Clean water to drink, clean water for aquatic life, and clean water for recreation, in adequate amounts to support all these uses in all river basins in the state of Georgia.

What is the RBMP MISSION?

To develop and implement a river basin planning program to protect, enhance, and restore the waters of the State of Georgia, that will provide for effective monitoring, allocation, use, regulation, and management of water resources.

[Established January 1994 by a joint basin advisory committee workgroup.]

What are the GOALS to Guide RBMP?

1) To meet or exceed local, state, and federal laws, rules, and regulations. And be consistent with other applicable plans.

2) To identify existing and future water quality issues, emphasizing nonpoint sources of pollution.

3) To propose water quality improvement practices encouraging local involvement to reduce pollution, and monitor and protect water quality.

4) To involve all interested citizens and appropriate organizations in plan development and implementation.

5) To coordinate with other river plans and regional planning.

6) To facilitate local, state, and federal activities to monitor and protect water quality.

7) To identify existing and potential water availability problems and to coordinate development of alternatives.

8) To provide for education of the general public on matters involving the environment and ecological concerns specific to each river basin.

9) To provide for improving aquatic habitat and exploring the feasibility of re-establishing native species of fish.

10) To provide for restoring and protecting wildlife habitat.

11) To provide for recreational benefits.

12) To identify and protect flood prone areas within each river basin, and encourage local and state compliance with federal flood plain management guidelines.

Ogeechee River Basin Management Plan 2000

Preface

This report was prepared by the Environmental Protection Division (EPD), Georgia Department Natural Resources (EPD), as required by O.C.G.A. 12-5-520 and as a public information document. It represents a synoptic extraction of the EPD files and, in certain cases, information has been presented in summary form from those files. The reader is therefore advised to use this condensed information with the knowledge that it is a summary document and more detailed information is available in the EPD files.

Comments or questions related to the content of this report are invited and should be addressed to:

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Contents

List of Figures

List of Tables

List of Acronyms and Abbreviations

Ac	acre
Ac-ft	acre-feet
ACCG	Association of County Commissioners of Georgia
ACF	Apalachicola-Chattahoochee-Flint Basin
ACT/ACF	Alabama-Coosa-Tallapoosa/Apalachicola-Chattahoochee Flint Basin
ADEM	Alabama Department of Environmental Management
ARC	Atlanta Regional Commission
ARS	USDA Agricultural Research Service
ASR	aquifer storage and recovery
BMPs	best management practices
BOD	biochemical oxygen demand
CAES	University of Georgia College of Agricultural and Environmental Sciences
Cd	cadmium
CFR	Code of Federal Regulations
COE	U.S. Army Corps of Engineers
CPUE	catch per unit effort (fishing)
CRMP	Chattahoochee River Modeling Project
CRP	Conservation Reserve Program
CSGWPP	Comprehensive State Ground Water Protection Plan
CSMTF	Community Stream Management Task Force
CSO	Combined Sewer Overflow
Cu	copper
CWA	U.S. Clean Water Act
DCA	Georgia Department of Community Affairs
DNR	Georgia Department of Natural Resources
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
EPD	Georgia Environmental Protection Division
EQIP	Environmental Quality Incentives Program
E&SC	Erosion and Sedimentation Control Act
FEMA	Federal Emergency Management Agency
FFY	Federal fiscal year
FIP	Forestry Incentives Program
FSA	Farm Service Agency
ft	feet
ft^2/d	square feet per day

ft^3/s	cubic feet per second
gal/m	gallons per minute
GDA	Georgia Department of Agriculture
GEMA	Georgia Emergency Management Agency
GFA	Georgia Forestry Association
GFC	Georgia Forestry Commission
GMA	Georgia Municipal Association
GPC	Georgia Power Company
GPD	gallons per day
GPM	gallons per minute
GSWCC	Georgia Soil and Water Conservation Commission
Hg	mercury
HUC	Hydrologic unit code (USGS)
IBI	Index of Biotic Integrity
kg	kilogram
km^2	square kilometer
kW	kilowatt
LAS	land application system for wastewater
LUST	leaking undeground storage tank
MCL	Maximum Contaminant Level for drinking water
meq/l	milliequivalent
mg/l	milligrams per liter
MG	million gallons
MGD	million gallons per day
mi^2	square miles
ml	milliliter
MLMP	Major Lakes Monitoring Project
MLRA	major land resource area
MOU	memorandum of understanding
MPN	most probable number (for quantification of fecal coliform bacteria)
MSA	Atlanta Metropolitan Statistic Area
MS4	municipal separate stormwater system
M&I	municipal and industrial
NFIP	National Flood Insurance Program
NOI	notice of intent
NPDES	National Pollution Discharge Elimination System
NPS	nonpoint source
NRCS	Natural Resources Conservation Service of USDA
NSSP	National Shellfish Sanitation Program
NURE	National Uranium Resource Evaluation
NWI	National Wetlands Inventory (USF&WS)
Pb	lead
PCB	polychlorinated biphenyl

PFA	public fishing area
ppm	parts per million; equivalent to mg/l
RBMP	River Basin Management Planning
RBP	Rapid Bioassessment Protocol
RC&D	Resource Conservation and Development Council
RDC	Regional Development Center
RM	river mile
SCS	Soil Conservation Service (now NRCS)
SMZs	Streamside Management Zones
SOCs	Synthetic Organic Chemicals
STATSGO	State Soil Geographic Database (USDA)
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load, as specified in the CWA
TTSI	Georgia combined lake trophic state index
UGA	University of Georgia
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USF&WS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WET	whole effluent toxicity
WHIP	Wildlife Habitat Incentives Program
WPCP	water pollution control plant
WRD	Georgia Wildlife Resources Division
WRP	Wetland Reserve Program
WWTP	wastewater treatment plant
Zn	zinc
µg/l	micrograms per liter
7Q10	7-day average low flow with a once-in-ten-year recurrence interval

Executive Summary

This document presents Georgia's management plan for the Ogeechee River basin, which is being produced as a part of Georgia's River Basin Management Planning (RBMP) approach. The Georgia Environmental Protection Division (EPD) has developed this plan in cooperation with several other agency partners including the USDA Natural Resources Conservation Commission, Georgia Soil and Water Conservation Commission, Georgia Forestry Commission, U.S. Geological Survey, Georgia Geological Survey, and Georgia Wildlife Resources Division. The RBMP approach provides the framework for identifying, assessing, and prioritizing water resources issues, developing management strategies, and providing opportunities for targeted, cooperative actions to reduce pollution, enhance aquatic habitat, and provide a dependable water supply.

Purpose of the Basin Plan

The purpose of this plan is to provide relevant information on the characteristics of the Ogeechee River basin, describe the status of water quality and quantity in the Ogeechee River basin, identify present and future water resource demands, present and facilitate the implementation of water quality protection efforts, and enhance stakeholder understanding and involvement in basin planning.

This Ogeechee River Basin Management Plan includes strategies to address a number of different basinwide objectives. These include:

- Protecting water quality in lakes, rivers, streams, estuaries, and coastal waters through attainment of water quality standards and support for designated uses;
- Providing adequate, high quality water supply for municipal, agricultural, industrial, environmental, and other human activities;
- Preserving habitat suitable for the support of healthy aquatic and riparian ecosystems;
- Protecting human health and welfare through prevention of water-borne disease; minimization of risk from contaminated fish tissue, and reduction of risks from flooding; and
- Ensuring opportunities for economic growth, development, and recreation in the region.

Achieving these objectives is the responsibility of a variety of state and federal agencies, local governments, business, industry, and individual citizens. Coordination among these many partners can be challenging, and impacts of actions in one locale by one partner on conditions elsewhere in the basin are not always understood or considered. River Basin Management Planning is an attempt to bring together stakeholders in the basin to increase coordination and to provide a mechanism for communication and consideration of actions on a broad scale to support water resource objectives for the entire basin. RBMP provides the framework to begin to understand the consequences of local decisions on basinwide water resources.

This river basin plan will serve as the road map for managing the water resources in the Ogeechee River basin over the next five years. It contains useful information on the health of the Ogeechee River basin and recommended strategies to protect the basin now and into the future.

Ogeechee River Basin Characteristics

The Ogeechee River basin is located in the southeast part of Georgia, occupying an area of 5,540 square miles. The basin contains parts of the Piedmont and Coastal Plan physiographic provinces, which extend throughout the southeastern United States. The Ogeechee River drains into the Atlantic Ocean.

Water Resources

The surface water resources of the basin are divided into four major watersheds or hydrologic units: the Upper Ogeechee River, the Lower Ogeechee River, Canoochee River, and the Ogeechee Coastal.

Biological Resources

The basin encompasses parts of four major land resource areas (Southern Piedmont Carolina and Georgia Sand Hills, Southern Coastal Plans, Atlantic Coast Flatwoods) providing many different ecosystem types. These ecosystems provide habitat for diverse species of aquatic and terrestrial wildlife. Several of the species are currently threatened or endangered.

Population and Land Use Characteristics

More than 419,000 people live in the Ogeechee River basin. The major population centers include the City of Statesboro and development surrounding Savannah. The population is expected to increase at an average growth rate through 2050.

More than 69 percent of the basin is covered by forests and forestry-related activities account for a major part of the basin's economy. Agriculture is also a significant land

use activity supporting a variety of animal operations and commodity production. Livestock and poultry production is less intense in the Ogeechee River as compared to other basins with large acreage in the Piedmont major land resource area. However, Bullock and Tattnall Counties rank in the top ten with respect to swine production.

Local Governments and Planning Authorities

The local governments in the basin consist of counties and incorporated municipalities. The Ogeechee basin includes part or all of 21 Georgia counties. These counties are members of five different Regional Development Centers. There are also 124 incorporated municipalities in the basin.

Water Quantity Conditions

Surface water supplies in the basin include water in rivers, ponds, and reservoirs. Surface water is the primary water source in the Piedmont Province of the Ogeechee River basin. Within the Coastal Plain Province, aquifer yields are higher and groundwater withdrawals are an important part of the total water budget. The Ogeechee River provides drinking water for nearly 394,000 people by municipal or privately owned public water systems. Georgia's Drinking Water Program oversees 356 active and permitted public water systems in the Ogeechee River basin.

The primary demands for water supply in the basin include municipal and industrial use, agricultural use, and recreation. The demand for drinking water is expected to remains stable in the near future due to average population growth rates. Agricultural water demand in the Ogeechee River basin is considerable. Future agricultural water demand is expected to increase slightly within the basin.

Water Quality Conditions

The major environmental stressors that impair or threaten water quality in the Ogeechee River basin include traditional chemical stressors, such as metals and bacterial contamination, as well as less traditional stressors, such as stream channel modifications and alteration of physical habitat.

Significant potential sources of environmental stressors in the basin include point source discharges such as municipal and industrial wastewater, and storm sewers; and nonpoint sources that result from diffuse runoff from urban and rural land uses. Based on EPD's 1998-1999 water quality assessment, urban runoff and rural nonpoint sources are now the major sources of failure to support designated uses of water bodies in the Ogeechee basin.

Point Sources

Point sources are defined as the permitted discharges of treated wastewater to river and tributaries that are regulated under the National Pollutant Discharge Elimination System (NPDES). These permits are issued by EPD for wastewater discharges and storm water discharges.

Municipal discharges. There are currently 4 permitted major municipal wastewater discharges with flows greater than 1 MGD in the Ogeechee River basin. There are also 38 minor public discharges. EPD monitors compliance of these permits and takes appropriate enforcement action for violations. As of the 1998-1999 water quality assessment, 3 stream segments (totaling 38 miles) were identified in which municipal

discharges contributed to a failure to support designated uses. Water quality standards violations in these segments are being addressed through the NPDES permitting process.

Industrial discharges. There are relatively few industrial wastewater dischargers in the basin including 3 major facilities. EPD identified 3 stream segments (totaling 5 miles) where permitted industrial discharges contributed to a failure to support designated uses. These segments are currently being addressed through the NPDES permitting process.

Permitted storm water discharges. Urban storm water runoff in the Ogeechee basin has been identified as a source of water quality impairment. Urban runoff which is collected by storm sewers is now subject to NPDES permitting and control.

Nonpoint Sources

Nonpoint sources of pollution include a variety of pollutants that are carried across the ground with rainwater or snowmelt and are deposited in water bodies. The 1998-1999 water quality assessment results for the Ogeechee basin indicate that urban and rural nonpoint sources contribute significantly to failure to support designated uses of water bodies. The major categories of nonpoint source pollution in the basin include the following:

- Urban, industrial, and residential sources, which may contribute storm water runoff, unauthorized discharges, oxygen-demanding waste, oil and grease, nutrients, metals, bacteria, and sediments.
- Agricultural sources, which may contribute nutrients from animal wastes and fertilizers, sediment, herbicides/pesticides, and bacteria and pathogens.
- Forestry activities, which may contribute sediments and herbicides/pesticides.

Support of Designated Uses

Under Georgia regulations, designated uses and associated water quality standards provide goals for water quality protection. EPD assessed the streams and estuaries in the Ogeechee basin and reported the results in *the Georgia 2000 305(b)/303(d) list*. This assessment indicated that 18 out of 45 stream segments (58 miles) supported uses, and 19 out of 45 (369 miles) partially supported uses, while 16 out of 45 (83 miles) did not support designated uses.

Key Environmental Stressors

The major threats to water quality in the Ogeechee River basin are summarized below.

Fecal coliform bacteria. The 1998-1999 water quality assessments indicate that listings due to fish consumption guidelines and for violations of water quality standards for fecal coliform bacteria were the most commonly listed causes of failure to support designated uses. Fecal coliform bacteria concentrations contributed to lack of full support on 236 miles, constituting 20 stream segments. Fecal coliform bacteria may arise from point and nonpoint sources, such as wastewater treatment plants, agricultural nonpoint sources, leaking septic systems, and storm water runoff. As point sources have been brought under control in the basin, nonpoint sources have become increasingly important as potential sources of fecal coliform bacteria.

Metals. The 1998-1999 water quality assessments indicate few violations of water quality standards for metals. Metals concentrations contributed to lack of full support on

one three mile stream segment. The metals on the segment was attributed to nonpoint urban runoff and storm water.

Nutrient loading. Nutrient loading is potentially an important issue in the Ogeechee River basin. Excess nutrient loads can promote undesirable growth of algae and degradation of water quality. An estuary receives unassimilated nutrients from the watershed upstream. The major sources of nutrient loading in the Ogeechee basin are agricultural runoff, urban runoff, storm water, and wastewater treatment facilities.

Fish tissue contamination. Fish consumption guidelines for individual fish species are in effect for 10 stream segments (274 miles). The majority of the guidelines for stream segments are the result of mercury. Most of the mercury load is believed to be of natural and atmospheric origin.

Flow and Temperature Modification. Stream flow and temperature affect the kinds of organisms able to survive in the water body. Stream flow and temperature also affect how much oxygen is available to the organisms. The potential threats to temperature regime in streams of the Ogeechee basin are warming by small impoundments, increases in paved surface area, and the removal of trees which provide shade along stream banks.

Sediment Loading and Habitat Degradation. A healthy aquatic ecosystem requires a healthy physical habitat. One major cause of disturbance to stream habitats is erosion and sedimentation. As sediment is carried into the stream, it can change the stream bottom, and may smother sensitive organisms. Turbidity associated with sediment loading also may potentially impair recreational and drinking water uses. Sediment loading is of greatest concern in developing areas and major transportation corridors. The rural areas of the basin are of lesser concern with the exception of rural unpaved road systems, areas where cultivated cropland exceeds 20 percent of the total land cover, and areas in which foresters are not following appropriate management practices.

Strategies for Water Supply

At this time, water quantity appears to be adequate for all uses within the Georgia portion of the Ogeechee basin, and there are no major new water supply projects proposed. There are, however, several water quantity concerns in the Ogeechee basin which are of significance to decision makers.

Strategies for Water Quality

Water quality in the Ogeechee River basin is generally good at this time, although problems remain to be addressed and proactive planning is needed to protect water quality into the future. Many actions have already been taken to protect water quality. Programs implemented by federal, state, and local governments, farmers, foresters, and other individuals have greatly helped to protect and improve water quality in the basin over the past twenty years.

The primary source of pollution that continues to affect waters of the Ogeechee River basin results from nonpoint sources. These problems result from the cumulative effect of activities of many individual landowners or managers. Population is growing every year, increasing the potential risks from nonpoint source pollution. Growth is essential to the economic health of the Ogeechee River basin, yet growth without proper land use planning and implementation of best management practices to protect streams and rivers can create harmful impacts on the environment.

Because there are many small sources of nonpoint loading spread throughout the watershed, nonpoint sources of pollution cannot effectively be controlled by state agency

permitting and enforcement, even where regulatory authority exists. Rather, control of nonpoint loading will require the cooperative efforts of many partners, including state and federal agencies, individual landowners, agricultural and forestry interests, local county and municipal governments, and Regional Development Centers. A combination of regulatory and voluntary land management practices will be necessary to maintain and improve the water quality of rivers, streams, and lakes in the Ogeechee River basin.

Key Actions by EPD. The Georgia EPD Water Protection Branch has responsibility for establishing water quality standards, monitoring water quality, river basin planning, water quality modeling, permitting and enforcement of point source NPDES permits, and developing Total Maximum Daily Loads (TMDLs) where ongoing actions are not sufficient to achieve water quality standards. Much of this work is regulatory. EPD is also one of several agencies responsible for facilitating, planning, and educating the public about management of nonpoint source pollution. Nonpoint source programs implemented by Georgia and by other states across the nation are voluntary in nature. The Georgia EPD Water Resources Branch regulates the use of Georgia's surface and ground water resources for municipal and agricultural uses, which includes source water assessment and protection activities in compliance with the Safe Drinking Water Act.

Actions being taken by EPD at the state level to address water quality problems in the Ogeechee River basin include the following:

- **Watershed Assessments and Watershed Protection Implementation Plans**. When local governments propose to expand an existing wastewater facility, or propose a new facility, EPD requires a comprehensive watershed assessment and development of a watershed protection implementation plan.
- **Total Maximum Daily Loads (TMDLs)**. Where water quality sampling has documented standards violations and ongoing actions are not sufficient to achieve water quality standard within a two year period, a TMDL will be established for a specific pollutant on the specific stream segment in accordance with EPA guidance.
- **Source Water Protection**. Most of the public water supply in the Ogeechee basin is drawn from surface water. To provide for the protection of public water supplies, Georgia EPD is developing a Source Water Assessment Program in alignment with the 1996 amendments to the Safe Drinking Water Act and corresponding recent EPA initiatives.
- **Fish Consumption Guidelines**. EPD and the Wildlife Resources Division work to protect public health by testing fish tissue and issuing fish consumption guidelines as needed, indicating the recommended rates of consumption of fish from specific waters. The guidelines are based on conservative assumptions and provide the public with factual information for use in making rational decisions regarding fish consumption.

Key Actions by Resource Management Agencies. Nonpoint source pollution from agriculture and forestry activities in Georgia is managed and controlled with a statewide non-regulatory approach. This approach is based on cooperative partnerships with various agencies and a variety of programs. Agriculture in the Ogeechee River basin is a mixture of livestock and poultry operations and commodity production. About 15 percent of the basin land area is in agricultural use. Key partners for controlling agricultural nonpoint source pollution are the Soil and Water Conservation Districts, Georgia Soil and Water Conservation Commission, and the USDA Natural Resources Conservation Service. These partners promote the use of environmentally-sound Best Management Practices (BMPs) through education, demonstration projects, and financial assistance.

Forestry is a major part of the economy in the Ogeechee basin and commercial forest lands represent over 69 percent of the total basin land area. The Georgia Forestry Commission (GFC) is the lead agency for controlling silvicultural nonpoint source pollution. The GFC develops forestry practice guidelines, encourages BMP implementation, conducts education, investigates and mediates complaints involving forestry operations, and conducts BMP compliance surveys.

Key Actions by Local Governments. Addressing water quality problems resulting from nonpoint source pollution will primarily depend on actions taken at the local level. Particularly for nonpoint sources associated with urban and residential development, it is only at the local level that regulatory authority exists for zoning and land use planning, control of erosion and sedimentation from construction activities, and regulation of septic systems.

Local governments are increasingly focusing on water resource issues. In many cases, the existence of high quality water has not been recognized and managed as an economic resource by local governments. That situation is now changing due to a variety of factors, including increased public awareness, high levels of population growth in many areas resulting in a need for comprehensive planning, recognition that high quality water supplies are limited, and new state-level actions and requirements. The latter include:

- Requirements for Watershed Assessments and Watershed Protection Implementation Plans when permits for expanded or new municipal wastewater discharges are requested;
- Development of Source Water Protection Plans to protect public drinking water supplies;
- Requirements for local comprehensive planning, including protection of natural and water resources, as promulgated by the Georgia Department of Community Affairs.

In sum, it is the responsibility of local governments to implement planning for future development which takes into account management and protection of the water quality of rivers, streams, and lakes within their jurisdiction. One of the most important actions that local governments should take to ensure recognition of local needs while protecting water resources is to participate in the basin planning process, either directly or through Regional Development Centers.

Continuing RBMP in the Ogeechee River Basin

This basin plan represents one step in managing the water resources in the Ogeechee basin. EPD, its resource management agency partners, local governments, and basin stakeholders will need to work together to implement the plan in the coming months and years. Additionally, the basin planning cycle provides the opportunity to update management priorities and strategies every five years. The Ogeechee River basin team and local advisory committee will both be reorganized in late 2001 to initiate the next iteration of the cycle. Agencies and organizations with technical expertise, available resources, and potential implementation responsibilities are encouraged to become part of the basin team. Other stakeholders can stay involved through working with the local advisory committee, and participating in locally initiated watershed planning and management activities. The next scheduled update of the Ogeechee River basin plan is planned for late 2005.

In This Section

Section 1

Introduction

What Is the Purpose of This Plan?

This document presents Georgia's river basin management plan for the Ogeechee River, which is being produced as a part of Georgia's River Basin Management Planning (RBMP) approach. The purpose of this plan is to provide relevant information on the Ogeechee River basin characteristics, describe the status of water quality and quantity in the Ogeechee River basin, identify present and future water resource demands, present and facilitate the implementation of water protection efforts, and enhance stakeholder understanding and involvement in basin planning.

This plan has been produced by the Georgia Department of Natural Resources Environmental Protection Division (EPD), based on data and information gathered by EPD, other state and federal agencies, universities, utilities, consultants, and environmental groups. A basin team made up of representatives from the Georgia Soil and Water Conservation Commission (GSWCC), the Natural Resources Conservation Service (NRCS), Georgia Department of Natural Resources Wildlife Resources Division (WRD), Georgia Forestry Commission (GFC), and EPD's Water Resources Management Branch, Water Protection Branch, and Geologic Survey Branch compiled the information to generate the plan. The U.S. Geological Survey (USGS) and the EPD Geologic Survey Branch created the majority of the figures in this report using geographic information system technologies.

River Basin Management Planning

RBMP is designed to coordinate management of water quantity and quality within river basins by integrating activities across regulatory and non-regulatory programs. The

RBMP approach provides the framework for identifying, assessing, and prioritizing water resources issues, developing management strategies, and providing opportunities for targeted, cooperative actions to reduce pollution, enhance aquatic habitat, and provide a dependable water supply. RBMP includes opportunities for stakeholders in the State's river basins to participate in developing and implementing river basin management plans. These plans will benefit from the collective experience and combined resources of a variety of stakeholders.

A separate document is available from Georgia EPD that describes the RBMP approach in greater detail.

Initial Efforts for the Ogeechee River Basin

Begun in 1993, RBMP is a new approach to the management of Georgia's water resources. This is the first river basin management plan produced under RBMP for the Ogeechee River (Figure 1-1). Under the RBMP approach, the Ogeechee River plan will be updated every five years. During the first iteration of RBMP in Georgia, much effort and resources are being dedicated to making programmatic changes, building the infrastructure of RBMP, cataloging current water management activities and beginning to coordinate with the many agencies, organizations, and individuals that have a stake in river basin management. As a result, some portions of the RBMP cycle have had to be condensed during this first iteration; in particular, it has not been possible to spend as much effort on developing management strategies as is planned for future iterations. Future iterations of the basin planning cycle will provide a better opportunity for developing new, innovative, and cost-effective strategies for managing water quality and quantity.

What's Inside?

This plan is organized into the following sections:

Executive Summary

The executive summary provides a broad perspective on the condition of the basin and the management strategies recommended to protect and enhance the Ogeechee River basin's water resources.

1.0 Introduction

The introduction provides a brief description of Georgia's River Basin Management Planning approach, the planning cycle for the Ogeechee River basin, opportunities for stakeholder involvement, and a description on how to use this document.

2.0 River Basin Characteristics

This chapter provides a description of the basin and its important characteristics, including boundaries, climate, physiography and geology, geochemistry, soils, surface water resources, ground water resources, biological resources, population and land use, local government and jurisdictions, and water use classifications.

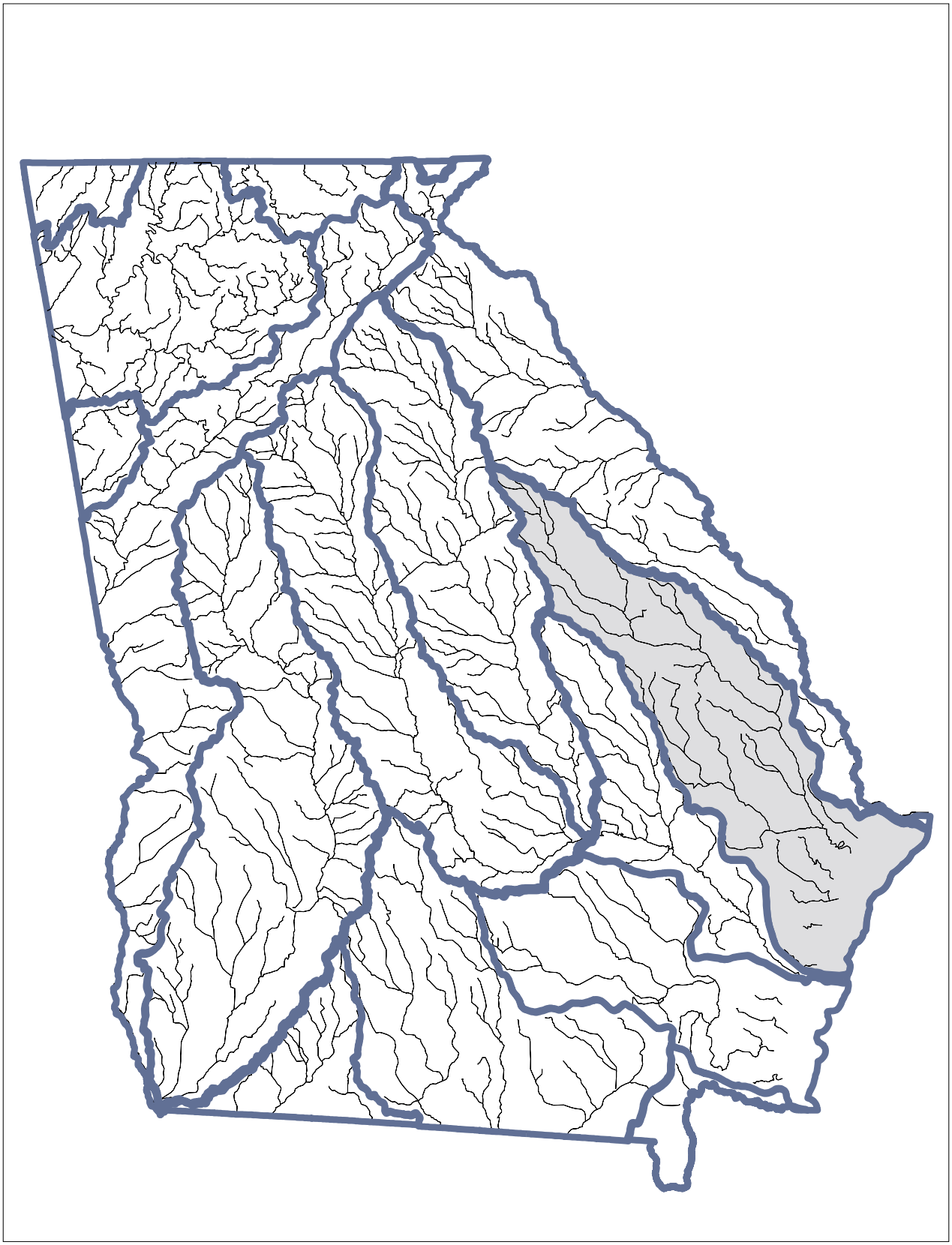

Figure I-1. The Ogeechee River Basin

3.0 Water Quantity

This chapter describes current surface and ground water availability, as well as forecasts for future demand. This chapter also includes sections on historic, present and possible proposed permitting activities pertaining to water availability.

4.0 Environmental Stressors

This chapter describes the major stressors in the basin that may impair water or habitat quality. The stressors are divided into point sources (i.e., NPDES permitted discharges) and nonpoint sources.

5.0 Assessment

This chapter provides an assessment of water quality and quantity in the streams, lakes, estuaries, and groundwater along with an assessment of the basin's biological integrity. The data sources and analysis techniques for these assessments are also discussed.

6.0 Concerns and Priority Issues

This chapter summarizes and prioritizes the issues of concern that were identified through the assessment in Chapter 5.

7.0 Implementation Strategies

This chapter presents strategies for addressing the issues of concern in the order that they appear on the priority list in Chapter 6 with a description of each issue, goals and objectives of management, overview of alternatives considered, and descriptions of recommended options for implementation.

8.0 Future Issues and Challenges

This chapter discusses long-range goals to set the stage for further improvements in managing water resources and water quality. Due to limited resources (data, time, funding, etc.), some issues will be addressed in future iterations of each basin planning cycle.

Appendices

The appendices contain technical information for those interested in specific details involved in the planning process.

How Do I Use This Plan?

This river basin plan will serve as the road map for managing the water resources in the Ogeechee River basin. It contains useful information on the health of the Ogeechee River basin and recommended strategies to protect the basin now and in the future. The document can be used as a reference tool for watershed conditions in the basin, as well as a planning guide for implementing key guide actions throughout the basin cycle.

Chapter 7 contains the key management strategies that have been identified to address the priority issues and concerns in the basin. The earlier chapters show the reader how the

issues were identified and where the specific stressors in the basin occur. Each chapter in this river basin plan builds upon the previous ones. For example, the recommended management strategies in Chapter 7 were formulated based on the priority concerns identified in Chapter 6. Similarly, the priority issues in Chapter 6 were derived as a result of the assessment in Chapter 5.

Links to Other Chapters

Because issues are discussed across several chapters, an explanatory paragraph at the beginning of chapters 4, 5, 6, and 7 will alert the reader that an issue may be discussed elsewhere. For example, Chapter 4 discusses stressors to the water body from various point and nonpoint sources. Chapter 5 provides an assessment summary of water quality and water quantity based on the sources of environmental stressors. Next, Chapter 6 combines the assessment information from Chapter five to identify priority issues for the development of management strategies. Finally, Chapter 7 provides general goals and strategies to address the most significant existing and future water quality and quantity issues within the Ogeechee basin.

What Is the Schedule of Activities for the Ogeechee River Basin?

The schedules of activities for the first two Ogeechee River basin cycles , i.e., 1996-2001 and 2001-2006, are provided in Figures 1-2 and 1-3. As mentioned earlier, initial scheduling complications and the need to devote resources to development of the RBMP infrastructure have caused the first basin cycle to be somewhat condensed. In the Ogeechee basin, this has meant that there was not as much time available in the first cycle (1996-2001) to develop management strategies for priority watersheds (step 8) as there will be once the program converges into a long-term rotating cycle (after 2001).

How Do Stakeholders Get Involved in the Basin Planning Process?

A major goal of RBMP is to involve interested citizens and organizations in plan development and implementation. This is intended to improve the identification and prioritization of water quality and quantity problems, maximize the efficient use of resources and expertise, create better and more cost-effective management strategies, and be responsive to stakeholder perceptions and needs. The opportunities for stakeholders to get involved in river basin management planning include the following:

Support the Basin Team

Every basin planning cycle begins with the organization of the basin team. The Ogeechee River basin team will be reorganizing itself in 2001.

Members of the basin team are from EPD programs and branches, and other interested governmental partners (e.g., the Department of Community Affairs, GFC, GSWCC, NRCS, and WRD). Emphasis is placed on technical knowledge, available resources, and potential implementation responsibilities. Other agencies may act as partners in the RBMP process, contributing resources and expertise, while not being directly involved in Basin Team activities. Support and provide input to the agency that represents your interests.

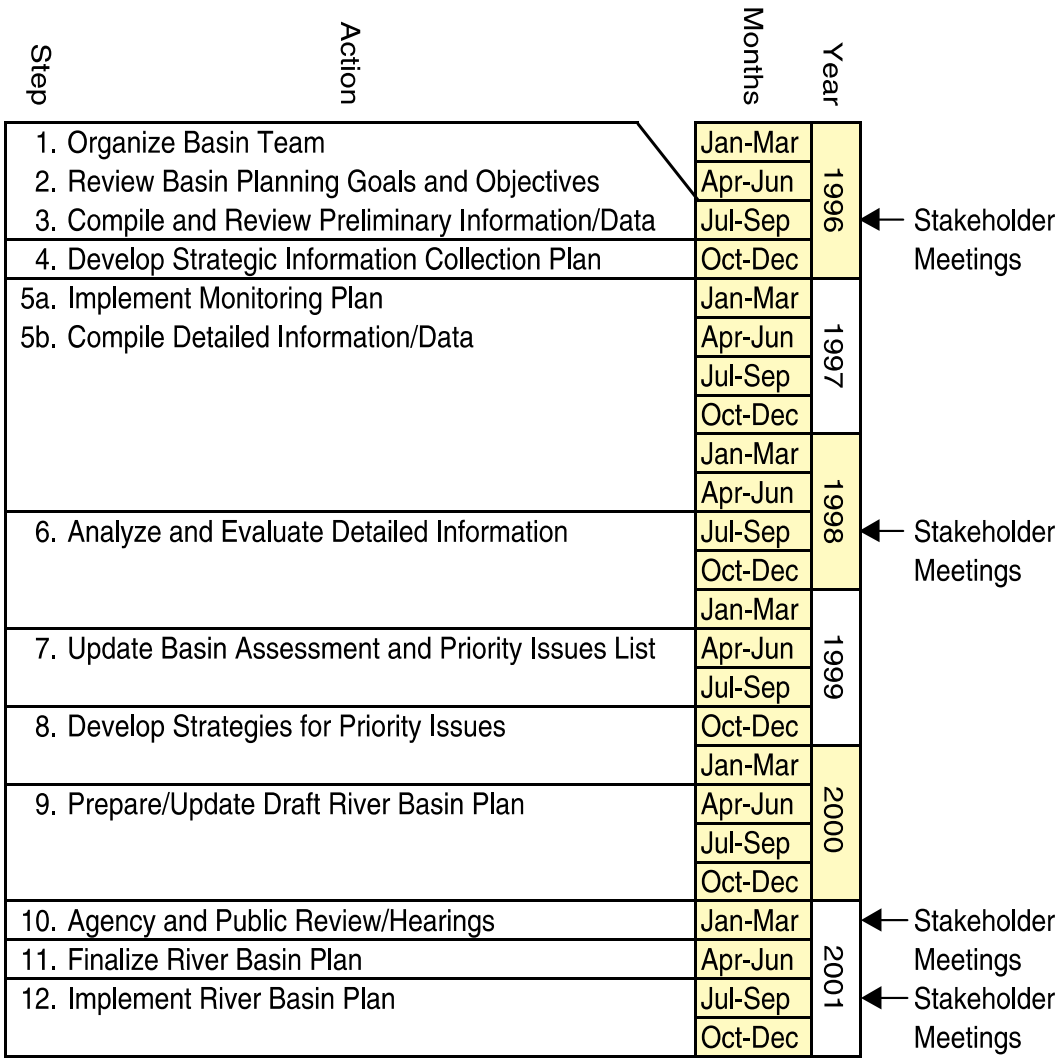

Figure I-2. Ogeechee River Basin Planning Schedule, I[st] Cycle, I998-200I

Support the Local Advisory Committee

The local advisory committees provide advice and counsel to EPD during river basin management plan development, representing a forum for involving local stakeholders. These local advisory committees form a link between EPD and the regulated community and local watershed interests. The local advisory committee will be reorganized simultaneously with the basin teams.

The committees consist of local people representing a variety of stakeholder interests including local governments, agriculture, industry, forestry, environmental groups, land-owners, and citizens. Committee members and chairs are appointed by the EPD Director following a nomination process at the beginning (step 1) of each river basin planning cycle. The committees meet periodically during the planning cycle, and provide input to EPD in the creation of river basin management plans. Meetings are called at the discretion of the chairman of the local advisory committee, and all meetings are open to the public. Table 1-1 lists the members of the Ogeechee River Basin Local Advisory Committee serving for the first planning cycle (through March 2001).

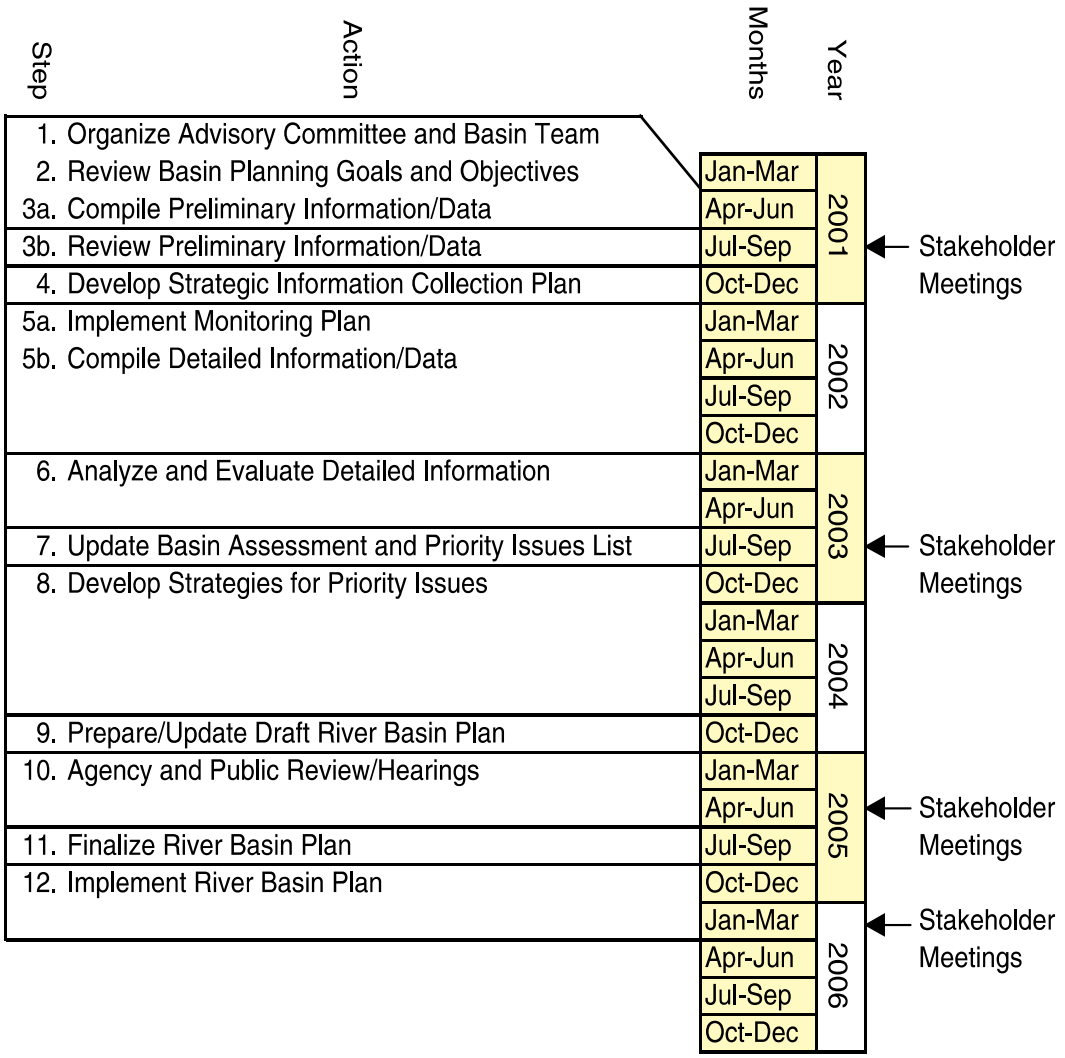

Figure I-3. Ogeechee River Basin Planning Schedule, I[st] Cycle, 200I- 2005

Participate in Stakeholder Forums

While River Basin Advisory Committees operate at the major basin level, there is an opportunity under RBMP for more localized stakeholder forums to play an important role in the creation and implementation of water resources management strategies. Some strategies, such as best management practices (BMPs) to control pollutant runoff from urban, agricultural or forestry areas, are best managed at the city, county, or sub-watershed level. These local forums might already exist in the form of conservation districts or watershed associations, or may be created as an outgrowth of RBMP.

Attend a Stakeholder Meeting

The RBMP approach includes regularly-scheduled stakeholder meetings, which provide the opportunity for the general public to learn about the status of water-related issues and management activities in their river basin, as well as contribute input that can influence basin management planning.

Table I-I. Ogeechee River Basin Local Advisory Committee Members

Greg Kist Central Savannah RC& D Council 3456 D Peach Orchard Rd. Augusta, Ga. 30906	Raymond Okeefe 2307 Alden Ave. Augusta, Ga. 30906	William Easterlin 401 West Broad Street Louisville, Ga
Arthur B. Walden Supervisor-Ogeechee River Soil and Water Conservation District 408 Peg Wen Blvd. Statesboro, Ga. 30458	Jim Daniel Union Camp Corp. Box 1391 Savannah, Ga. 31402	J.F. (Moe) Gill Box 357 Fleming, Ga. 31309
Pete Waller Supervisor-Coastal Soil and Water Conservation District 702 Bloomingdale Dr. Bloomingdale, Ga. 31302	Dan Gray GFC District Forester 18899 US Hwy. 301 North Statesboro, Ga. 30458	Daniel Russell Hawthorne Chairman-Coastal Soil and Water Conservation District Box 196 Darien, Ga. 31305
Mary Elfen Coastal Georgia Land Trust Ogeechee Audubon 428 Bull Street Savannah, Ga. 31401	Arthur Howard Howard Lumber Co. Box 1669 Statesboro, Ga. 30459	Lamar Crosby Effingham County Administrator Box 307 Springfield. Ga. 31329
Dr. Phyllis Isley Dir. Bureau Research and Economic Development Georgia Southern University Environmental Lawyer Box 8151 Statesboro, Ga. 30460	P.M. Clanton, Mgr. Georgia Power Company 305 South Main Street Statesboro, Ga. 30458	Billy Edwards City of Hinesville 115 E. M.L. King, Jr. Drive Hinesville, Ga. 31313
	David Cole Wastewater Treatment Forstmann and Company 1700 Forstmann Rd. Louisville, Ga. 30434	John Karrh Bryan County Planning Director Box 1071 Pembroke, Ga. 31321
	Michael Cox Interstate Paper 2366 Interstate Paper Road Riceboro, Ga. 34323	

Figures 1-2 and 1-3 show the timing of stakeholder meetings that have been and will be held as part of the Ogeechee basin RBMP cycles. EPD hosted the initial stakeholder meeting in Statesboro in late 1996 to invite and encourage stakeholder input early in the planning process for the Ogeechee River basin. Monitoring in the Ogeechee River basin was extended through 1998. The data was assessed in the 1999 and waters not meeting water quality standards were public noticed in February, 2000. This work along with priority issues was presented to and discussed with the Local Advisory Committee in March, 2000. Draft strategies to address priority issues were presented to and discussed with the Local Advisory Committee in June, 2000. Due to the extended monitoring program and compressed schedules for problem listing and strategy development, the second stakeholder meeting was not held. A third group of stakeholder meetings—to give stakeholders the opportunity to review this river basin management plan was held in March 2001. A public hearing to receive formal comment on this draft basin plan was also held in March 2001. A final group of meetings in mid-2001 will give stakeholders a chance to discuss implementation of management strategies. The next set of stakeholder meetings after the implementation phase of the first cycle is planned for mid to late 2001, providing stakeholders an opportunity to be involved in the planning for the next cycle of RBMP in the Ogeechee basin. The dates of ensuing stakeholder meetings are indicated in Figure 1-3.

What's Next?

This draft plan will be reviewed by governmental partners, the Ogeechee River Basin Advisory Committee, and the public. Public meetings will be held to solicit comments and recommendations regarding the river basin management plan. Following the review, appropriate modifications will be made to the plan, and the final plan will be submitted for review and acceptance by the Board of the Georgia Department of Natural Resources. After approval and an initial implementation period, partners will enter into the next 5-year cycle iteration to evaluate and update the plan as necessary.

In This Section

- River Basin Description
- Population and Land Use
- Local Governments and Planning Authorities
- Water Use Classifications

Section 2

River Basin Characteristics

This section describes the following major characteristics of the Ogeechee River basin:

- *River basin description* (Section 2.1): the physical features and natural processes of the basin.
- *Population and land use* (Section 2.2): the sociological features of the basin, including the types of human activities that might affect water quality and water resource use.
- *Local governments and planning authorities* (Section 2.3): identification and roles of the local authorities within the basin.
- *Water use classifications* (Section 2.4): description of water use classifications and baseline goals for management of waters within the basin as defined in the state regulatory framework.

2.1 River Basin Description

This section describes the important geographical, geological, hydrological, and biological characteristics of the Ogeechee River basin.

The physical characteristics of the Ogeechee River basin include its location, physiography, soils, climate, surface water and ground water resources, and natural water quality. These physical characteristics influence the basin's biological habitats and the ways people use the basin's land and water resources.

2.1.1 River Basin Boundaries

The Ogeechee River basin is located in mid to southeastern Georgia and is flanked by the Altamaha and Oconee River basins to the west and the Savannah River basin to the east (Figure 2-1). The headwaters are located in the southeastern edge of the Piedmont Province and the basin continues southeastward to the Atlantic Ocean. In the headwaters, the North and South Fork Ogeechee Rivers join to form the Ogeechee River which runs

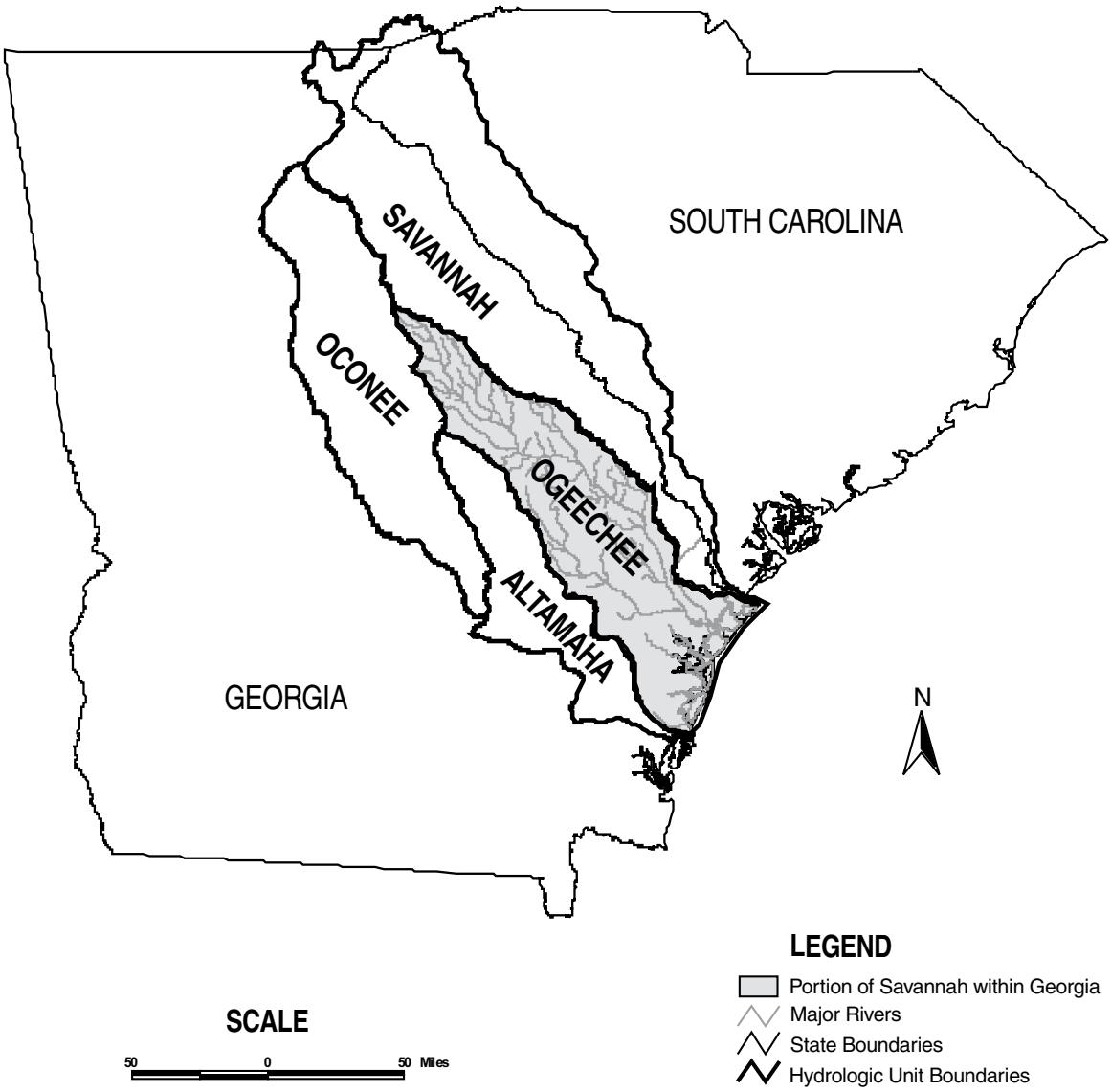

Figure 2-1. Location of the Ogeechee River Basin

245 miles in a southeasterly direction nearly the entire length of the basin. The Ogeechee River basin is located entirely in the State of Georgia and drains approximately 5,540 square miles.

The U.S. Geological Survey (USGS) has divided the Ogeechee River basin into four subbasins, or Hydrologic Unit Codes (HUCs; see Table 2-1). These HUCs are referred to repeatedly in this report to distinguish conditions in different parts of the Ogeechee River basin. Figure 2-2 shows the location of these subbasins and the associated counties within each subbasin.

Table 2-I. Hydrologic Unit Codes (HUCs) of the Ogeechee River Basin in Georgia

03060201	Upper Ogeechee River
03060202	Lower Ogeechee River
03060203	Canoochee River
03060204	Ogeechee Coastal

2.I.2 Climate

The Ogeechee River basin is characterized by mild winters and hot summers. Mean annual precipitation ranges from 40 to 52 inches per year. Precipitation occurs chiefly as rainfall, and to a lesser extent in the upper portion of the basin, as snowfall. Rainfall is fairly evenly distributed throughout the year, but a distinct dry season occurs from mid-summer to late fall. Rainfall is usually greatest in March and least in October. The mean annual temperature is about 60 degrees Fahrenheit (Journey and Atkins, 1996; citing Peck et al., 1992; Schneider et al., 1965; and Carter and Stiles, 1983).

2.I.3 Physiography, Geology, and Soils

Physiography

The Ogeechee River basin contains parts of the Piedmont and Coastal Plain physiographic provinces, which extend throughout the southeastern United States. Similar to much of the Southeast, the basin's physiography reflects a geologic history of mountain building in the Appalachian Mountains and long periods of repeated land submergence in the Coastal Plain Province. The northernmost part of the Ogeechee River Basin is within the Piedmont Province where the headwaters arise.

The Piedmont Province is underlain by mostly Precambrian as well as early Paleozoic crystalline rocks that include a wide variety of gneisses, granites, schists, amphibolites and phyllites. Metavolcanic and metasedimentary rocks are also present. The area is characterized by numerous inactive fault zones and joint patterns within the rocks that dictate the surface stream patterns and ground water resources. The crystalline rocks typically are overlain by a porous, residual soil generally known as saprolite.

The Fall Line is the boundary between the Piedmont and Coastal Plain provinces. This boundary approximately follows the contact between older crystalline metamorphic rocks of the Piedmont Province and the younger unconsolidated Cretaceous and Tertiary sediments of the Coastal Plain Province. As implied by the name, streams flowing across the Fall Line can undergo abrupt changes in gradient, which are marked by the presence of rapids and shoals. Geomorphic characteristics of streams differ between the Piedmont and Coastal Plain provinces. In the Coastal Plain, streams typically lack the riffles and

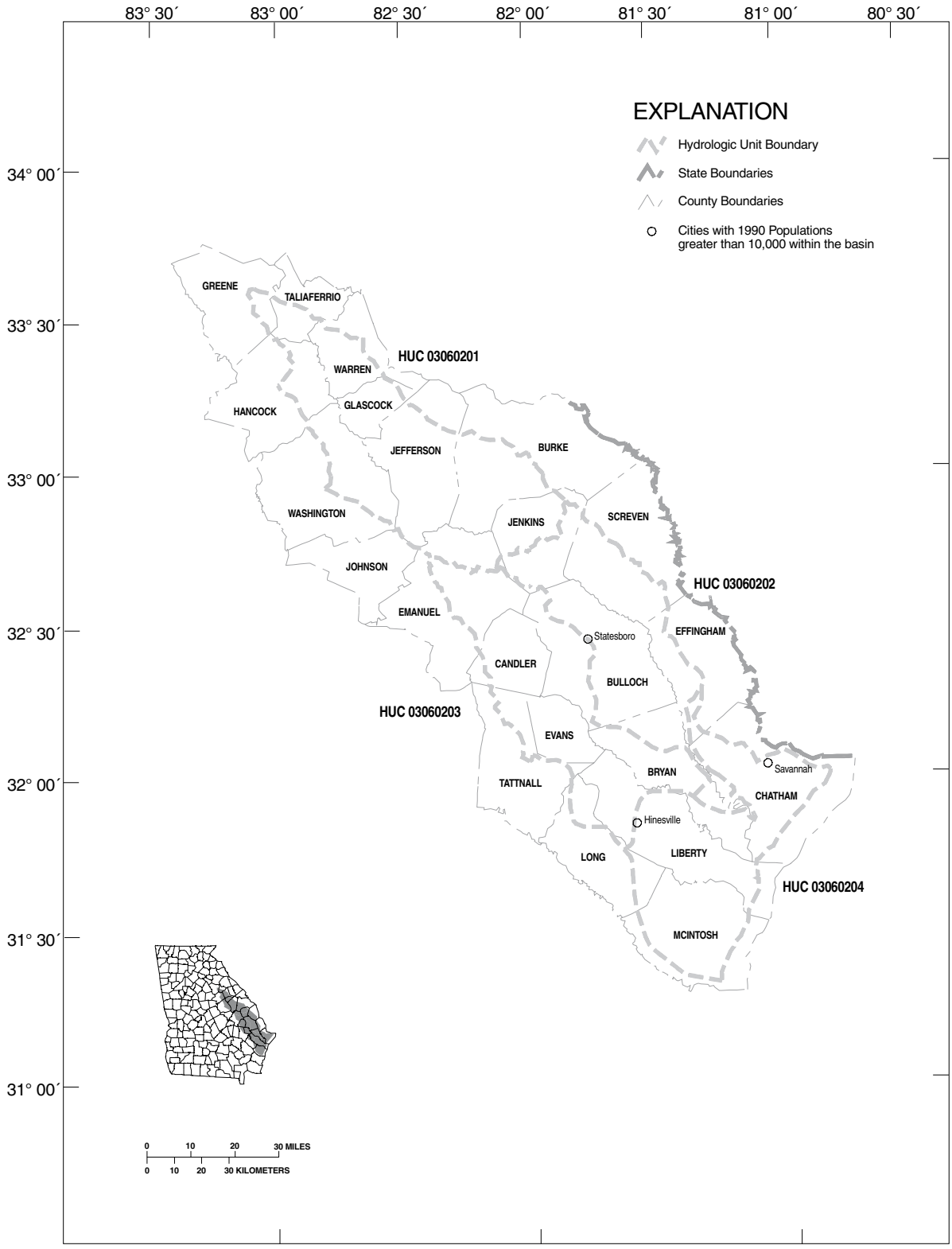

Figure 2-2. Hydrologic Units and Counties of the Ogeechee River Basin

shaoals common to stream in the piedmont and exhibit greater floodplain development and increased sinuosity.

Geology

The northernmost part of the Basin is within the Piedmont Province. This province constitutes less than 5 percent of the Ogeechee River Basin and is underlain by crystalline metamorphic and igneous rocks. The metamorphic rocks originally were sedimentary, volcanic, and plutonic igneous rocks that have been altered by several stages of regional metamorphism as well as several episodes of granite intrusion. A large portion of the exposed rocks of the Ogeechee River Basin consist of several types of gneisses and granites. The gneisses include several varieties of biotite gneiss, felsic gneiss, granite gneiss, and amphibolite gneiss. Granites include biotite and porphyritic varieties. Other rock types found in the basin include metasedimentary rocks, schists and phyllites, felsic and mafic metavolcanic rocks, and amphibolite.

Coastal Plain sediments constitute more than 95 percent of the Ogeechee River basin. Approximately 80 percent of the Coastal Plain sediments in the basin are sands and clays. The rest include calcareous sediments and Quaternary alluvium. Coastal Plain sediments overlap the igneous and metamorphic rocks of the southern edge of the Piedmont Province at the Fall Line. Coastal Plain sediments nearest to the Fall Line are Cretaceous to Eocene in age. These sediments are dominantly terrestrial to shallow marine in origin and consist of sand, kaolinitic sand, kaolin, and pebbly sand. They host the major kaolin deposits in Georgia with many of these deposits found within the Ogeechee River Basin.

Much of the southeastern Piedmont is covered by deeply weathered bedrock called saprolite. Average saprolite thickness in the Piedmont rarely exceeds 20 meters, but the thickness can vary widely within a short distance. A considerable amount of ground water flows through the saprolite and recharges streams in the Piedmont. Saprolite is easily eroded when covering vegetation and soil are removed. Extensive erosion of soil and saprolite caused by agricultural practices during the 1800s and early 1900s contributed a vast quantity of sediment into stream valleys, choking the streams and raising the streams base level. As conservation practices stabilized erosion, streams began to reestablish grade and cut into the thick accumulations of sediments, remobilizing them into the major rivers and eventually into reservoirs.

Soils

The Ogeechee River watershed in Georgia crosses four major land resource areas (MLRA's), which generally reflect the physiographic provinces and are shown in Figure 2-3. About 6 percent of the area is in the Southern Piedmont MLRA, about 4 percent in the Carolina and Georgia Sand Hills MLRA, 48 percent in the Southern Coastal Plain MLRA, and 42 percent in the Atlantic Coast Flatwoods MLRA. Soils vary widely across the watershed, ranging from nearly level to steep, from shallow to very deep, from excessively drained to very poorly drained, and from sandy to clayey. There are some general trends with soils across the watershed. Going from north to south, degree of slope decreases, water tables are generally higher, and soil textures go from to clayey in the Southern Piedmont, to sandy or sandy over loamy in the Sand Hills, Coastal Plain, and Atlantic Coast Flatwoods.

Most of the soils in the Southern Piedmont region are characterized by very deep, well drained, red clayey soils that formed from felsic, high grade metamorphic or igneous rocks.

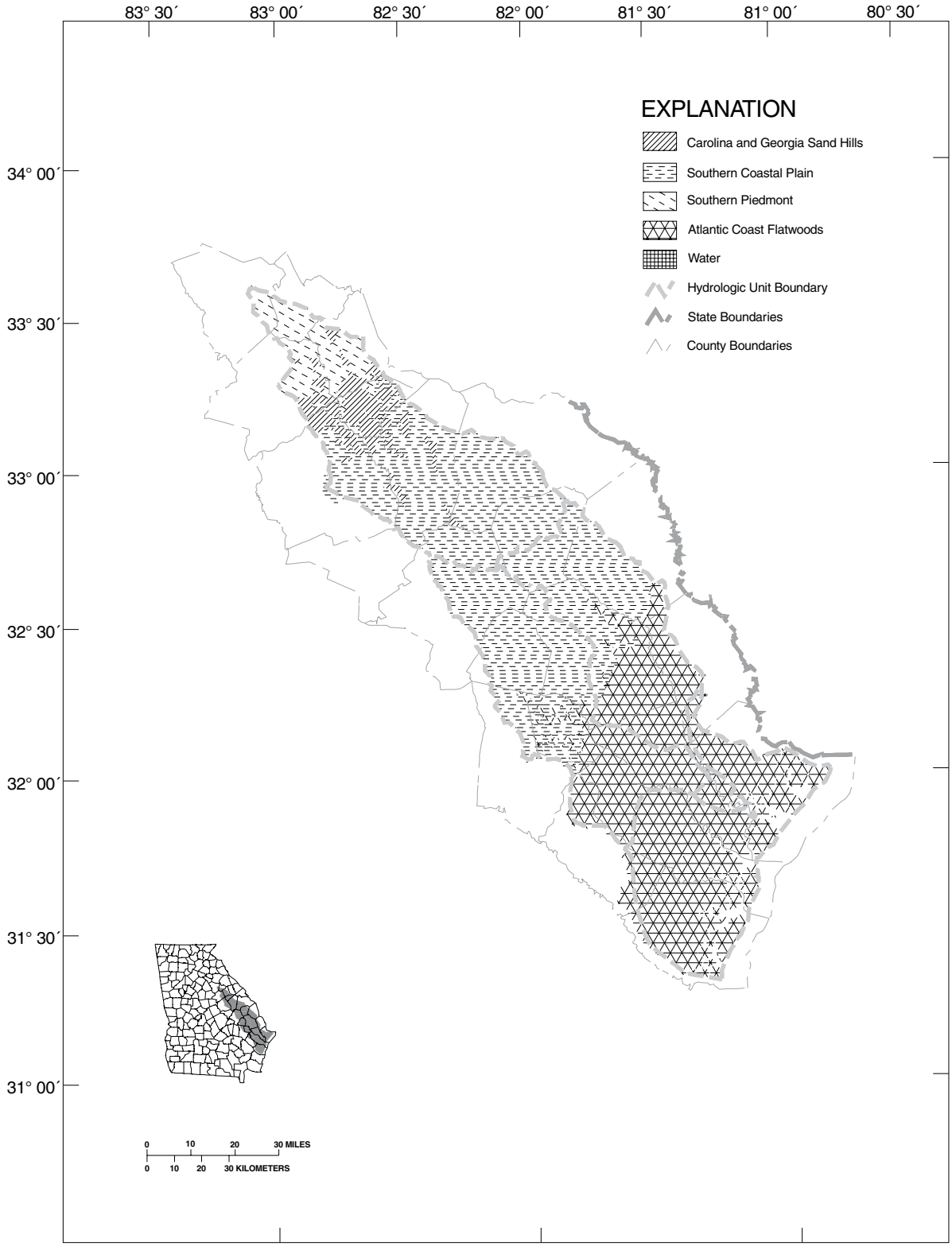

Figure 2-3. Major Land Resource Areas in the Ogeechee River Basin

The Carolina and Georgia Sand Hills portion of the Ogeechee basin is characterized by soils formed primarily in sandy and loamy marine sediments, which occasionally overlie residual Piedmont materials. There are two major groups of soils in this area. One group consists of deep sands ranging from 40 to more than 80 inches deep. The other group consists primarily of soils that have a sandy surface and a loamy subsoil, often exhibiting dense or brittle properties. Soils in this MLRA are generally less developed than soils in other parts of the watershed. The dominant soils in this part of the watershed have 40 to 60 inches of sandy materials overlying a loamy subsoil.Soils in the Southern Coastal Plain part of the watershed are more variable than in other parts, particularly with regards to textures and water table depths. Typically, soils have a sandy surface layer that overlies a red to yellow, loamy subsoil. The depth of the sandy surface is quite variable. Soils in this region are on more gently sloping landforms than in previously mentioned MLRA's. There is a continuum of soils ranging from well-drained soils on ridges and hillsides to poorly drained soils in depressions and along drainageways.

Landforms in the Atlantic Coast Flatwoods part of the watershed are nearly level. Water tables are generally closer to the surface in this area than in other parts of the watershed. Typically, soils have a sandy surface layer that is 20 to 40 inches deep over a loamy subsoil. This varies considerably, however. Characteristic of part of this MLRA are sandy soils that have an accumulation of an organic matter-aluminum complex. There is also a significant area of marsh soils along coastal areas.

2.1.4 Surface Water Resources

The Ogeechee River is the dominant waterbody in the basin, while its principal tributary, the Canoochee River, drains approximately 1,400 square miles and is the only other major river in the basin. Numerous smaller tributaries flow into these two rivers throughout the basin. Other significant water features are the coastal estuaries, sounds, and Atlantic Intracoastal waterway. There are no large storage reservoirs or hydroelectric plants in the Ogeechee River basin, however, there are many small lakes, reservoirs and farm ponds. Stream networks within each HUC are shown in Figures 2-4 through 2-7.

In addition to the year-to-year variability in flow, there is also great variation from stream to stream. Streamflows are typically high in late winter and early spring and flow at lower levels in the late summer and fall. The flow regime of the Canoochee River, particularly low flows, differs significantly from the Ogeechee River. The Canoochee River experiences more severe low flows. The higher low flows of the Ogeechee River are attributed to the runoff characteristics and relative impermeability of the upstream Piedmont Province. The annual mean discharge (water years 1937 to 1997) for the Ogeechee River near Eden (USGS Station 02202500), which drains 2,650 square miles, is 2,342 cubic feet per second (cfs). The annual mean discharge (water years 1937 to 1997) for the Canoochee River near Claxton (USGS Station 02203000), which drains 555 square miles, is 472 cfs. For these same gages the lowest annual mean for the Ogeechee and Canoochee Rivers is 874 cfs and 77.7 cfs, respectively.

River slopes of less than 1.5 feet per mile are not observed on the Ogeechee River until it reaches the final 130 miles of its length, all of which is below the 100-foot elevation. On the coast, salt water wedges can be detected upstream nearly as far as tidal influences. The latter extend some 30 to 35 miles up the river under low flow conditions.

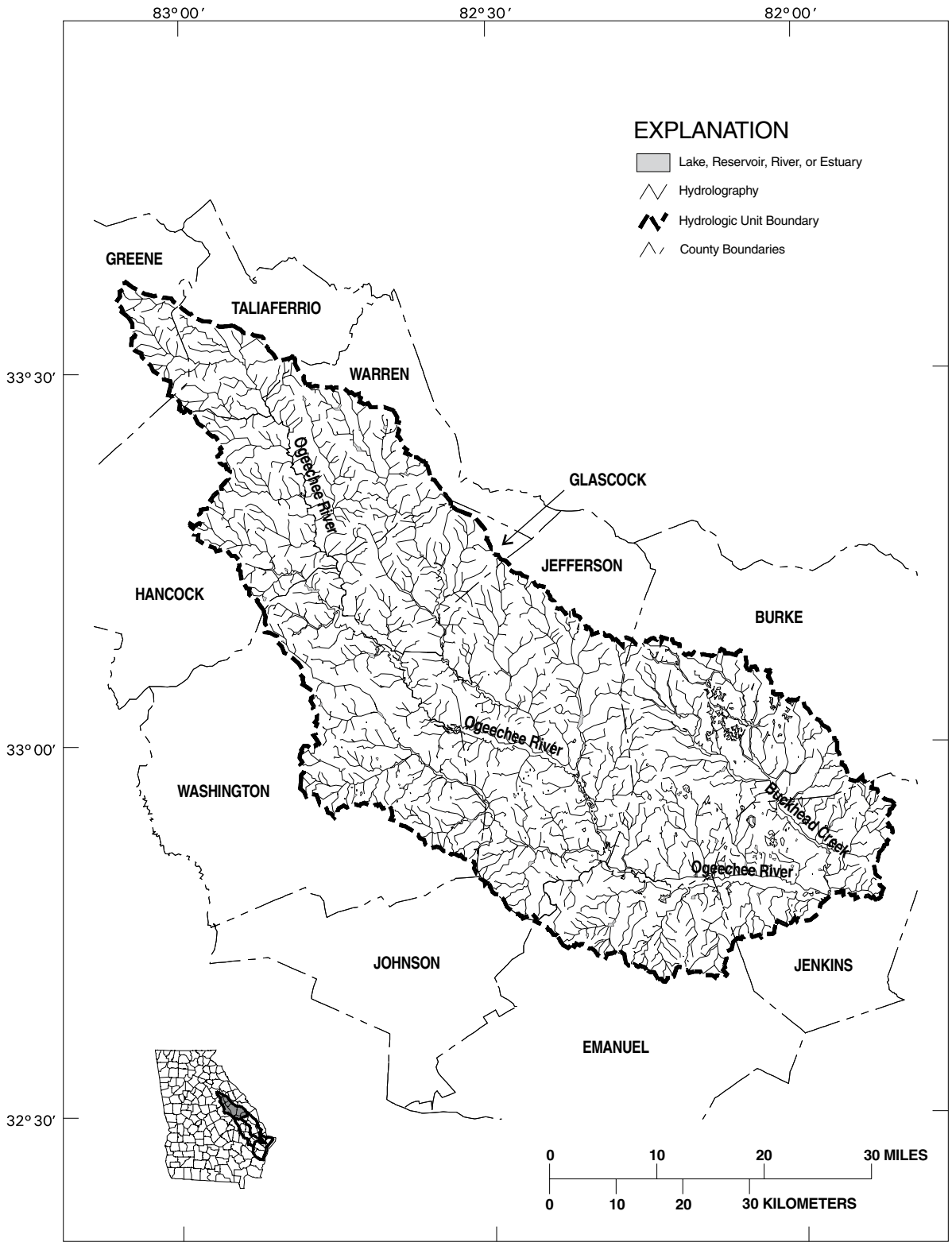

Figure 2-4. Hydrography, Ogeechee River Basin, HUC 03060201

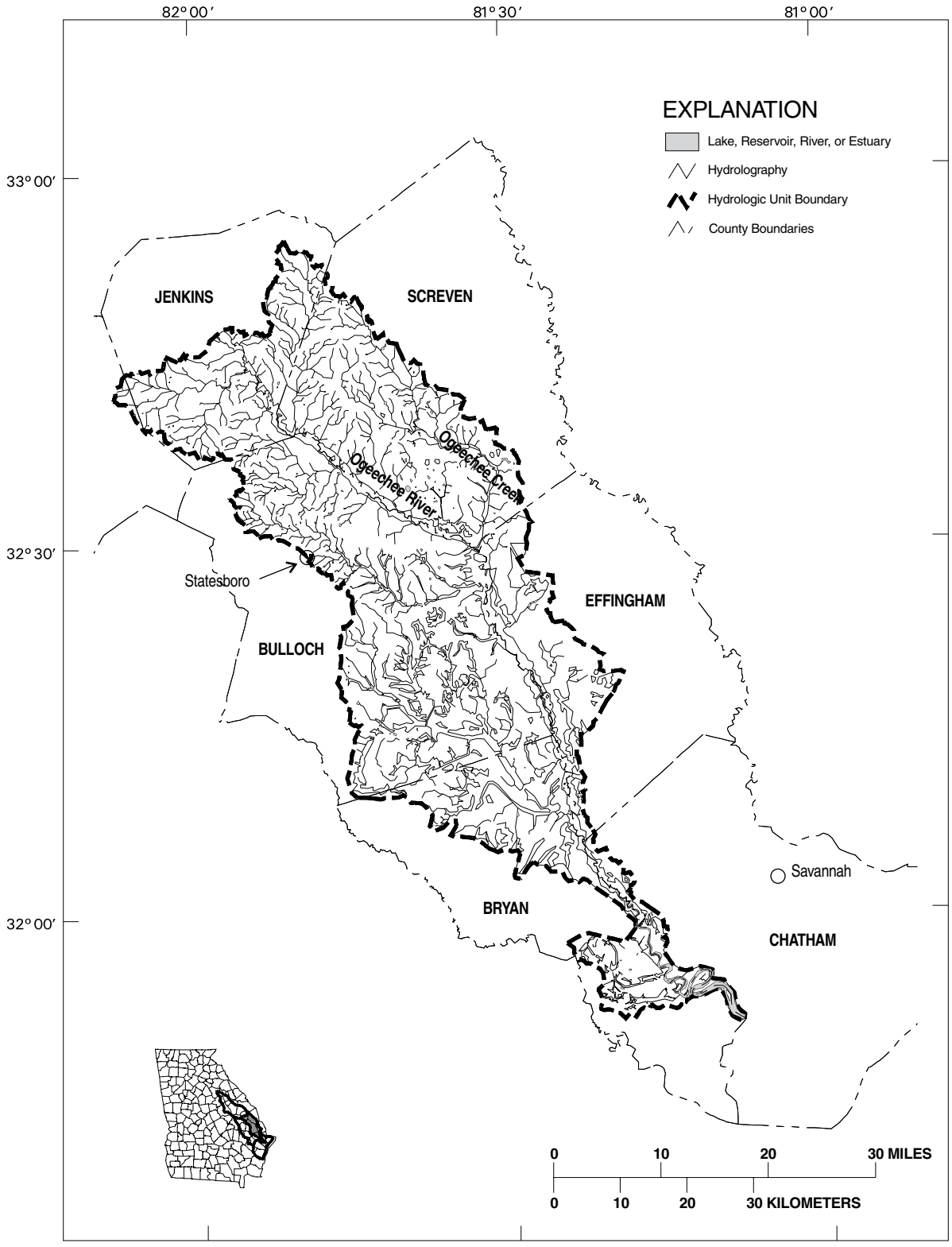

Figure 2-5. Hydrography, Ogeechee River Basin, HUC 03060202

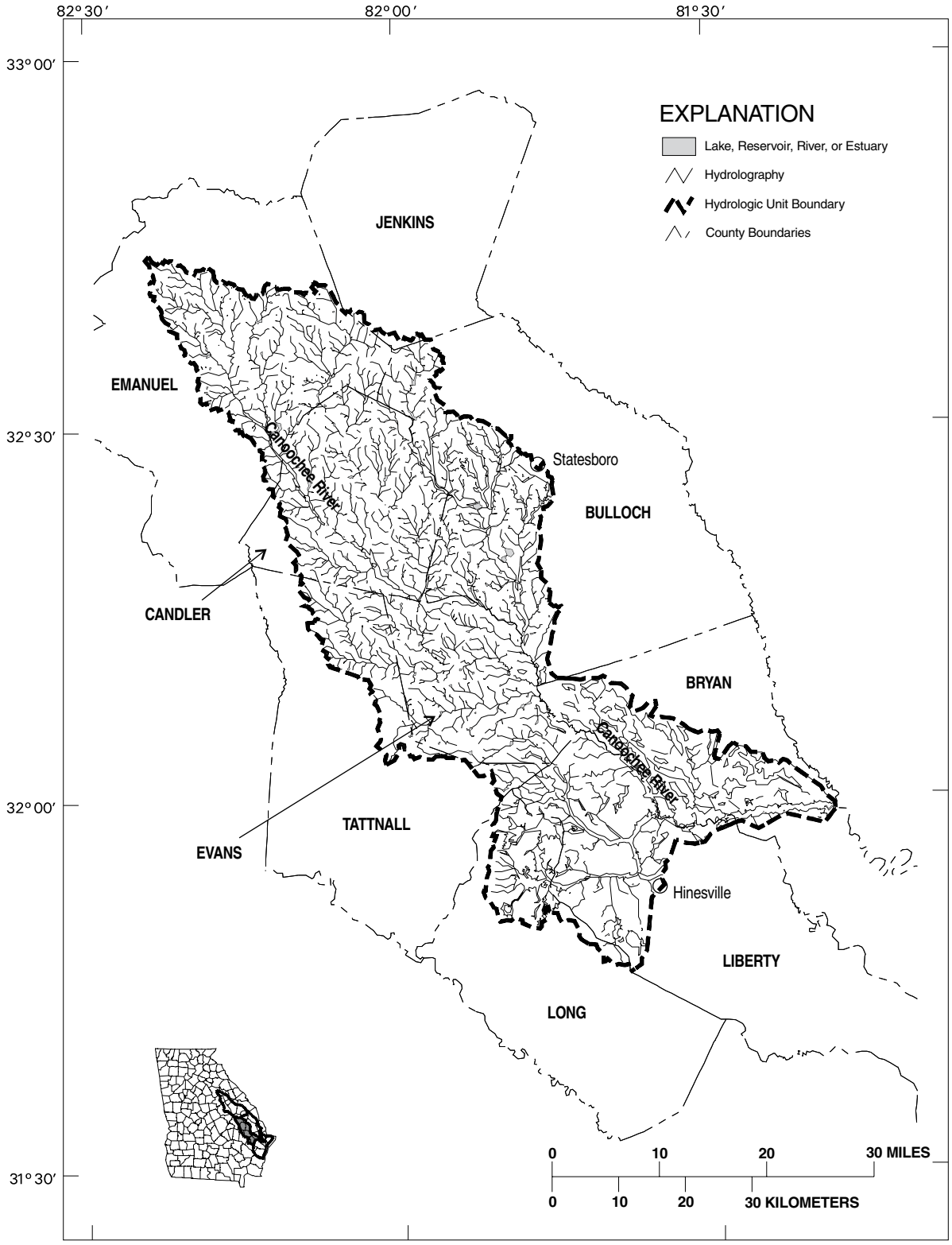

Figure 2-6. Hydrography, Ogeechee River Basin, HUC 03060203

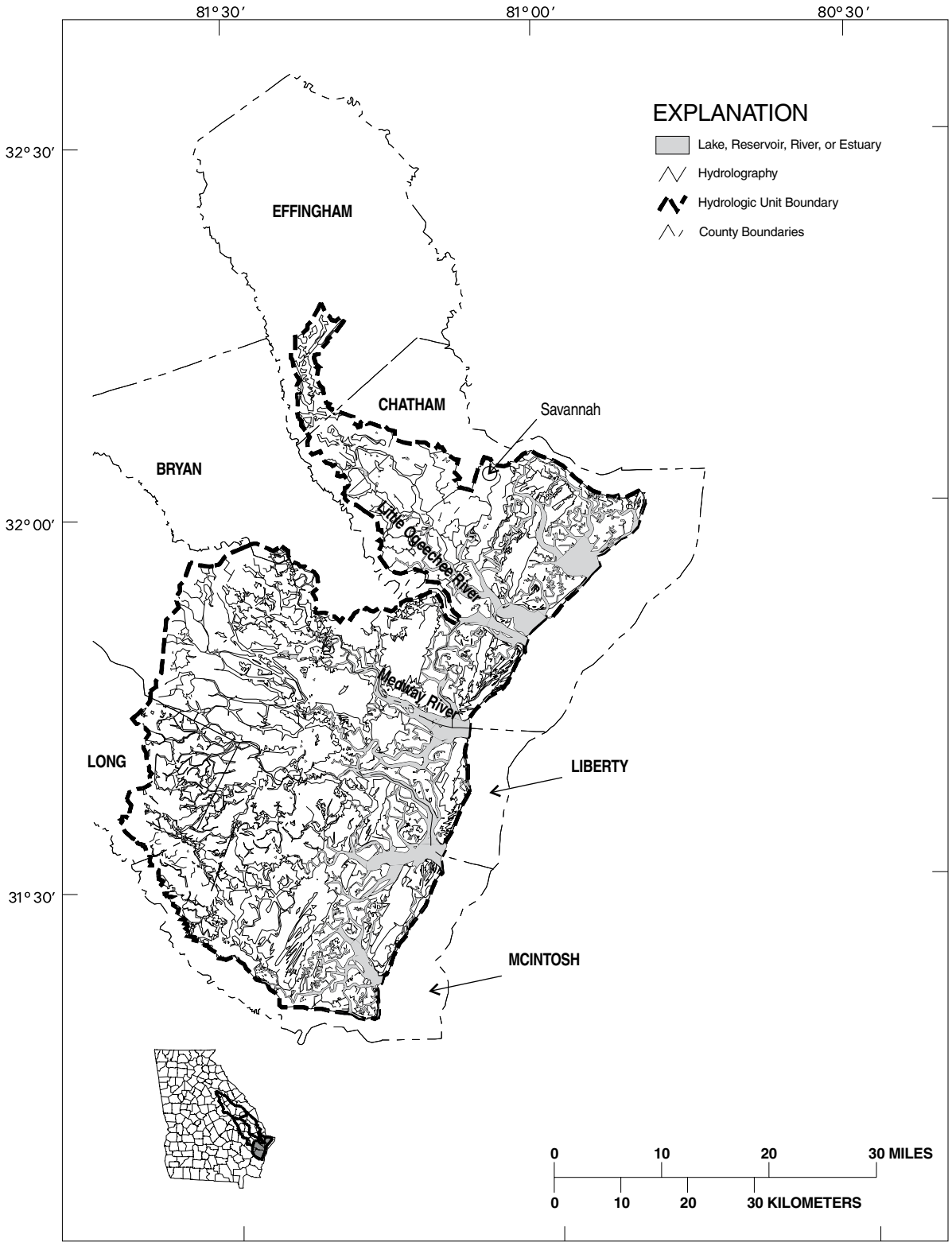

Figure 2-7. Hydrography, Ogeechee River Basin, HUC 03060204

2.1.5 Ground Water Resources

In the Ogeechee River basin, groundwater occurrence is related to two distinct physiographic provinces. Abundant groundwater supplies are concentrated in the lower half of the basin in the Coastal Plain province. Generalized outcrop areas of major aquifers for the Ogeechee River basin are shown in Figure 2-8. Traveling south in the basin, the areas are as follows:

Crystalline rock aquifers

In the upper half of the basin, from Greene County south to the Fall Line between Macon and Augusta, the crystalline rock formations that underlie the Piedmont province greatly restricts groundwater availability. Some studies have shown that there may be contact zones, fractures, and shear planes capable of producing water yields as high as 400 gallons per minute (GPM) in the Piedmont, though the common range of production is nearer 50 GPM or less. Some wells have found on the order of 1 GPM. Techniques for locating these reliable sources have improved greatly over the past 10 years, and will likely continue to do so.

Cretaceous sand aquifers

The Cretaceous sand aquifer system, located along the northern edge of the Coastal Plain, outcrops in a band of terrain about 40 miles wide across the central part of the Basin, mainly in Washington and Jefferson Counties, are part of the Kaolin Belt of Georgia. Dewatering operations at the clay pits, plus the extensive amount of process water necessary for processing the kaolin can lead to localized drawdowns within the Cretaceous aquifer. This can mean some domestic wells or other operations can lose the use of their wells. Generally the kaolin companies then redrill or deepen the wells to provide water to the impacted folks. The Cretaceous aquifer is made up of the Dublin-Midville aquifers, a clastic aquifer containing water in sandy intervals. Overlying this is the Gordon Aquifer, a thin sand and shale unit of Eocene age. The Cretaceous aquifer consists of interbedded sands and clays that begin at the Fall Line and is as thick as several hundred feet farther to the south. Groundwater occurs in the pore spaces of the somewhat unconsolidated sand layers, which are composed of largely angular to subangular quartz grains. The interbedded clay layers act as confining beds causing the deeper roundwater to occur under artesian conditions. Well yields in the portions of the Cretaceous sand aquifer underlying the Ogeechee River basin have been found to exceed 1,000 GPM. Recharge occurs through the sandy soil in the outcrop area. In the northern portion of the basin this unit is seen as one single aquifer and can be called either the Cretaceous Aquifer or the Dublin-Midville Aquifer. As you move to the south, an intervening clay layer becomes apparent, and divides the aquifer into two distinct units. Below is the Midville Aquifer of definite Cretaceous age. Overlying the confining shale unit is the Dublin Aquifer, which is of Cretaceous-Early Tertiary age.

Gordon aquifer

The Gordon Aquifer system, of Eocene age, overlies the Cretaceous sand aquifer in the Coastal Plain portion of the basin, and consists of saturated permeable sands. It is confined above and below by clay-rich layers, and ranges in thickness from about 20 feet in Washington County to about 150 feet to the south. Generally well yields of up to 500 GPM are possible in the southern portions of the bairn. Gordon Aquifer recharge occurs mainly through the outcrop areas in Washington and Jefferson Counties.

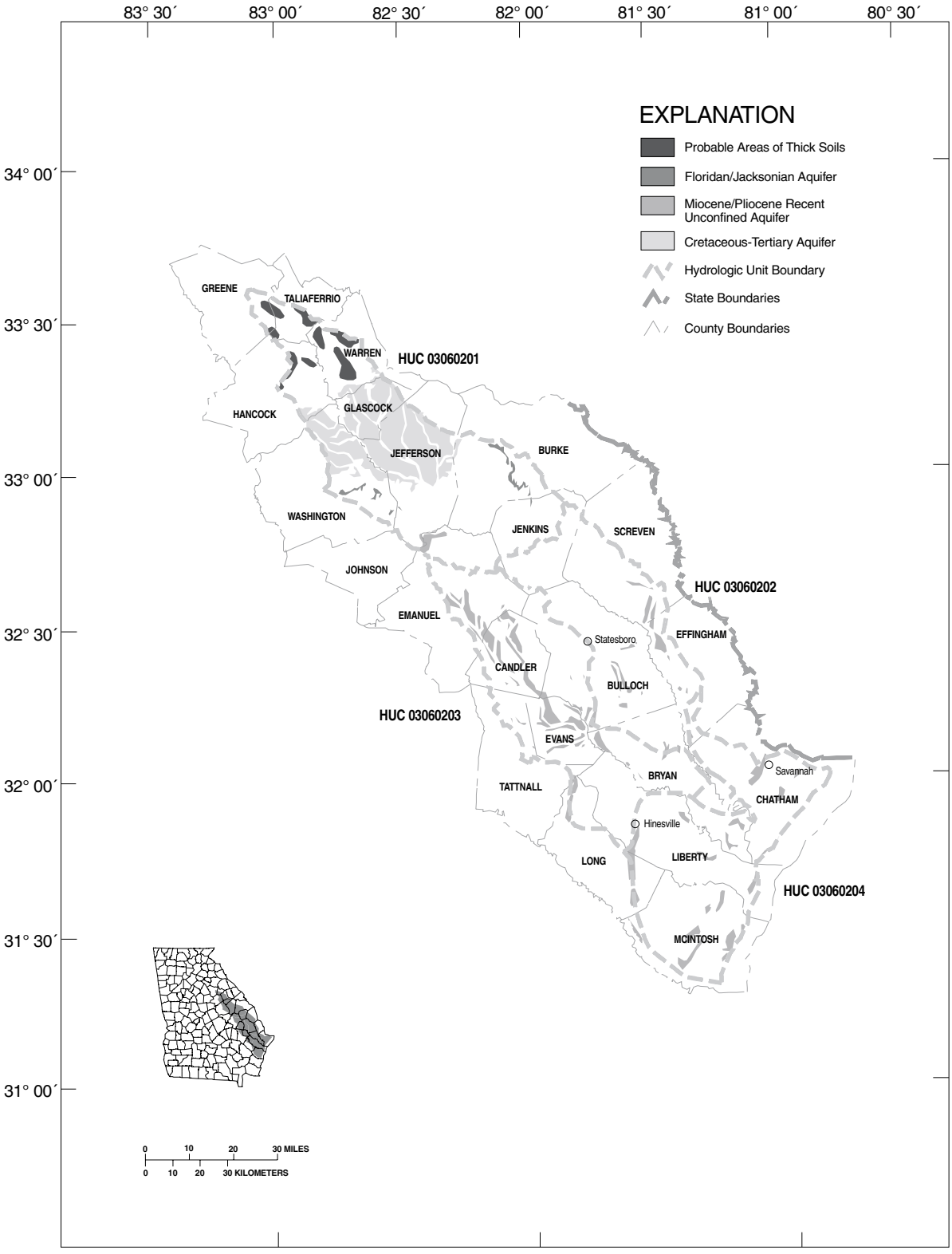

Figure 2-8. Hydrogeologic Units Underlying the Ogeechee River Basin

Floridan aquifer

The Floridan aquifer underlies the rest of the southern portion of the Basin. The aquifer is overlain by approximately 25-125 feet of sandy clay residuum derived from chemical weathering of the underlying rock. The total thickness of the Floridan aquifer in the basin ranges from a few tens of feet in the north to more than 400 feet in the extreme southern portion of the basin. Clastic grains of sand and shale comprise the main units in the northern portions of this aquifer, while to the south the aquifer becomes ever more carbonate (limestone) in content. In the south the aquifer consists of three thick beds of limestone (i.e., Tampa limestone, Suwannee limestone, and Ocala limestone). Well yields can range from about 40 GPM in the north to more than 10,000 GPM in the thickest, southern most portions of the Floridan aquifer. The Floridan serves as the main aquifer from Emanuel and Burke Counties to the coast.

2.1.6 Biological Resources

The Ogeechee River basin supports a diverse and rich mix of terrestorial and aquatic habitats and is home to several federally and state-protected species. The basin encompasses parts of five major land resource areas. Some of the biological resources of the basin are summarized below.

Terrestrial Habitats

The Ogeechee River is one of Georgia's few remaining free flowing streams. The river drains over 14,000 km^2 and contains excellent habitat for numerous freshwater fish species. It's headwaters are formed in Greene county Georgia at 198 meters above sea level and flow southeasterly 425 kilometers to Ossabaw Island and the Atlantic Ocean (Schmitt 1988). The river traverses portions of two physiographic regions on its journey to the ocean. The headwaters begin in the Piedmont Region, but the majority (95 percent) of the Ogeechee River basin lies in the Outer Coastal Plain Mixed Forest Province and is comprised of forests (48%), agricultural lands (36%) and wetlands (13 %) (Bailey, 1995). The Outer Coastal Plain is a temperate rainforest (or temperate evergreen forest or laurel forest) ecoregion characterized by lower species diversity, but a greater abundance of individuals than equatorial or tropical rainforests. The Ogeechee River is a typical blackwater coastal stream, which is a result of tannins from decaying tree roots and other organic materials passing through the sandy soil and staining the water. However, unlike other black water rivers, the Ogeechee has a high pH (near 7.0) due to a large input of carbonate-rich water from Magnolia Springs.

Common species of trees include evergreen oaks and species of the laurel and magnolia families. Typically these habitats include a well-developed lower stratum of vegetation consisting of tree ferns, small palms, shrubs, and herbaceous plants. At the higher elevations, the trunks and branches of trees are often covered in moss. At the lower elevations, trees such as Evangeline oaks, baldcypress and others are covered by the epiphyte commonly known as Spanish moss (Bailey, 1995).

The lower reaches of the Ogeechee River basin flow through the extensive coastal marshes and interior swamps of Georgia's coastal region and are dominated by gum and cypress. The upland areas are covered by subclimax pine forests, which have an understory of grasses and sedges referred to as savannas. Undrained shallow depressions in savannas form upland bogs or pocosins, in which evergreen shrubs predominate.

Fauna

Terrestrial Fauna

The habitat diversity in this region supports a wide variety of wildlife. Although small numbers of black bears may be found in isolated areas, the white-tailed deer is the only large indigenous mammal in this region (Bailey, 1995). Populations of feral hogs have become quite prevalent and their destructive foraging habits have made them a nuisance species in agricultural locales. Small mammals that are common to the basin include raccoons, opossums, flying squirrels, rabbits and numerous species of ground-dwelling rodents.

The bobwhite quail, eastern wild turkey and mourning dove are the primary game birds. Migratory nongame bird species, as well as waterfowl are numerous in this region. The red-cockaded woodpecker, which inhabits mature longleaf pine stands, is a federally-listed endangered species.

Fish Fauna

The diverse fish fauna of the Ogeechee River basin includes 59 species representing 23 different families. The largest group of species in the Ogeechee River basin belongs to the sucker family Catostomidae. Even though suckers are not highly prized by most fishermen, they are ecologically important because they often account for the largest fish biomass in Georgia streams. In a 1988 survey conducted by the Fisheries Section of the Georgia Department of Natural Resources on the Ogeechee River, spotted suckers comprised 28 percent of the total sample by weight. Other families with large numbers of species are the sunfish and bass family (Centrarchidae) and the catfish family (Ictaluridae).

Striped bass are spawned and raised to intermediate size at Richmond Hill Hatchery for stocking when late spring and early summer flows drop below 30 percent of average annual discharge. Research has shown that flows less than 800 cfs during this period result in poor recruitment of striped bass to juvenile stage. Artesian cool water refuges (springs) are critical to the survival of adult striped bass during summer months. The Ogeechee River offers excellent fishing for redbreast sunfish, largemouth and striped bass, catfish, redear sunfish, spotted sunfish, black crappie and chain pickerel.

The Canoochee River is the largest tributary to the Ogeechee River and is home to many freshwater fish species and offers excellent fishing for redbreast sunfish, largemouth bass, catfish, redear sunfish, and spotted sunfish.

2.2 Population and Land Use

2.2.1 Population

As of 1995, about 419,800 people lived in the Ogeechee watershed (DRI/McGraw-Hill, 1996). Population distribution in the basin at the time of the 1990 census by census blocks is shown in Figure 2-9. Population centers in the Ogeechee watershed include the development surrounding Savannah and the City of Statesboro.

Between 1975 and 1995, the population in the Ogeechee River basin increased by 1.3 percent per year (DRI/McGraw-Hill, 1996). Basin population is projected to increase at an average growth rate through 2050.

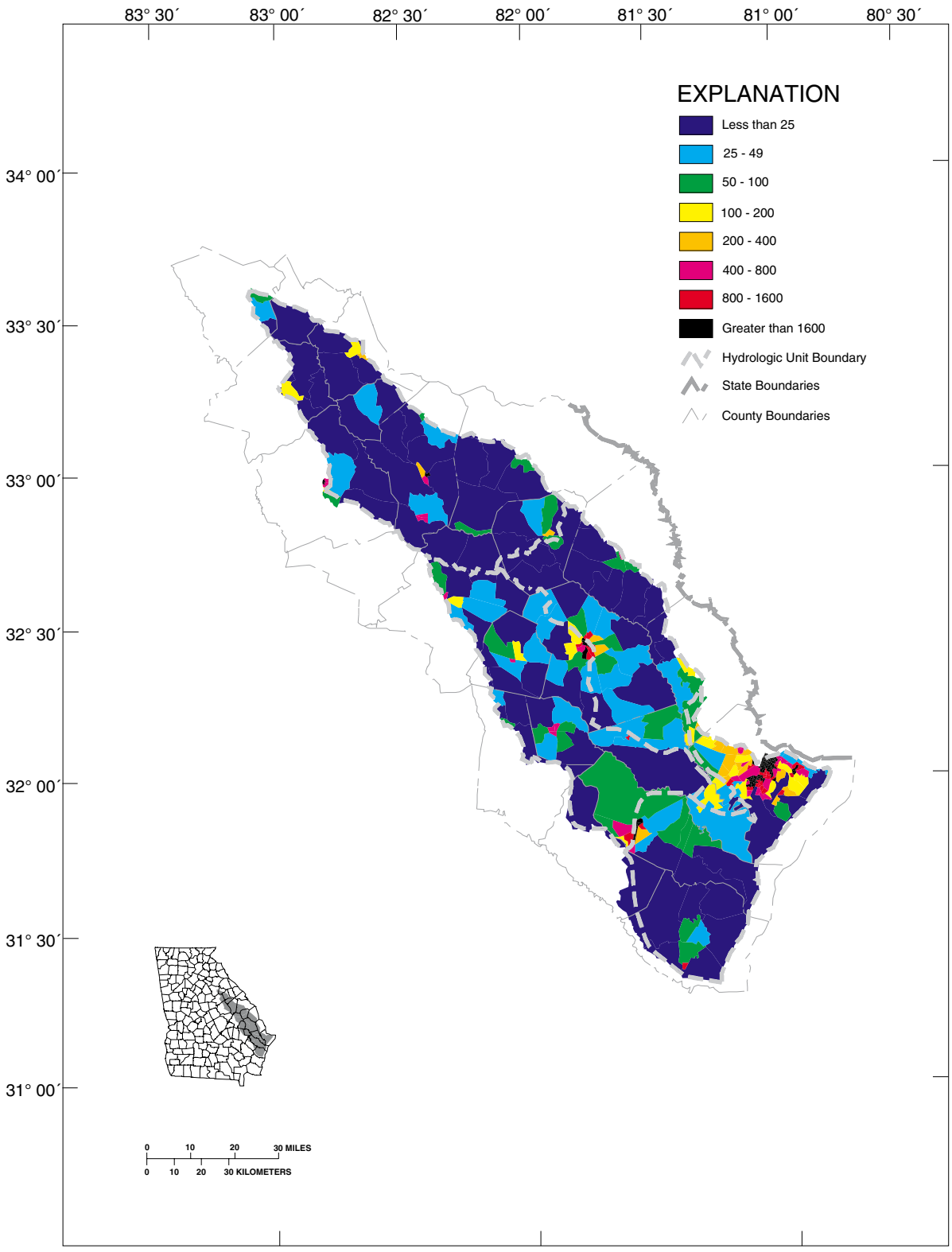

Figure 2-9. Population Density in the Ogeechee River Basin, 1990

One area in which this river basin will differ slightly from state trends, is an age cohort of 0-16 year olds which will keep its share of total population above 26 percent through 2050. This is in contrast with the 22 percent share this cohort is forecasted to comprise in Georgia by 2050. The river basin will mirror state trends in terms of its elderly population with the 65 and older age group showing the largest gains in share through 2050, at which time 19 percent of the population will be in this age cohort. Large youth and elderly populations will mean a decline in the working age population, down 43 percent in 2050 from 63 percent today.

2.2.2 Employment

The Ogeechee River basin supported 182,100 jobs in 1995. It is moving from a manufacturing- to a service-based economy. In the coming years, a decrease in jobs is expected in manufacturing and durable goods, offset by an increase in jobs in the service and trade sectors.

The Ogeechee River basin has historically been less dependent on manufacturing industries than is the rest of Georgia. In 1975, only 21 percent of the river basin's jobs were in industrial sectors, as compared with 24 percent statewide. As manufacturing sectors have declined across the state, Georgia as a whole is beginning to look more like Ogeechee in terms of industrial mix. In fact, by 2050, only 4 percent of jobs, both within the river basin and within the state, are forecast to be in manufacturing sectors. One important sector for Ogeechee is paper, in which the river basin's 4,800 jobs constitute 14 percent of the state's paper industry. In terms of job losses between 1995 and 2050, however, the most significant sector is durable goods, in which more than one-half of the 28,800 jobs will no longer be present in 2050. This decline accounts for 47 percent of all employment losses in industrial sectors. The nonmanufacturing sectors, in particular the service sector, will offset these job losses. By 2050, services will account for 40 percent of river basin employment, growing at an annual rate of 1.9 percent. The trade sector will also remain important for the area, keeping a nearly constant employment share of 24 percent until the end of the 55-year forecast horizon.

2.2.3 Land Cover and Use

Land use/land cover classification was determined for the Ogeechee River Basin based on high-altitude aerial photography for 1972-76 (U.S. Geological Survey, 1972-78). Subsequently in 1991 land cover data were developed based on interpretation of Landsat TM satellite image data obtained during 1988-90, leaf-off conditions. These two coverages differ significantly. Aerial photography allows identification of both land cover and land uses. Satellite imagery, however, detects primarily land cover, and not land use, such that a forest and a wooded subdivision may, for instance, appear similar. Satellite interpretation also tends to be less accurate than aerial photography.

The 1972-76 classification (Figures 2-10 through 2-13) indicates that 54 percent of the basin land areas was forest, 19 percent wetlands, 12 percent agriculture, and 1 percent urban.

The 1988-90 land cover interpretation showed 39 percent of the basin in forest cover, 24 percent in wetlands, 1 percent in urban land cover, and 17 percent in agriculture (Figures 2-14 through 2-17). Statistics for 15 landcover classes in the Georgia portion of the Ogeechee River basin for the 1988-90 coverage are presented in Table 2-2 (GA DNR, 1996).

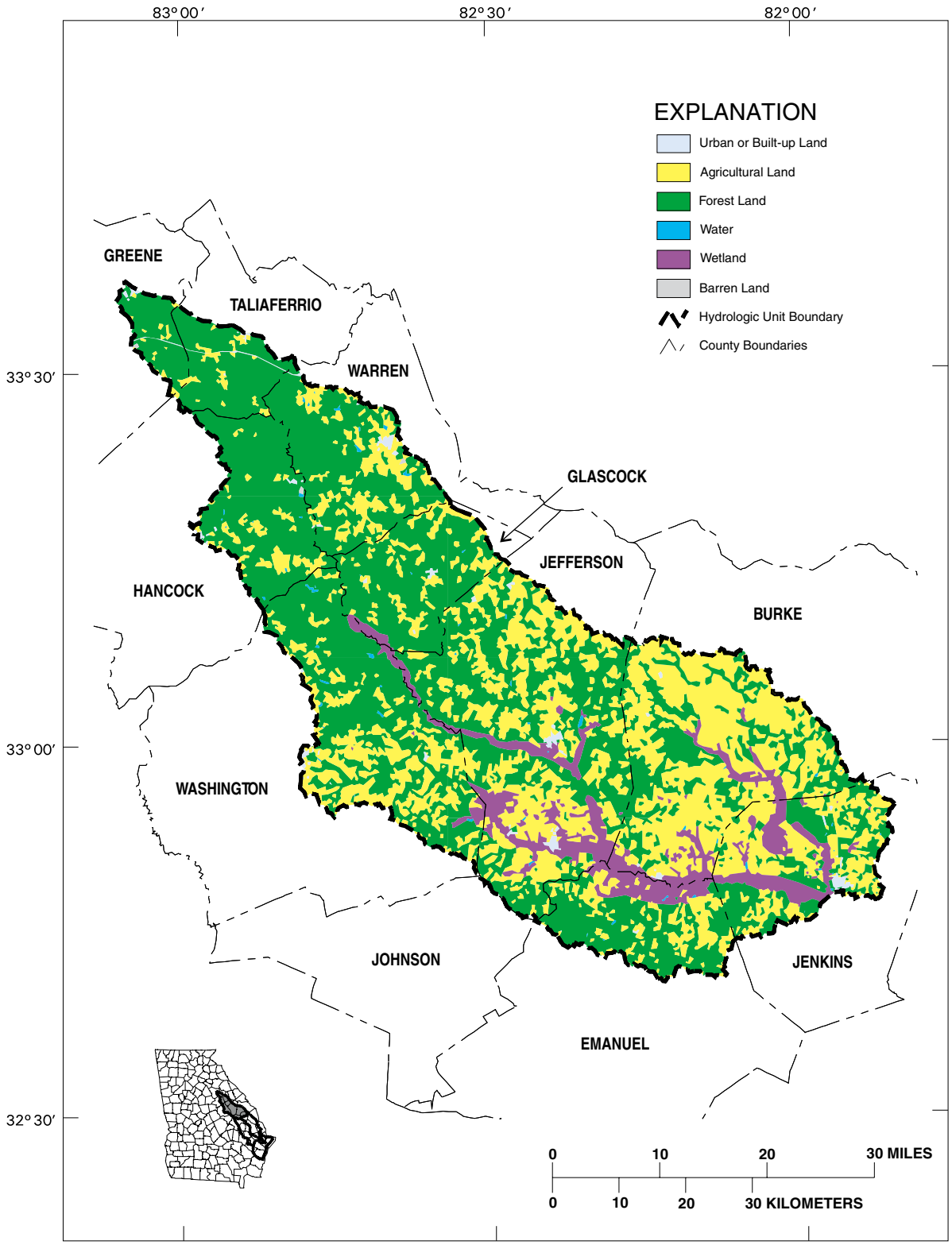

Figure 2-10. Land Use, Ogeechee River Basin, HUC 03060201, USGS 1972-76 Classification Updated with 1990 Urban Areas

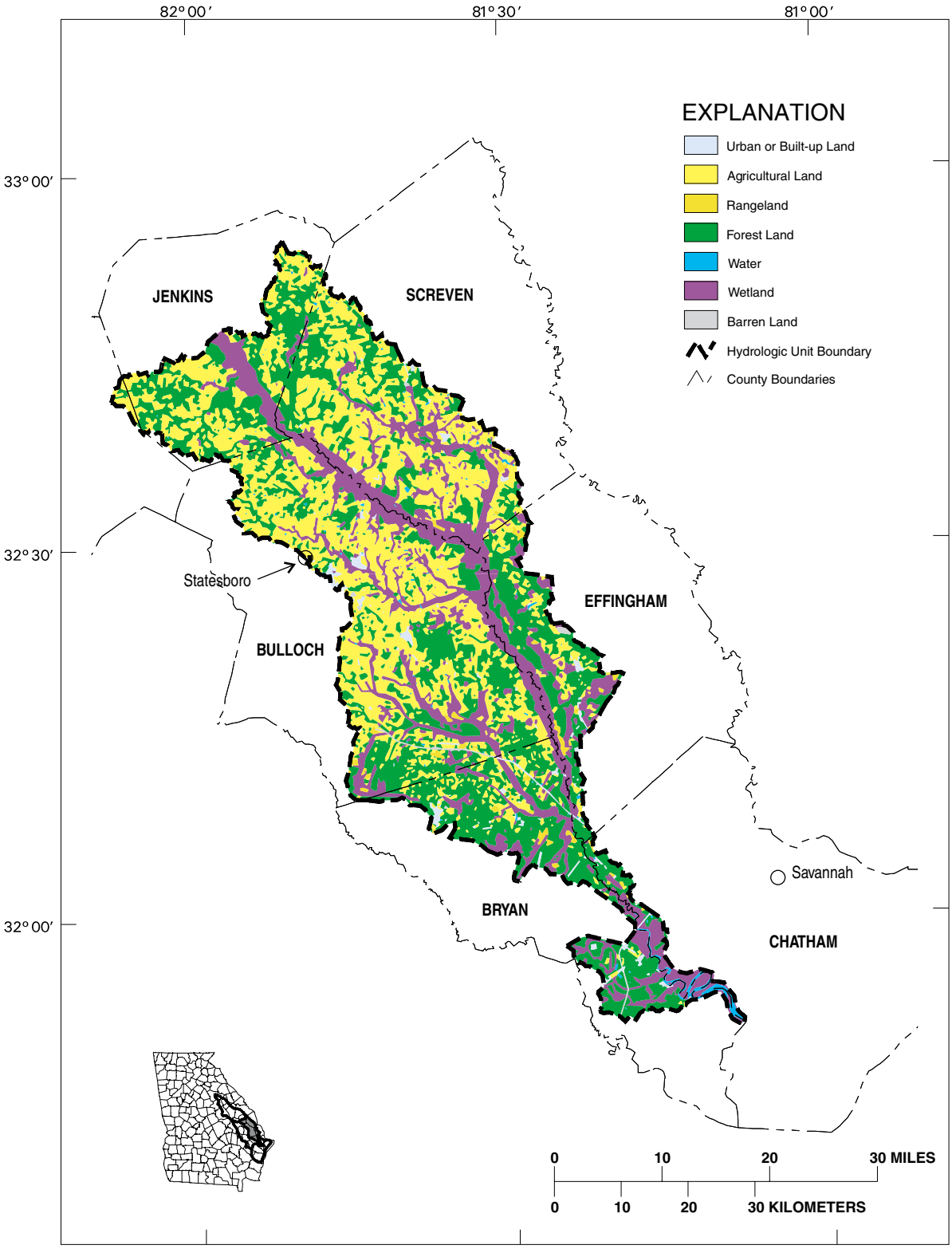

Figure 2-II. Land Use, Ogeechee River Basin, HUC 03060202, USGS 1972-76 Classification Updated with 1990 Urban Areas

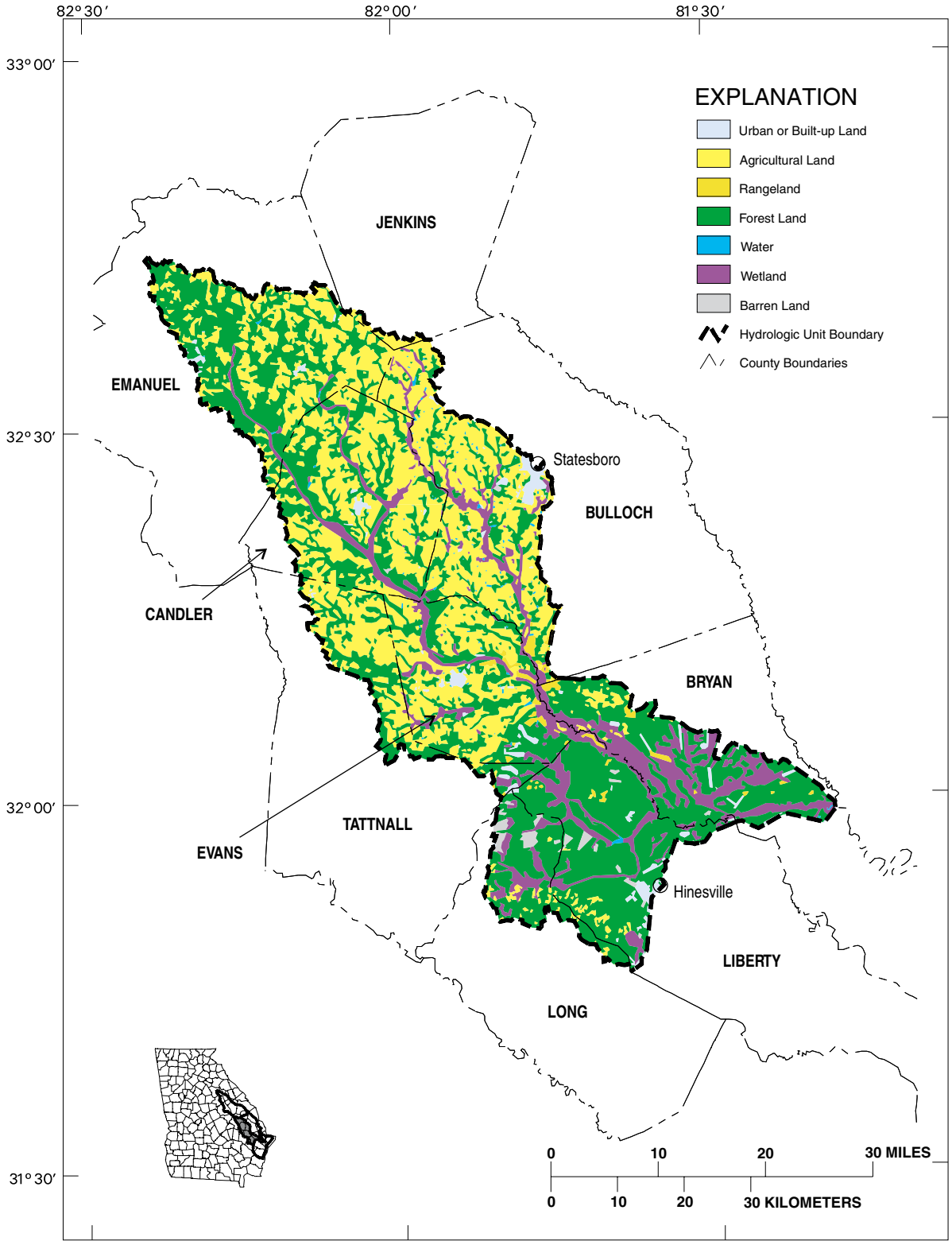

Figure 2-12. Land Use, Ogeechee River Basin, HUC 03060203, USGS 1972-76 Classification Updated with 1990 Urban Areas

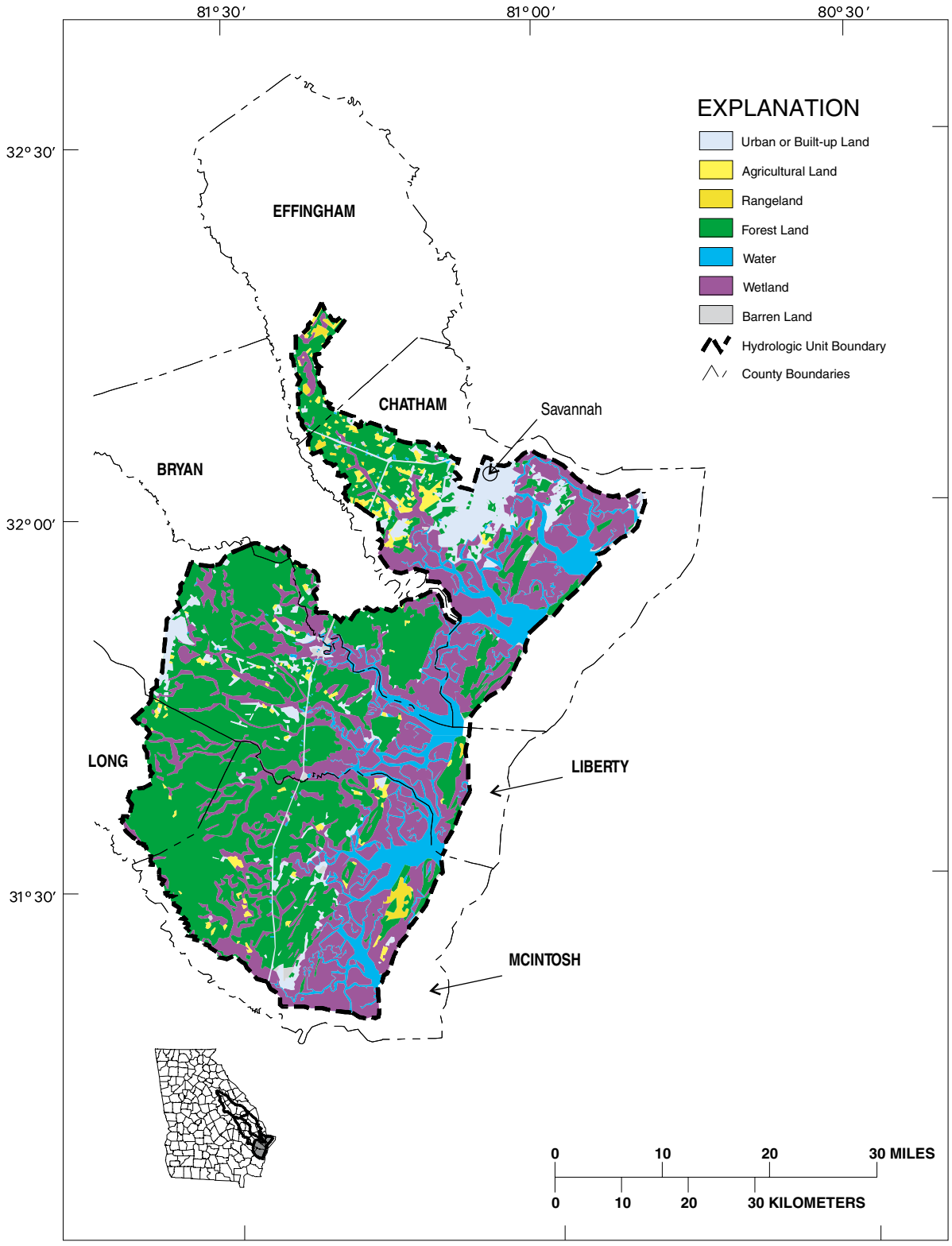

Figure 2-13. Land Use, Ogeechee River Basin, HUC 03060204, USGS 1972-76 Classification Updated with 1990 Urban Areas

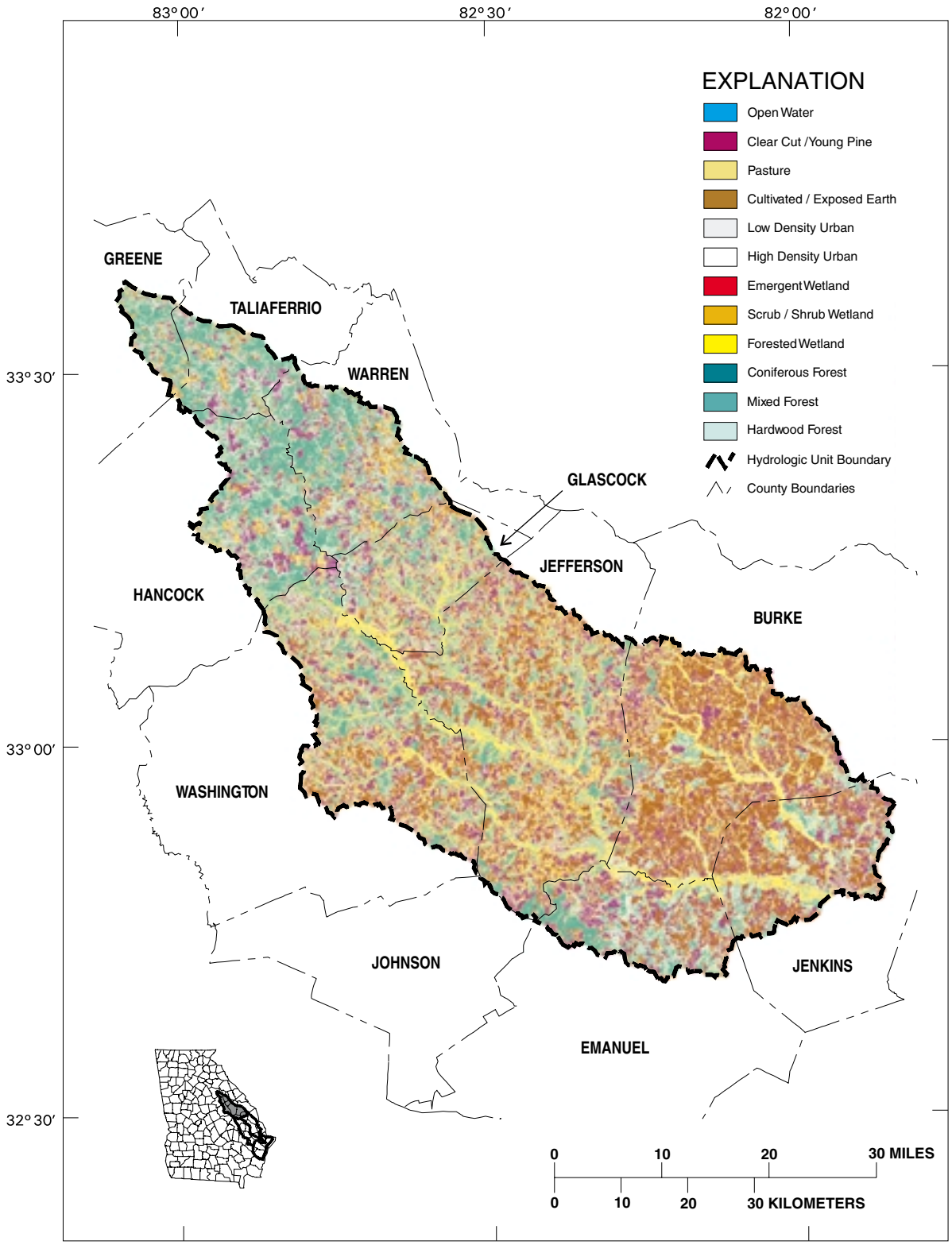

Figure 2-14. Land Cover 1990, Ogeechee River Basin, HUC 03060201

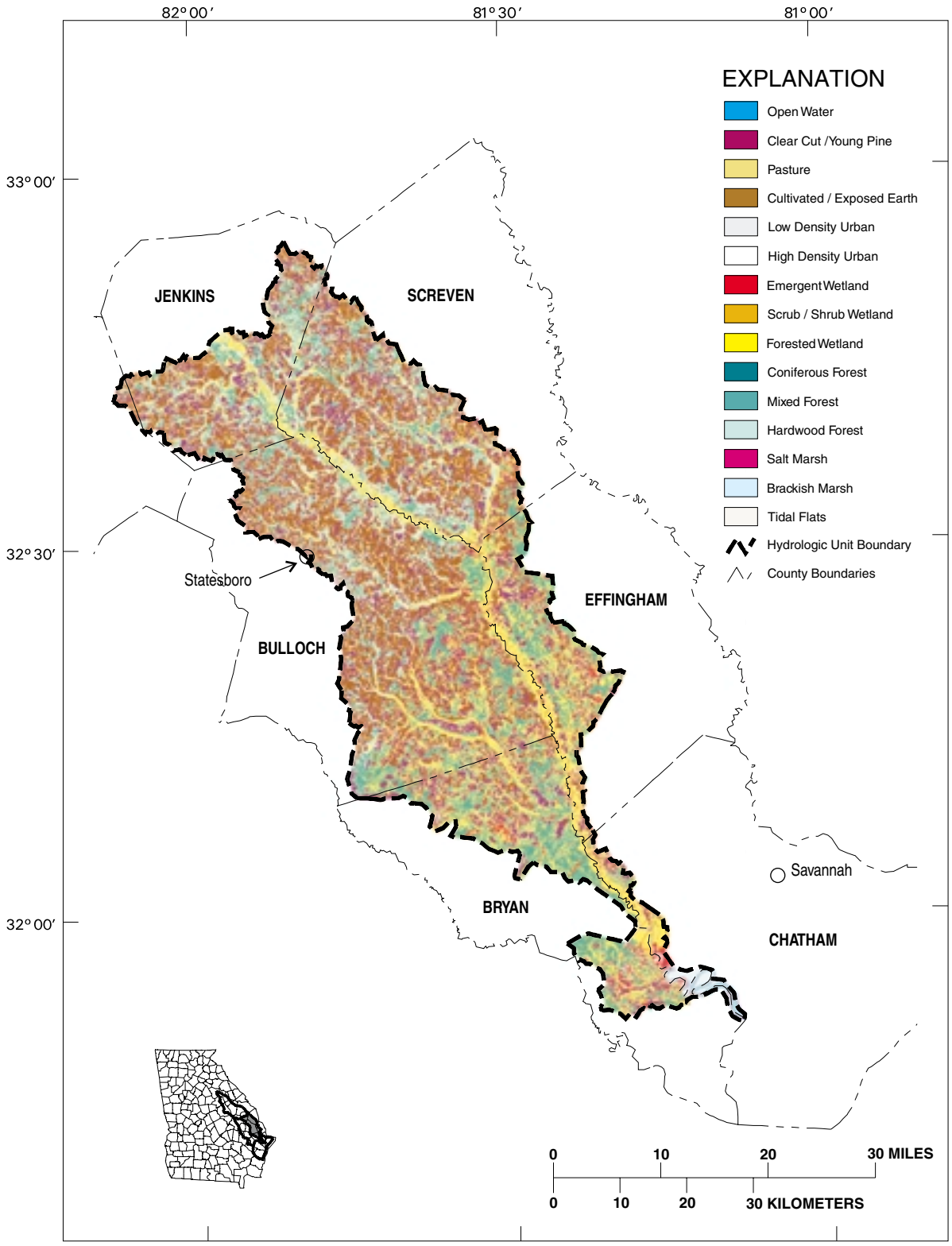

Figure 2-15. Land Cover 1990, Ogeechee River Basin, HUC 03060202

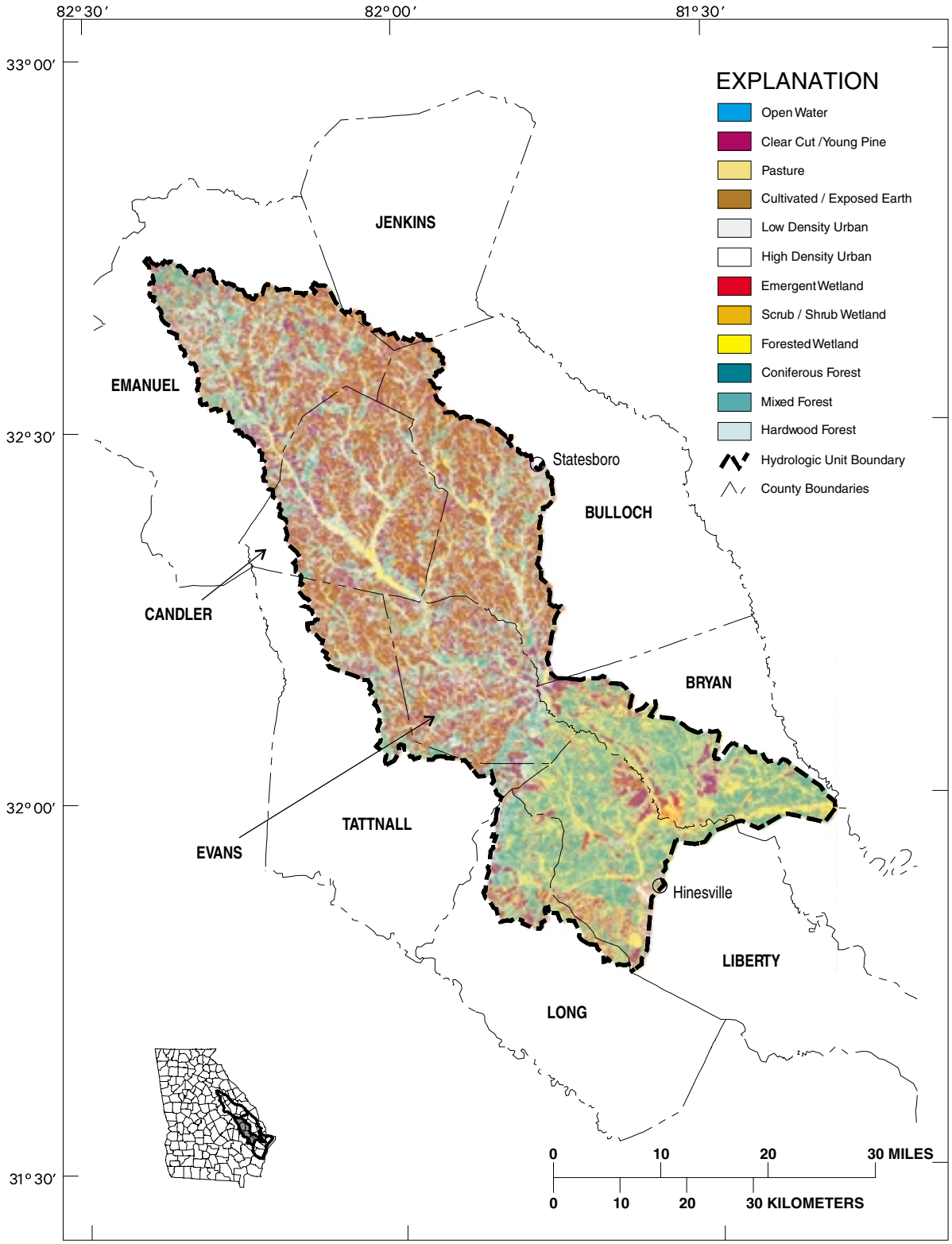

Figure 2-16. Land Cover 1990, Ogeechee River Basin, HUC 03060203

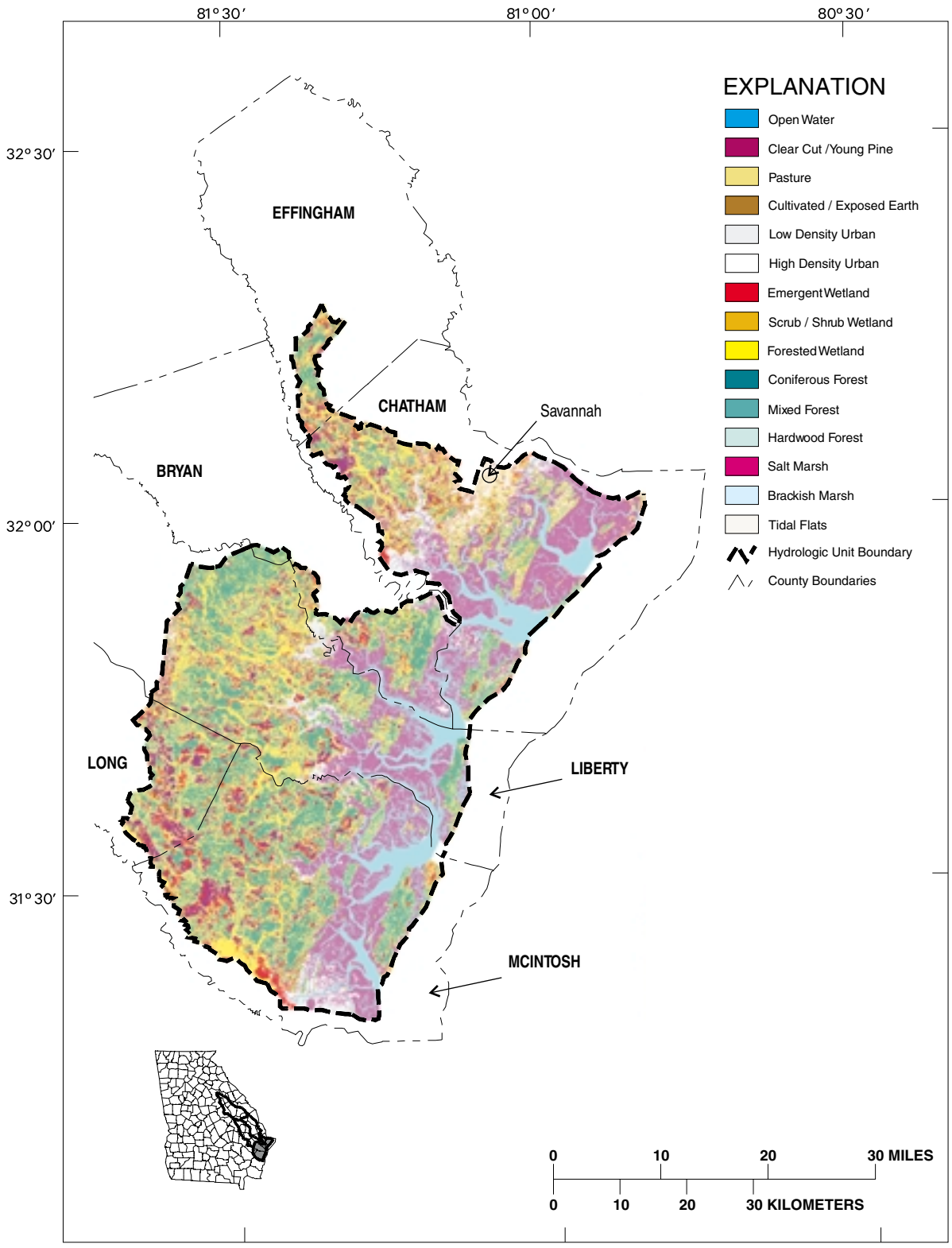

Figure 2-17. Land Cover 1990, Ogeechee River Basin, HUC 03060204

Table 2-2. Land Cover Statistics for the Ogeechee Basin

Class Name	%	Acres
Open Water	2.6	94,974.7
Clear Cut/Young Pine	15.5	569,760.8
Pasture	5.5	202,741.0
Cultivated/Exposed Earth	12.0	441.752.0
Low Density Urban	0.9	34,706.3
High Density Urban	0.4	14,465.6
Emergent Wetland	1.3	46,261.9
Scrub/Shrub Wetland	1.0	34,730.2
Forested Wetland	17.0	623,070.5
Coniferous Forest	15.9	584,877.5
Mixed Forest	12.8	468,934.9
Hardwood Forest	9.9	362,531.3
Salt Marsh	4.1	151,728.8
Brackish Marsh	1.0	37,876.2
Tidal Flats/Beaches	0.1	4,985.3
Total	*100.0*	*3,674,407.0*

Forestry

Forestry is a major part of the economy within the basin. Markets for forest products afford landowners excellent investment opportunities to manage and sell their timber, pine straw, naval stores, etc., products. Statewide, the forest industry output for 1997 grew to approximately $19.5 billion dollars. The value added by this production, which includes wages, profits, interest, rent, depreciation and taxes paid into the economy reached a record high $9.3 billion dollars. Georgians are benefited directly by 177,000 job opportunities created by the manufacture of paper, lumber, furniture and various other wood products as well as benefiting the consumers of these products. Other benefits of the forest include hunting, fishing, aesthetics, wildlife watching, hiking, camping and other recreational opportunities as well as providing important environmental benefits such as clean air and water and wildlife habitat.

According to the US Forest Service's Forest Statistics for Georgia, 1989 report (Thompson, 1989), there is approximately 2,192,000 acres of commercial forest land in the basin representing approximately 69 percent of the total land area in the basin. Private landowners account for 62 percent of the commercial forest ownership while the forest industry companies account for 25 percent. Governmental entities account for about 13 percent of the forest land. Figure 2-18 depicts silvicultural land use in the Ogeechee basin. Forestry acreage in the Ogeechee River basin is summarized in Table 2-3.

The pine type is composed of 493,600 acres of planted pine and 564,400 acres of natural pine stands.

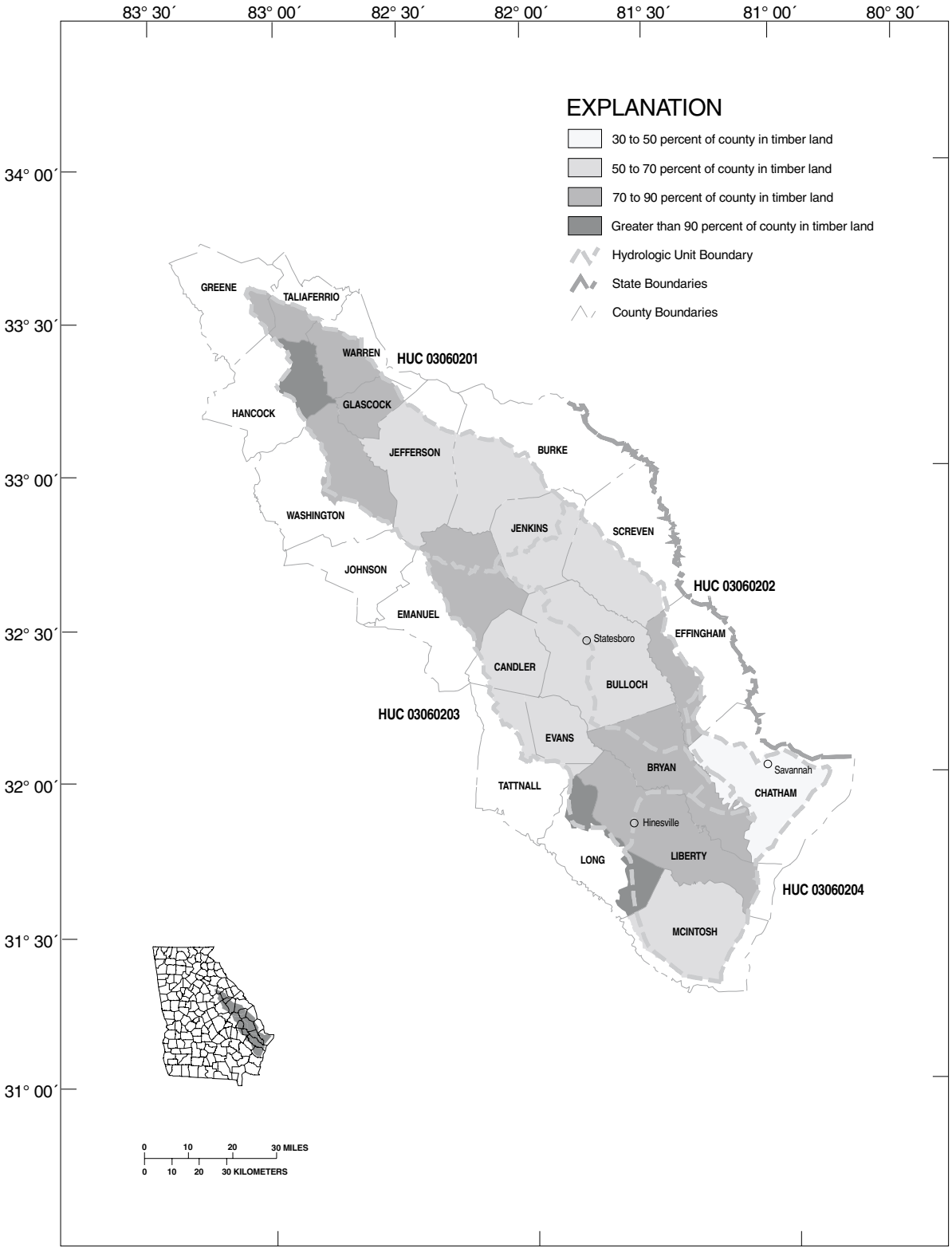

Figure 2-18. Silvicultural Land in the Ogeechee River Basin

Table 2-3. Forestry Acreage in the Ogeechee River Basin

County	Commercial Forest	Pine	Oak-pine	Upland Hardwood	Lowland Hardwood
Bryan	233,900	134,100	25,200	8,500	66,000
Bulloch	218,700	59,000	49,800	27,200	82,500
Burke	47,800	16,000	12,700	19,100	0
Candler	82,100	30,100	4,700	18,900	28,400
Chatham	76,200	29,900	8,200	20,200	18,000
Effingham	80,200	55,900	0	8,400	15,800
Emanuel	168,300	75,300	25,900	26,900	40,100
Evans	68,000	33,300	3,200	9,800	21,700
Glascock	65,500	26,700	8,400	17,500	13,000
Greene	23,200	15,800	3,700	0	3,700
Hancock	97,800	69,600	7,000	17,700	3,600
Jefferson	170,700	42,300	16,100	68,500	43,800
Jenkins	102,100	55,000	5,800	11,200	30,100
Johnson	2,600	0	0	0	2,600
Liberty	246,300	163,100	16,100	13,100	53,800
Long	44,800	35,900	3,200	0	5,600
McIntosh	58,800	33,600	2,300	11,400	11,600
Screven	122,400	29,900	20,700	31,500	40,200
Taliaferro	56,500	21,600	17,500	17,500	0
Tattnall	38,100	18,000	0	6,100	14,000
Warren	67,000	29,500	6,000	28,500	3,000
Washington	120,900	83,200	7,700	22,300	7,700
Total	*2,192,000*	*1,058,000*	*244,300*	*384,300*	*505,400*

For the period from 1982 to 1989, for the entire counties within the basin, the area classified as commercial forest land increased approximately 2 percent. The area classified as pine type increased 5 percent. The area classified as oak-pine type decreased 13 percent. The area classified as upland hardwood decreased 5 percent, and the area classified as bottomland hardwood increased 10 percent.

Agriculture

Agriculture in the Ogeechee River basin is a varied mixture of animal operations and relatively intensive commodity production. Agriculture land comprises some 37 percent of the land use within the basin, and over 76 percent of the land use within HUC 03060201 (Upper Ogeechee River) watershed.

Total farmland in the basin, approximately 1,477,607 acres (Figure 2-19), has declined rather steadily since 1982. Almost 75 percent of this farmland is in pasture. The remaining 25 percent is dedicated to growing cotton, peanuts, tobacco, and small grain (wheat, sorghum, soybean, millet). Commodity producers applied an average of 6.63 inches per acre of supplemental irrigation to over 81,000 acres during 1995. Burke and Jefferson Counties contain the largest number of irrigated acreage in the basin. Irrigation application, along with the number of acres actually harvested among these crops, varies from year to year in response to market conditions, government subsidy and conservation programs, and weather.

Livestock and poultry production is less intense in the Ogeechee River basin than in river basins with large acreage in the Piedmont MLRA. Approximately 88,000 head of cattle, 96,000 head of swine, and 16,000,000 broilers and layers are raised on animal operations in the basin (Table 2-4). Greene and Jenkins Counties, with 7,100 head of dairy cows, are among Georgia's top ten animal production counties for dairy cows. Bulloch and Tattnall Counties produce 63,000 head of swine ranking them among the State's top ten counties for swine production.

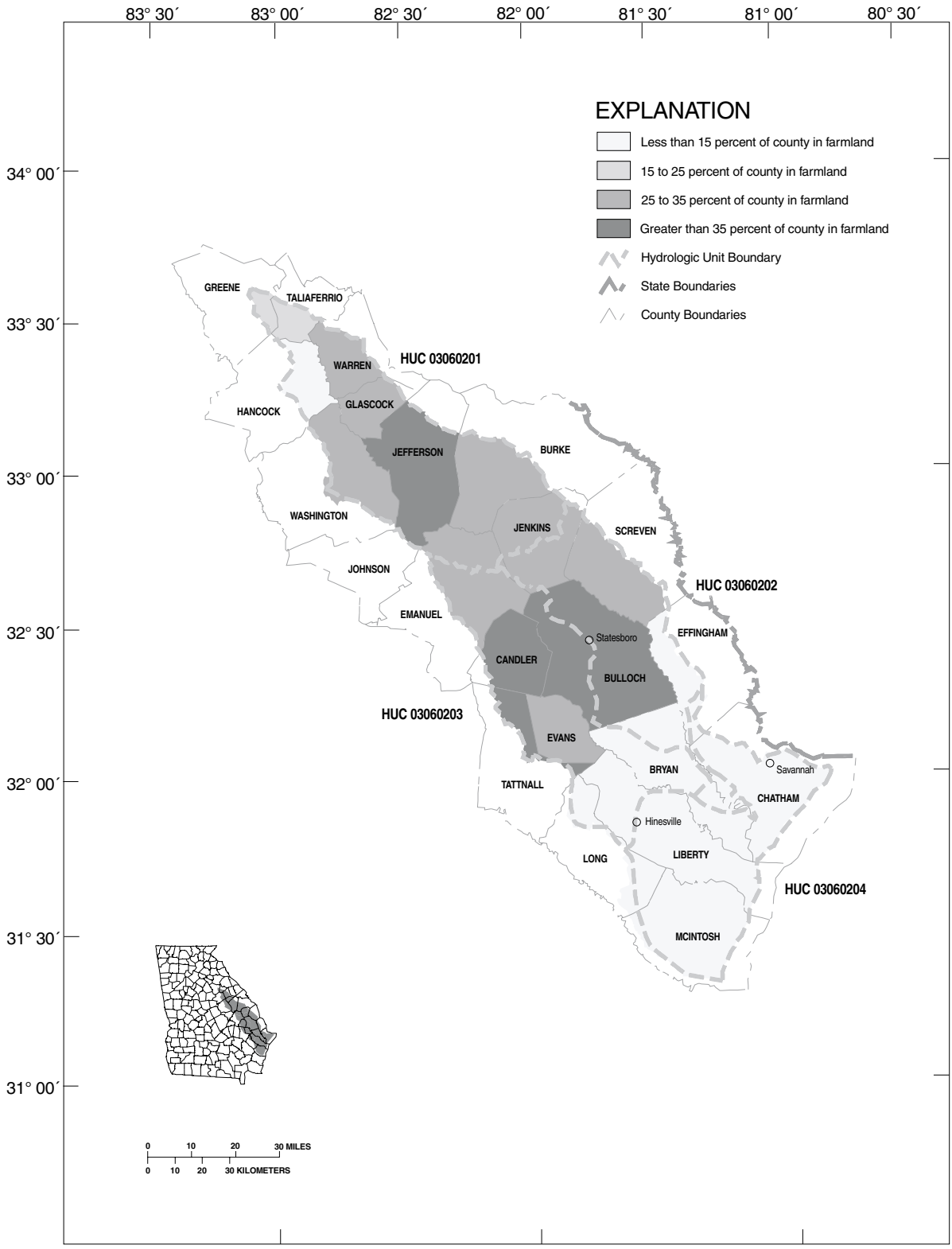

Figure 2-19. Agricultural Land in the Ogeechee River Basin

Table 2-4. Agricultural Operations in the Ogeechee River Basin (data supplied by NRCS)

Element	Watershed 3060201	Watershed 3060202	Watershed 3060203	Watershed 3060204	Ogeechee Basin Total
Acres	1,279,461	970,543	758,223	890,407	3,898,634
Number of Farms (1992)	899	911	630	130	2,570
Number of Dairies (1997)	30	8	1	-	39
Dairy Cattle (Head 1997)	4,983	1,495	77	-	6,555
All Cattle and Calves (Head 1997)	41,268	26,892	17,658	2,320	88,138
Hogs and Pigs (Head 1997)	10,257	58,791	26,837	342	96,227
Boilers (thousands, 1997)	445	1,198	13,921	430	15,994
Layers (thousands, 1997)	107	354	212	-	673
Irrigated Acres (1995)	37,389	30,250	12,207	1,205	81,051
Irrigated Water Use (MGD 1995)	15.63	13.41	7.59	3.71	40
Harvested Cropland (Acres 1992)	140,178	142,278	72,395	2,832	357,683
Total Agriculture Acres (1989-1997)	978	312,273	166,079	20,483	1,477,607

2.3 Local Governments and Planning Authorities

Many aspects of basin management and water quality protection depend on decisions regarding zoning, land use, and land management practices. These are particularly important for the control of nonpoint pollution—pollution that arises in storm water runoff from agriculture, urban or residential development, and other land uses. The authority and responsibility for planning and control of these factors lies with local governments, making local governments and jurisdictions important partners in basin management.

The Department of Community Affairs (DCA) is the state's principal department with responsibilities for implementing the coordinated planning process established by the Georgia Planning Act. Its responsibilities include promulgation of minimum standards for preparation and implementation of plans by local governments, review of local and regional plans, certification of qualified local governments, development of a state plan, and provision of technical assistance to local governments. Activities under the Planning Act are coordinated with the Environmental Protection Division (EPD), Regional Development Centers (RDCs), and local governments.

2.3.1 Counties and Municipalities

Local governments in Georgia consist of counties and incorporated municipalities. As entities with constitutional responsibility for land management, local governments have a significant role in the management and protection of water quality. The role of local governments includes enacting and enforcing zoning, storm water and development ordinances; undertaking water supply and wastewater treatment planning; and participating in programs to protect wellheads and significant ground water recharge areas. Many local governments are also responsible for operation of water supply and wastewater treatment facilities.

The Ogeechee River basin includes part or all of 21 Georgia counties (Table 2-5 and Figure 2-2); however, only four are entirely within the basin, and two counties have a small fraction (<20 percent) of their land area within the basin. Thus there are a total of 19 counties with significant jurisdictional in the basin. Municipalities or cities are communities officially incorporated by the General Assembly. Georgia has more than 530 municipalities. Table 2-6 lists the municipalities in the Ogeechee River basin.

Table 2-5. Georgia Counties in the Ogeechee River Basin

Counties Entirely Within the Ogeechee River Basin	Counties Partially Within the Ogeechee River Basin	Counties With Less Than 20% Area Within the Basin
Bulloch, Bryan, Evans, Liberty	Burke, Candler, Chatham, Effingham, Emanuel, Glascock, Hancock, Jefferson, Jenkins, Long, McIntosh, Screven, Taliaferro, Washington, Warren	Greene, Tattnall

2.3.2 Regional Development Centers

Regional Development Centers (RDCs) are agencies of local governments, with memberships consisting of all the cities and counties within each RDC's territorial area. There are currently 17 RDCs in Georgia. RDCs facilitate coordinated and comprehensive planning at local and regional levels, assist their member governments with conformity to minimum standards and procedures, and can have a key role in promoting and supporting management of urban runoff, including watershed management initiatives. RDCs also serve as liaisons with state and federal agencies for local governments in each region.

Funding sources include members' dues and funds available through DCA. Table 2-7 summarizes the RDCs and the associated counties within the Ogeechee River basin.

2.4 Water Use Classifications

2.4.1 Georgia's Water Use Classification System

The Board of Natural Resources was authorized through the Rules and Regulations for Water Quality Control promulgated under the Georgia Water Quality Control Act of 1964, as amended, to establish water use classifications and water quality standards for the surface waters of the State.

Table 2-6. Georgia Municipalities in the Ogeechee River Basin

HUC 03060201				
Avera	Gibson	Mayfield	Powelton	Wadley
Bartow	Gough	Midville	Riddleville	Warrenton
Colemans Lake	Grange	Millen	Rosier	Warthen
Culverton	Hadden	Mitchell	Shoals	
Davisboro	Herndon	Moxley	Summertown	
Edgehill	Jewell	Munnerlyn	Union Point	
Emmalane	Louisville	Perkins	Vidette	
HUC 03060202				
Altman	Denmark	Guyton	Newington	Stilson
Arcola	Dover	Halcyondale	Oliver	Thrift
Blitchton	Eden	Hunters	Pineora	Tusculum
Brooklet	Egypt	Kildare	Richmond Hill	Woodcliff
Burroughs	Eldora	Lanier	Rocky Ford	
Butts	Ellabell	Marlow	Scarboro	
HUC 03060203				
Aline	Daisy	Hagan	Pembroke	Twin City
Bellville	Excelsior	Manassas	Portal	Wade
Canoochee	Garfield	Metter	Pulaski	
Claxton	Groveland	Modoc	Register	
Cobbtown	Gum Branch	Nevils	Statesboro	
HUC 03060204				
Allenhurst	Dorchester	McIntosh	Ridgeville	Thunderbolt
Ashintilly	Eulonia	meldrim	Sandfly	Townsend
Belfast	Fleming	Meridian	Sapelo Island	Valona
Bloomingdale	Flemington	Midway	Savannah	Vernon View
Carnigan	Halfmoon Landing	Montgomery	Seabrook	Vernonburg
Coffee Bluff	Hinesville	Pine Harbor	Shellman Bluff	Walthourville
Crescent	Isle of Hope	Pooler	Silk Hope	Wilmington
Cross Roads	Jones	Retreat	South Newport	
Darien	Keller	Riceboro	Sunbury	

Table 2-7. Regional Development Centers in the Ogeechee River Basin

Regional Development Center	Member Counties with Land Area in the Ogeechee Basin
Heart of Georgia	Candler, Evans, Tattnall
Central Savannah	Burke, Emanuel, Glascock, Jefferson, Jenkins, Screven, Taliaferro, Warren, Hancock, Washington
Coastal Georgia	Bryan, Chatham, Liberty, Long, Bullock
Northeast Georgia	Greene

The water use classifications and standards were first established by the Georgia Water Quality Control Board in 1966. Georgia was the second state in the nation to have its water use classifications and standards for intrastate waters approved by the federal government in 1967. For each water use classification, water quality standards or criteria were developed which established a framework to be used by the Water Quality Control Board and later the Environmental Protection Division in making water use regulatory decisions.

The water use classification system was applied to interstate waters in 1972 by the EPD. Georgia was again one of the first states to receive federal approval of a statewide system of water use classifications and standards. Table 2-8 provides a summary of water use classifications and criteria for each use.

Congress made changes in the CWA in 1987 that required each state to adopt numeric limits for toxic substances for the protection of aquatic life and human health. To comply with these requirements, the Board of Natural Resources adopted 31 numeric standards for protection of aquatic life and 90 numeric standards for the protection of human health. Appendix B provides a summary of toxic substance standards that apply to all waters in Georgia. Water quality standards are discussed in more detail in Section 5.2.1.

Table 2-8. Georgia Water Use Classifications and Instream Water Quality Standards for Each Use

	Bacteria (fecal coliform)		Dissolved Oxygen (other than trout streams)[2]		pH	Temperature (other than trout streams)[2]	
Use Classification[1]	30-Day Geometric Mean[3] (no/100 ml)	Maximum (no./100ml)	Daily Average (mg/l)	Minimum (mg/l)	Std. Units	Maximum Rise above Ambient (°F)	Maximum (°F)
Drinking Water requiring treatment	1,000 (Nov-April) 200 (May-October)	4,000 (Nov-April)	5.0	4.0	6.0-8.5	5	90
Recreation	200 (Freshwater) 100 Coastal)	--	5.0	4.0	6.0-8.5	5	90
Fishing Coastal Fishing[4]	1,000 (Nov-April) 200 (May-October)	4,000 (Nov-April)	5.0	4.0	6.0-8.5	5	90
Wild River	No alteration of natural water quality						
Scenic River	No alteration of natural water quality						

[1] Improvements in water quality since the water use classifications and standards were originally adopted in 1972 provided the opportunity for Georgia to upgrade all stream classifications and eliminate separate use designations for "Agriculture", "Industrial", "Navigation", and "Urban Stream" in 1993.

[2] Standards for Trout Streams for dissolved oxygen are an average of 6.0 mg/l and a minimum of 5.0 mg/l. No temperature alteration is allowed in Primary Trout Streams and a temperature change of 2°F is allowed in Secondary Trout Streams.

[3] Geometric means should be "based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours." The geometric mean of a series of N terms is the Nth root of their product. Example: the geometric mean of 2 and 18 is the square root of 36.

[4] Standards are same as fishing with the exception of dissolved oxygen which is site specific.

In the latter 1960s through the mid-1970s there were many water quality problems in Georgia. Many stream segments were classified for the uses of navigation, industrial, or urban stream. Major improvements in wastewater treatment over the years have allowed the stream segments to be raised to the uses of fishing or coastal fishing which include more stringent water quality standards. The final two segments in Georgia were upgraded as a part of the triennial review of standards completed in 1989. All of Georgia's waters are currently classified as either fishing, recreation, drinking water, wild river, scenic river, or coastal fishing.

2.4.2 Water Use Classifications for the Ogeechee River Basin

Waters in the Ogeechee River basin are classified as fishing, recreation, drinking water, or wild and scenic. Most of the waters are classified as fishing. Those waters explicitly classified in Georgia regulations are shown in Table 2-9; all waters not explicitly classified are classified as fishing.

Table 2-9. Ogeechee River Basin Waters Classified in Georgia Regulations[1]

Waterbody	Segment Description	Use Classification
Ogeechee River	U.S. Highway 17 Bridge to Open Sea and littoral waters of Skidaway, Ossabaw, Sapelo, and St. Catherines Islands	Recreation
Little Ogeechee River	South end of White Bluff Road near Carmelite Monastery to Open Sea and littoral waters of Skidaway and Ossabaw Islands	Recreation

[1] Rules and Regulations for Water Quality Control, Chapter 391-3-6(13). Waters within the Ogeechee River basin not explicitly classified and listed above are classified as Fishing.

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In This Section

- Drinking Water Supply
- Surface Water Quantity
- Ground Water Quantity

Section 3

Water Quantity

This section addresses water quantity issues (availability and use), while water quality in the Ogeechee basin is the subject of Section 4. Water use in the Ogeechee River Basin is measured by estimates of freshwater withdrawn from groundwater and surface water. Uses of water include both consumptive and nonconsumptive uses.

Surface water is the primary water source in the Piedmont Province of the Ogeechee River basin because ground water yields from crystalline rock aquifers tend to be low. Within the Coastal Plain province, aquifer yields are higher and ground water withdrawals are an important part of the total water budget. Although most public-supply withdrawals in the Piedmont Province are from surface-water sources, with the exception of counties near or immediately below the Fall Line, most public-supply water in the Coastal Plain comes from ground water sources. The Floridan aquifer system supplied most of the ground water used in the basin in 1990, followed by the Claiborne, Clayton, Piedmont crystalline rock, and the Providence aquifer systems. As previously mentioned, the two sources of supply are not independent, because ground water discharge to streams is important in maintaining dry-weather flow. Thus, withdrawal of ground water can, under certain conditions, also result in reduction in surface water flow.

Water use in the Ogeechee River Basin is expected to remain stable in the near future due to average population growth rates.

In the following sections, water availability is discussed from a number of viewpoints. First, the important topic of drinking water is presented, which includes both surface and ground water supplies. Then, general surface water availability is presented, followed by ground water availability.

3.1 Drinking Water Supply

3.1.1 Drinking Water Supplies in the Ogeechee River Basin

The Ogeechee River basin provides drinking water for nearly 394,000 people in the state of Georgia by municipal or privately owned public water systems. A public water system pipes water for human consumption and has at least 15 service connections or

regularly serves at least 25 individuals 60 or more days out of the year. Public water system sources include surface water pumped from rivers and creeks or ground water pumped to the surface from wells or naturally flowing from springs. There are three different types of public water systems: community, non-community non-transient, and non-community transient.

Types of Public Water Systems

A community public water system serves at least 15 service connections used by year round residents or regularly serves at least 25 year-round residents. Examples of community water systems are municipalities, such as cities, counties, and authorities which serve residential homes and businesses located in the areas. Other types of community public water systems include rural subdivisions or mobile home parks which have a large number of homes connected to a private public water system, usually a small number of wells.

A non-community non-transient public water system serves at least 25 of the same persons over six months per year. Examples of non-community non-transient systems are schools, office buildings, and factories which are served by a well.

A non-community transient public water system does not meet the definition of a non-community non-transient system. A non-community transient public water system provides piped water for human consumption to at least 15 service connections or which regularly serves at least 25 persons at least 60 days a year. Examples of a non-community transient are highway rest stops, restaurants, motels, and golf courses.

Private domestic wells serving individual houses are not covered by the state's public water system regulations. However, the regulations for drilling domestic wells are set by the Water Well Standards Act and the local health department is responsible for insuring water quality.

In the Ogeechee River basin there is one community public water system utilizing surface water and serves 2,800 people and 355 community public water systems utilizing ground water and serving approximately 368,000 people (Table 3-1). The locations of surface water intakes within each of the Hydrologic Units of the Ogeechee River basin are shown in Figures 3-1 through 3-4.

Table 3-I. Community Public Water Systems in the Ogeechee River Basin

Drinking Water Permit Number	Water System Name	County
HUC 03060201		
GA0330001	Midville	Burke
GA0330003	Vidette	Burke
GA1070004	Summertown	Emanuel
GA1250000	Gibson	Glascock
GA1250001	Mitchell	Glascock
GA1250004	Edgehill	Glascock
GA1330001	Siloam	Greene
GA1330003	White Plains	Greene
GA1410002	Hancock Co-Mayfield	Hancock
GA1410019	Hancock Co-GA15e/Devereau	Hancock
GA1630000	Avera	Jefferson
GA1630001	Bartow	Jefferson
GA1630002	Louisville	Jefferson

Drinking Water Permit Number	Water System Name	County
GA1630003	Stapleton	Jefferson
GA1630004	Wadley	Jefferson
GA1630015	Jefferson County Water System	Jefferson
GA1650000	Millen	Jenkins
GA1650001	Perkins Water Authority	Jenkins
GA2650000	Crawfordville	Taliaferro
GA2650007	The New Frontier-Fena Inc.	Taliaferro
GA3010001	Warrenton	Warren
GA3010004	Norwood	Warren
GA3030005	Sandersville	Washington
HUC 03060202		
GA0290000	Richmond Hill	Bryan
GA0290004	So Atl-Black Creek Farms Subdivision	Bryan
GA0290006	Bryan Woods Estates	Bryan
GA0290008	Ft. McAllister/Cape Hardwicke	Bryan
GA0290009	Lake Lorraine Subdivision	Bryan
GA0290011	Strathy Hall Subdivision	Bryan
GA0290012	Mill Hill Landing	Bryan
GA0290013	Black Creek Farms West	Bryan
GA0290014	Bar D Ranch Subdivision	Bryan
GA0290015	Coastal Chlor-Briarwood Subdivision	Bryan
GA0290021	Coastal Chlor-the Cove Subdivision	Bryan
GA0290022	Holly Hill Subdivision	Bryan
GA0290023	Bryan Woods Estates Phase III	Bryan
GA0290029	Gardner Estates	Bryan
GA0290031	Kens Mobile Home Park	Bryan
GA0290036	Richmond Hill Mobile Home Park	Bryan
GA0290066	Redbird Creek	Bryan
GA0290071	Waterford Landing	Bryan
GA0290073	Strathy Hall Two Subdivision	Bryan
GA0290076	Oxford Subdivision	Bryan
GA0290084	Black Creek Development	Bryan
GA0310000	Brooklet	Bulloch
GA0310002	Portal	Bulloch
GA0310004	Statesboro	Bulloch
GA0310013	Leefield Water Assoc., Inc.	Bulloch
GA0310016	Grove Lakes Subdivision	Bulloch
GA0310033	Tankersley Subdivision	Bulloch
GA0310034	Windfield Subdivision	Bulloch
GA0310040	Riverside Estates	Bulloch
GA0310049	Frankville Water Association	Bulloch
GA0310052	Coach House Estates Mobile Home Park	Bulloch
GA0310053	Colonial Heights Subdivision	Bulloch
GA0310060	Mill Creek Estates	Bulloch
GA0310061	Lakeside Estates	Bulloch
GA0310062	Newtons Mobile Home Village	Bulloch
GA0310068	Thomas Village	Bulloch
GA0310071	Westchester Subdivision	Bulloch
GA0310075	Frinks Trailer Park	Bulloch
GA0310140	Zetterower Mobile Home Park	Bulloch

Drinking Water Permit Number	Water System Name	County
GA0310165	Georgian Walk Subdivision	Bulloch
GA0310166	Eldora Farms Subdivision	Bulloch
GA0310167	Mill Creek Landing	Bulloch
GA0310171	Deerfield Subdivision	Bulloch
GA0310172	Northwood Subdivision	Bulloch
GA0310174	Chance`s Mobile Home Park	Bulloch
GA0310177	Old Mill Pond Subdivision	Bulloch
GA0310180	Timberland Points	Bulloch
GA0310183	Hunters Point Subdivision	Bulloch
GA0310187	English Oaks Mhp	Bulloch
GA0310188	Olney Station	Bulloch
GA0310189	Plantation Mobile Estates	Bulloch
GA0310190	Yorktown Subdivision	Bulloch
GA0310193	Brannen Mobile Home Park	Bulloch
GA0310199	Westside Mobile Home Park	Bulloch
GA0310201	Oak Hill Mobile Home Park	Bulloch
GA0310202	Middleground Plantation	Bulloch
GA0310203	Pretoria Station/Brookwood SD	Bulloch
GA0310206	Inman Lakes Subdivision	Bulloch
GA0310211	Old Indian Trail WS	Bulloch
GA0310212	Westboro Apartments	Bulloch
GA0310213	Cody Lane Mobile Home Park	Bulloch
GA0310214	Greenwood Trailer Park	Bulloch
GA0510025	Atlantic Ws-argyle Est	Chatham
GA0510085	Atlantic Ws-oliver Pines	Chatham
GA0510114	Bellaire Village Subdivision	Chatham
GA0510129	Chatham Co.-Burroughs Comm.	Chatham
GA0510129	Chatham Co.-Burroughs Comm.	Chatham
GA0510157	Atlantic Ws-riverside Estates	Chatham
GA0510223	J. R. Rogers Mobile Home Ct.	Chatham
GA0510249	Argyle Village Subdivision	Chatham
GA0510253	Riverbluff Subdivision	Chatham
GA0510267	Sandy Bluff Subdivision	Chatham
GA1030000	Guyton	Effingham
GA1030011	Meldrim Lakes	Effingham
GA1030016	Lakeside W Co-Foxbow Farms	Effingham
GA1030017	Foxbow North Subdivision	Effingham
GA1030086	Clearview Subdivision	Effingham
GA1030095	Wrph Ltd-Pine Hill S/d	Effingham
GA1030097	Lee Village Subdivision	Effingham
GA1030102	River Road Farms	Effingham
GA1030104	Cypress Lakes Subdivision	Effingham
GA2510001	Newington	Screven
GA2510002	Oliver	Screven
GA2510013	Green Acres Mobile Home Park	Screven
GA2510014	Indigo Mobile Estates	Screven
GA2510044	Rocky Ford	Screven
GA2510048	Hillcrest Heights	Screven
GA2510053	Blue Hole Mobile Home Park	Screven

Drinking Water Permit Number	Water System Name	County
HUC 03060203		
GA0290001	Pembroke	Bryan
GA0310001	Nevils Water Association	Bulloch
GA0310003	Register	Bulloch
GA0310006	Georgia Southern University	Bulloch
GA0310014	Mixon`s Mobile Village	Bulloch
GA0310015	Forest Heights Subdivision	Bulloch
GA0310017	Johnson Mobile Home Park	Bulloch
GA0310025	The Barn Mobile Home Park	Bulloch
GA0310028	Lake Collins Estates	Bulloch
GA0310031	Lanier Mobile Home Park	Bulloch
GA0310035	Hazelwood Subdivision	Bulloch
GA0310036	Country Club Hills/Pine Forest	Bulloch
GA0310037	Forest Hills Subdivision	Bulloch
GA0310038	Country Lakes Estates Mobile Home Park	Bulloch
GA0310041	New Hope Subdivision	Bulloch
GA0310055	Cypress Lake Mobile Home Park	Bulloch
GA0310149	Woodland Mobile Estates	Bulloch
GA0310168	Meadow Lakes Plantation Subdivision	Bulloch
GA0310169	Westridge Subdivision	Bulloch
GA0310170	Hodges Subdivision	Bulloch
GA0310173	Cedarwood Mobile Home Park	Bulloch
GA0310175	Williford Trailer Park	Bulloch
GA0310178	Bird Road Trailer Park	Bulloch
GA0310184	Southern Comfort Subdivision	Bulloch
GA0310185	On the Pond Subdivision	Bulloch
GA0310191	Horizons West Subdivision	Bulloch
GA0310192	Dry Branch Village	Bulloch
GA0310194	Lundy Trailer Park	Bulloch
GA0310195	Country Walk Subdivision	Bulloch
GA0310197	Gallop Mobile Home Park	Bulloch
GA0310198	Heritage Mobile Home Park	Bulloch
GA0310204	Westover Subdivision	Bulloch
GA0310205	Bradford Place	Bulloch
GA0310216	Star Line Heights Apts.	Bulloch
GA0310229	Pine Inn Estates	Bulloch
GA0430000	Metter	Candler
GA0430001	Pulaski	Candler
GA0430003	Daniel Village Mobile Home Park	Candler
GA1030018	Pecan Grove Subdivision	Effingham
GA1030028	Pineora System	Effingham
GA1070001	Garfield	Emanuel
GA1070003	Stillmore	Emanuel
GA1070005	Swainsboro	Emanuel
GA1070006	Twin City	Emanuel
GA1070031	Country View Estates Mobile Home Park	Emanuel
GA1070032	Ogburn Subdivision	Emanuel
GA1090000	Bellville	Evans
GA1090001	Claxton	Evans
GA1090002	Daisy	Evans

Drinking Water Permit Number	Water System Name	County
GA1090003	Hagan	Evans
GA1090006	Evans Memorial Hospital	Evans
GA1090007	Claxton-evans County Industrial Park	Evans
GA1090037	Winnmeir Subdivision	Evans
GA1090038	La Casa Carmen Subdivision	Evans
GA1790018	Roberts Properties	Liberty
GA1790022	Oakview Mobile Home Park	Liberty
GA1790024	Usa-fort Stewart Main	Liberty
GA1790027	Palms West Mobile Home Park	Liberty
GA1790029	Victory Manor Mobile Home Park	Liberty
GA1790032	Guyett Rentals (Bucks Mobile Home Park)	Liberty
GA1790034	Oak Hill Estates Mobile Home Park	Liberty
GA1790046	Mossy Oak Trailer Park	Liberty
GA1790093	Deerfield Mobile Home Park	Liberty
GA1790096	Westgate Mobile Home Park	Liberty
GA1790127	Alsennia`s Trailer Park	Liberty
GA1790128	Cowart Subdivision	Liberty
GA1790134	Live Oak Mobile Home Park	Liberty
GA1790135	Zorn Subdivision	Liberty
GA1790136	Woodridge Community Mobile Home Park	Liberty
GA1830005	Horse Creek Trailer Park	Long
GA1830010	Middleton Mobile Village	Long
GA1830020	Taylors Creek Mobile Home Park	Long
GA1830031	Mcdonald Village	Long
GA1830032	Pine Crest Mobile Home Park	Long
GA2670000	Cobbtown	Tattnall
GA2670003	Manassas	Tattnall
HUC 03060204		
GA0290005	Bryan Acres Subdivision	Bryan
GA0290010	Lincoln River Estates	Bryan
GA0290020	B & B Water Works	Bryan
GA0290024	The Bluff-Belle Island	Bryan
GA0290025	Tivoli Marsh Water System	Bryan
GA0290053	Shuman Trailer Park	Bryan
GA0290063	Heron Point Subdivision	Bryan
GA0290064	Bailey Plantation Subdivision	Bryan
GA0290067	Quail Hamlet Subdivision	Bryan
GA0290068	Sayle`s Landing Subdivision	Bryan
GA0290069	Jerico Subdivision	Bryan
GA0290070	Oak Pointe Subdivision	Bryan
GA0290075	Cranston Bluff Subdivision	Bryan
GA0290080	Buckhead Development	Bryan
GA0290083	Hope Creek Plantation	Bryan
GA0290085	Marsh Harbor	Bryan
GA0290086	Brigham Lakes Subdivision	Bryan
GA0510001	Pooler	Chatham
GA0510003	Savannah-Main	Chatham
GA0510005	Tybee Island	Chatham
GA0510006	Thunderbolt	Chatham

Drinking Water Permit Number	Water System Name	County
GA0510011	Golden Isles Subdivision	Chatham
GA0510012	Grove Hill Subdivision	Chatham
GA0510014	Azalea Mobile Home Plaza	Chatham
GA0510015	Water`s Bluff Mobile Home Park	Chatham
GA0510016	Bloomingdale	Chatham
GA0510017	Crosby Mobile Estates	Chatham
GA0510021	Cottonvale Estates	Chatham
GA0510022	Dyches Mobile Estates	Chatham
GA0510023	East Pines Subdivision	Chatham
GA0510024	Estill Hammock/Spanish Hammock	Chatham
GA0510026	Garden Acres Estates	Chatham
GA0510027	Savannah-Dutch Island	Chatham
GA0510027	Savannah-Dutch Island	Chatham
GA0510028	Grays Subdivision	Chatham
GA0510030	Harbour Creek Subdivision	Chatham
GA0510031	Holiday Mobile Park	Chatham
GA0510033	The Landings Subdivision	Chatham
GA0510034	Larchmont Utilities	Chatham
GA0510035	Nortons Trailer Park	Chatham
GA0510036	Atlantic WS-Ogeechee Farms	Chatham
GA0510038	Parkersburg Subdivision	Chatham
GA0510038	Parkersburg Subdivision	Chatham
GA0510040	Atlantic WS-Pine Barren Acres	Chatham
GA0510042	Plantation Inn Mobile Estates	Chatham
GA0510044	Chatham WC-Rio Vista/Burnside	Chatham
GA0510046	River Oaks Subdivision	Chatham
GA0510047	Skidaway Mobile Estates	Chatham
GA0510049	Southside Mobile Estates	Chatham
GA0510050	Southwinds Community	Chatham
GA0510051	Savannah Pines Mobile Home Park	Chatham
GA0510052	Talahi Island Community	Chatham
GA0510054	The Bluff Subdivision	Chatham
GA0510055	Vicks Mobile Home Park	Chatham
GA0510056	White Oaks Subdivision	Chatham
GA0510060	Savannah Yacht & Country Club	Chatham
GA0510079	Morgan Mobile Home Park	Chatham
GA0510080	Melody Acres Park	Chatham
GA0510081	Savannah-Georgetown Community	Chatham
GA0510089	Nassau Woods Mobile Home Park	Chatham
GA0510091	Commodore Point	Chatham
GA0510094	Whitemarsh Estates	Chatham
GA0510096	Chatham Co.-Runaway Point	Chatham
GA0510096	Chatham Co.-Runaway Point	Chatham
GA0510098	Ennis Mobile Home Park	Chatham
GA0510099	Chatham Co.-Montgomery Area	Chatham
GA0510099	Chatham Co.-Montgomery Area	Chatham
GA0510100	Bethesda Home for Boys	Chatham
GA0510103	Lakeside Mobile Home Park	Chatham
GA0510104	Whitfield Park Subdivision	Chatham
GA0510107	Usa-hunter Af Main	Chatham

Drinking Water Permit Number	Water System Name	County
GA0510109	Chatham Co.-Glen of Robin Hood	Chatham
GA0510109	Chatham Co.-Glen of Robin Hood	Chatham
GA0510110	Foss Mobile Home Park	Chatham
GA0510111	Live Oak Mobile Home Park	Chatham
GA0510112	Shady Acres Mobile Home Park	Chatham
GA0510113	Grove Point Mobile Est.	Chatham
GA0510121	Beaulieu Village Subdivision	Chatham
GA0510123	Derrick Subdivision	Chatham
GA0510124	Chatham Co.-Little Neck Planta	Chatham
GA0510124	Chatham Co.-Little Neck Planta	Chatham
GA0510126	Miller Pines Mobile Home Park	Chatham
GA0510128	Chatham Co.-Modena on Skidaway	Chatham
GA0510128	Chatham Co.-Modena on Skidaway	Chatham
GA0510130	Candler General Hospital	Chatham
GA0510133	Chatham Co.-West Chatham Co.	Chatham
GA0510133	Chatham Co.-West Chatham Co.	Chatham
GA0510138	Bashlors Mobile Home Park	Chatham
GA0510139	Heathcote Farms Subdivision	Chatham
GA0510141	Whitfield Mobile Estates	Chatham
GA0510144	Riverview Mobile Inn	Chatham
GA0510163	Seabreeze Mobile Home Park	Chatham
GA0510229	Savannah-Wilmington Island	Chatham
GA0510235	Dean Forest Road Trailer Park	Chatham
GA0510250	Savannah-Whitemarsh Island	Chatham
GA0510259	Savannah-Wavannah Quarters	Chatham
GA0510266	B`dette Mobile Bluff	Chatham
GA0510275	Dean Forest Rd. Tp-north	Chatham
GA1030020	Meadowood Subdivision	Effingham
GA1030083	Goshen Apartments	Effingham
GA1030090	Creekwood Farms Subdivision	Effingham
GA1030099	Edwards Mobile Home Park	Effingham
GA1030107	South Pointe Subdivision	Effingham
GA1790000	Hinesville	Liberty
GA1790001	Midway	Liberty
GA1790004	Hillcrest Trailer Park	Liberty
GA1790005	Atlantic WS-Isle of Wight	Liberty
GA1790007	Lake George Subdivision	Liberty
GA1790014	Woodland Lakes	Liberty
GA1790017	W.D. Stanford Mobile Home Park	Liberty
GA1790020	Walthourville	Liberty
GA1790021	Westview Subdivision	Liberty
GA1790035	Riceboro	Liberty
GA1790037	Denmark Trailer Park	Liberty
GA1790048	C.r.stanford Apartments	Liberty
GA1790086	Fleming Estates Mobile Home Pk	Liberty
GA1790087	Salter Mobile Home Park	Liberty
GA1790094	Country Lane Mobile Home Park	Liberty
GA1790098	Sasser`s Mobile Home Park	Liberty
GA1790104	Lakeview Trailer Park	Liberty

Drinking Water Permit Number	Water System Name	County
GA1790121	Blount`s Subdivision	Liberty
GA1790122	Dutchman`s Cove Subdivision	Liberty
GA1790123	The Pointe at Sunbury	Liberty
GA1790124	Glenbrook Mobile Home Park	Liberty
GA1790125	Halfmoon Villas & Marina	Liberty
GA1790129	Sequoia Mobile Home Park	Liberty
GA1790130	Pamona Lake Subdivision	Liberty
GA1790132	Seabrook Island Subdivision	Liberty
GA1790140	Brights Lake Subdivision	Liberty
GA1790143	Holly Hammock, Inc.	Liberty
GA1790145	Fair Haven Acres Mobile Home Park	Liberty
GA1830002	Twin Oaks Mobile Home Park	Long
GA1830006	Aaron Mobile Home Park	Long
GA1830008	Spring Creek Mobile Home Park	Long
GA1830011	Pine Meadows Mobile Home Park	Long
GA1830017	Country Manor Mobile Home Park	Long
GA1830024	Oak Meadows Mobile Home Park	Long
GA1830026	Carter Mobile Home Park	Long
GA1830027	Penny Acres Trailer Park	Long
GA1830028	Oak Ridge Mobile Home Park	Long
GA1830029	Stewart Pines Trailer Park	Long
GA1830039	Beaver Hill Mobile Home Park	Long
GA1910000	Darien	Mcintosh
GA1910003	Sapelo Gardens	Mcintosh
GA1910008	Sapelo Woods Subdivision	Mcintosh
GA1910009	John Alford Subdivision	Mcintosh
GA1910010	Mcintosh Co.-Youngs Island	Mcintosh
GA1910011	Mcintosh Co.-Briar Patch	Mcintosh
GA1910012	Mcintosh Co.-Jones Comm. Water Authority	Mcintosh
GA1910014	Mcintosh Co.-Cannon Bluff Water Authority	Mcintosh
GA1910015	Dnr-hog Hammock Community	Mcintosh
GA1910019	Mcintosh Co.-Carnigan Community	Mcintosh
GA1910020	Mcintosh Co.-Meridian Community	Mcintosh
GA1910021	Mcintosh Co.-Crescent Community	Mcintosh
GA1910023	Mcintosh Co.-Eulonia Community	Mcintosh
GA1910050	Belle Bluff Estates	Mcintosh
GA1910061	Mcintosh Co. Industrial Park	Mcintosh
GA1910067	Shell Point Subdivision	Mcintosh
GA1910069	Sutherland Bluff Plantation	Mcintosh
GA1910071	River Oaks Subdivision	Mcintosh
GA1910072	Belvedere Island	Mcintosh
GA1910073	Eagle Neck Subdivision	Mcintosh
GA1910074	Tolomato Spanish Mission	Mcintosh
GA1910076	Priester Estates	Mcintosh
GA1910084	Buccaneer Mobile Village	Mcintosh
GA1910087	Evergreen Mobile Home Park	Mcintosh
GA1910089	Mcintosh Co.-Harris Neck Community	Mcintosh
GA3030000	Davisboro	Washington
GA3030004	Riddleville	Washington

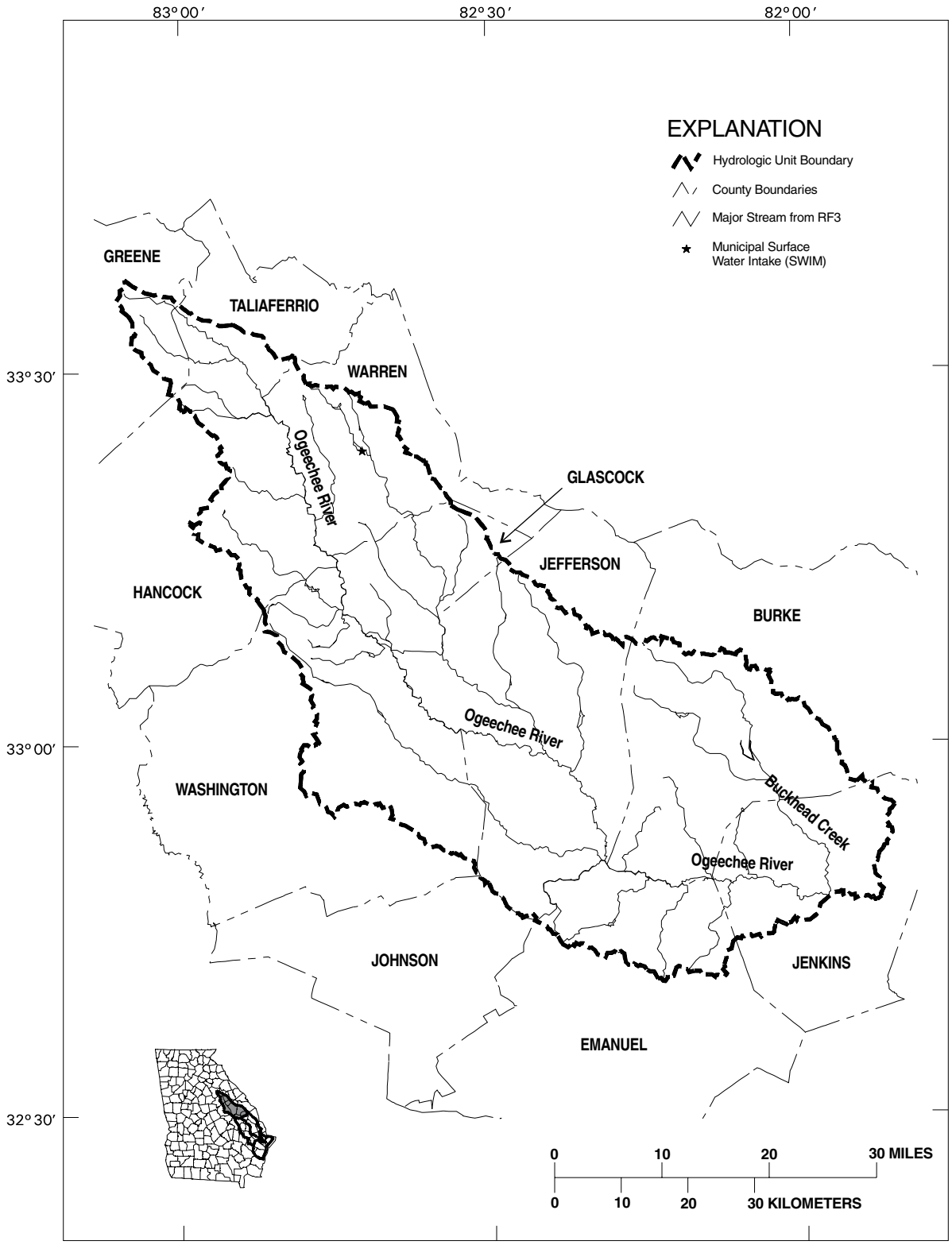

Figure 3-I. Surface Water Intakes, Ogeechee River Basin, HUC 03060201

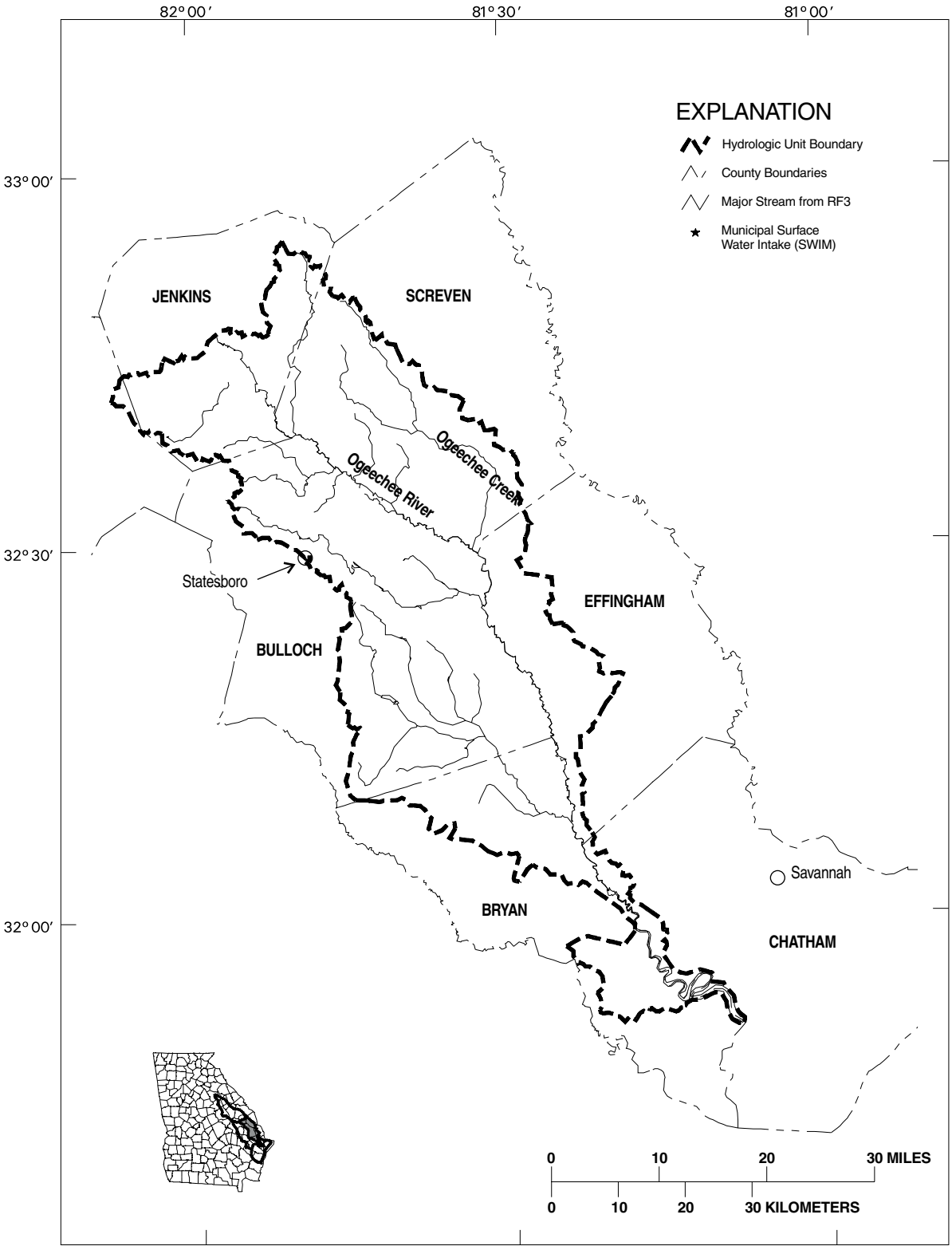

Figure 3-2. Surface Water Intakes, Ogeechee River Basin, HUC 03060202

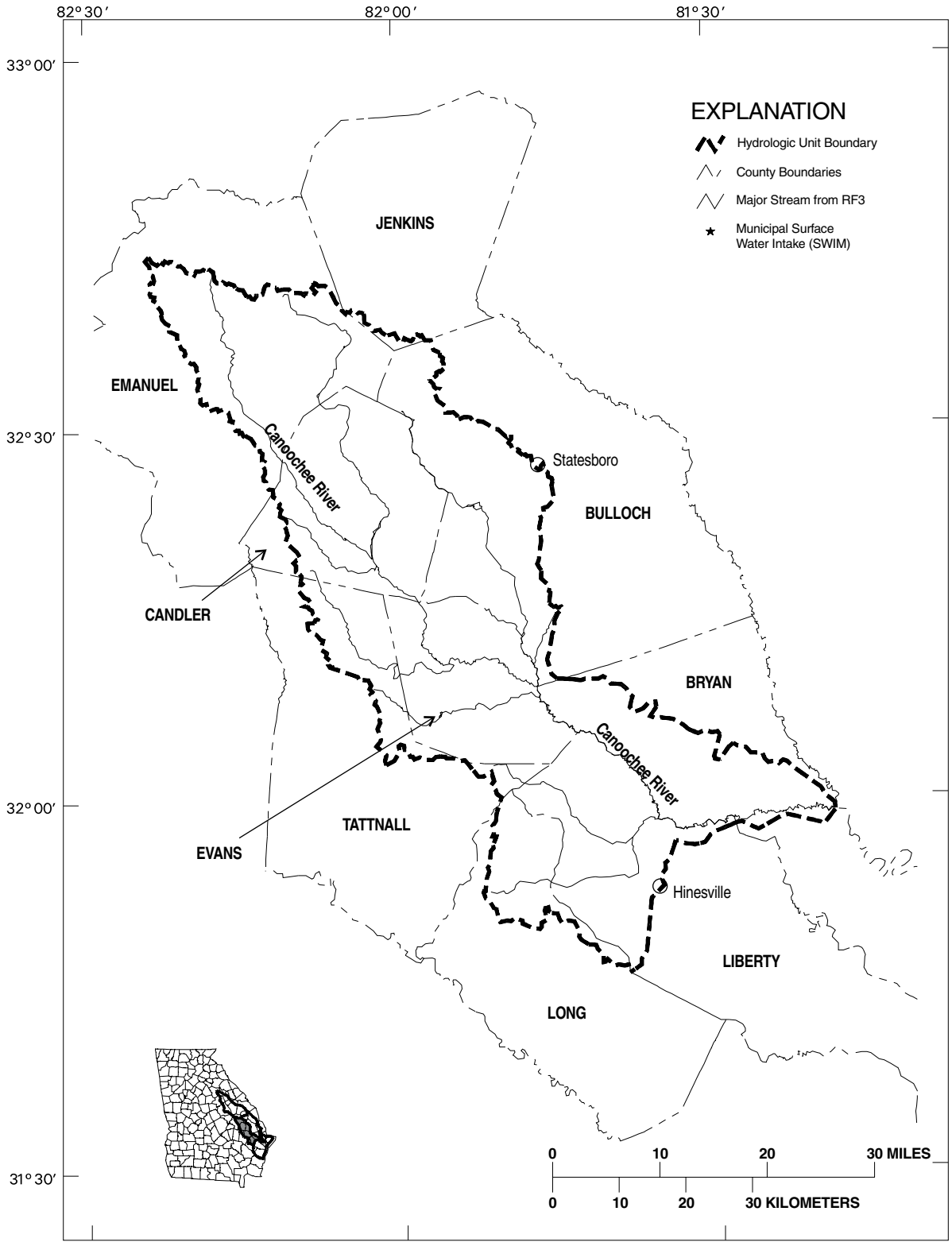

Figure 3-3. Surface Water Intakes, Ogeechee River Basin, HUC 03060203

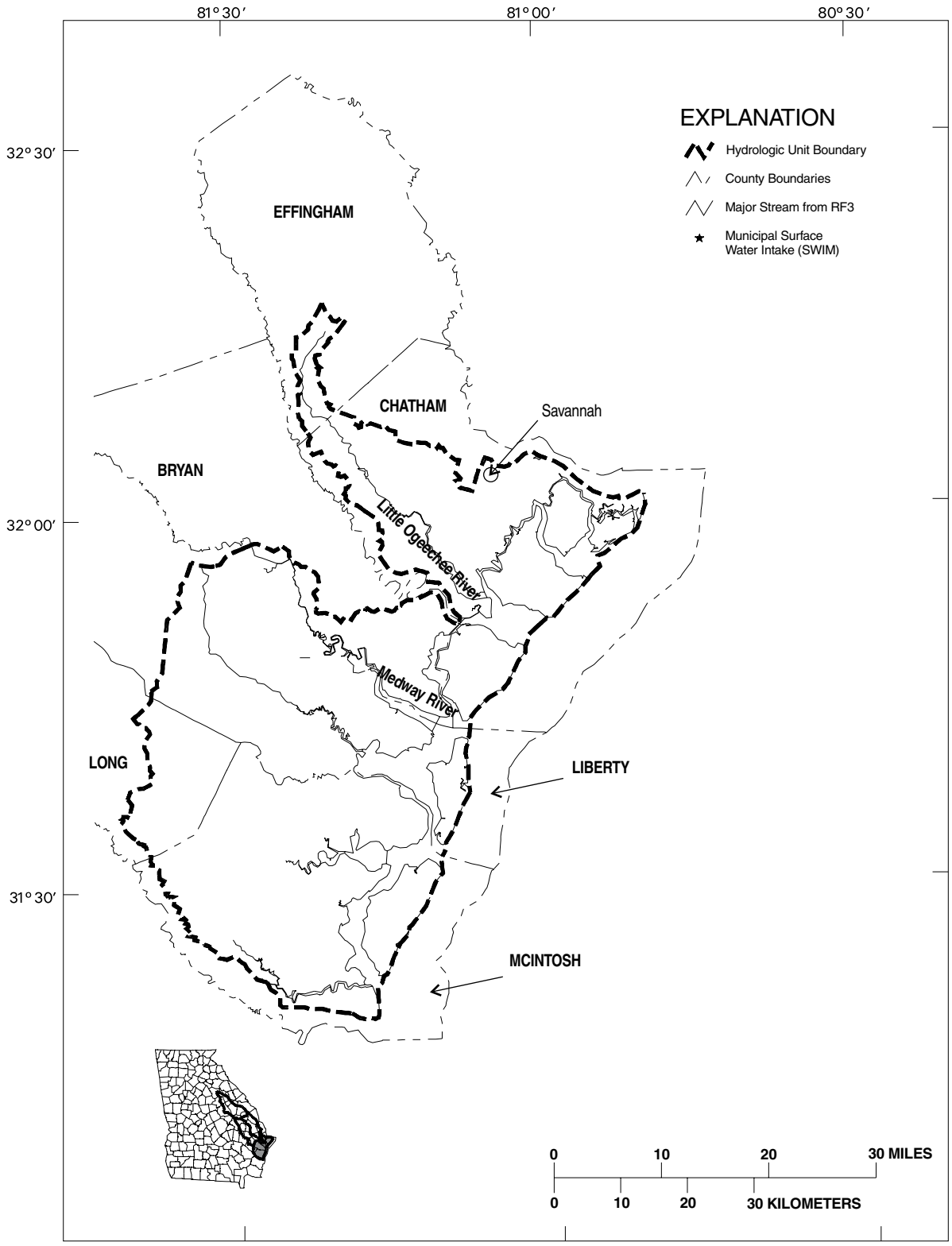

Figure 3-4. Surface Water Intakes, Ogeechee River Basin, HUC 03060204

3.1.2 Drinking Water Demands

Over the next few years there will be an increase in the use of groundwater to be used for drinking water from the Ogeechee River basin. One particular area of noted increase will be the coastal areas in McIntosh, Liberty, Long and Bryan counties. These counties are experiencing rapid growth in residential subdivisions and vacation homes. Another area of expected growth is Statesboro in Bulloch County. This coastal growth trend is expected to continue.

3.1.3 Drinking Water Permitting

The Georgia Safe Drinking Water Act of 1997, the Rules for Safe Drinking Water (391-3-5) adopted under the act require any person who owns and/or operates a public water system to obtain a permit to operate a public water system from the Environmental Protection Division. The permitting process has three phases: Inquiry and Discovery, Technical Review, and Permitting. During these phases the owners must provide a detailed description of the project; demonstrate the reliability of the water source; render engineering plans and specifications prepared by a professional engineer demonstrating the construction integrity of wells, treatment and distribution; conduct preliminary water sample testing; and legal documentation including an application to operate a public water system. Permits contain specific conditions the owner must meet for different types of public water systems, including a list of approved water sources, filter rates, disinfection and treatment requirements, compliance with sample testing schedule, and number of allowed service connections. Permits are issued for 10 years and are renewable.

3.2 Surface Water Quantity

3.2.1 Surface Water Supply Sources

The Ogeechee River Basin is a 5220 square-mile landmass in eastern Georgia. The Basin is drained by its 266 mile-long namesake Ogeechee River, which flows generally southeast to the Atlantic Ocean. This basin has the distinction of being the only one in the study area with any portion of its landmass within the Piedmont physiographic province.

As the basin's name implies, the major surface water body is the Ogeechee River. With its headwaters in Greene County, the Ogeechee collects water from smaller tributaries as it flows towards the coast, having an average annual flow at its mouth of about 4000 cubic feet per second (cfs). The 7Q10 at the mouth is a sizeable 300 cfs.

The Ogeechee River's largest tributary is the Canoochee River, which drains about 1400 square miles from the southwestern sector of the basin. The Canoochee discharges into the Ogeechee about 32 miles upstream of the Atlantic Ocean with an average annual flow of approximately 1200 cfs. At only 1.6 cfs, the 7Q10 of the Canoochee at its mouth is quite small.

Some of the other larger tributaries across the basin include Black Creek, Rocky Comfort Creek, Buckhead Creek, Williamson Swamp Creek, Canoochee Creek and Lotts Creek.

3.2.2 Surface Water Supply Demands and Uses

Municipal and Industrial Demand

Municipal and Industrial (M&I) water demands include public supplied needs such as residential, commercial, governmental, institutional, manufacturing and other demands such as distribution system losses.

Currently, the Ogeechee River basin contains only two surface water withdrawal permits, one industrial and one municipal. These are listed in Table 3-2, sorted by county. These permits are for users equal to or greater than 100,000 gallons per day. Users below this amount of surface water are not required to have a permit for their withdrawals.

Table 3-2. Surface water withdrawals

Facility	Type	Source	Mon Avg (Mgd)	Max Day (Mgd)	County
Thiele Kaolin	Industrial	Duhart Creek	1.50	1.75	Jefferson
Warrenton	Municipal	Rocky Comfort Creek	0.75	0.83	Warren

Agricultural Water Demand

Agricultural surface water demand in the Ogeechee River Basin is considerable. The counties to the north of the fall line are not generally used for farmland. Irrigated crops are grown throughout Emmanuel, Jenkins, Evans and Treutlen Counties. The Vidalia onion crop is centered in the Montgomery, Tooms, Candler, and Tattnal Counties in the area. Three nursery and pulp land irrigation is used in Tatnall and Bulloch Counties.

The demands on surface water resources for agricultural activities include irrigation for crops, nursery, and turf; drinking water for livestock and poultry; and, to a much lesser extent, water for aquacultural purposes.

As of 1993, the EPD had issued 843 agricultural permits for surface water withdrawal permits to entities located within the Ogeechee River basin. The combined permitted pumping capacity of these permits is 781,414 GPM (1125 MGD). According to the support information provided with each application, these permits are used to supply water to irrigate some 76,067 acres of crops, orchards, turf, etc.

Irrigated Acreage

The total water demand from agriculture, including both surface water and ground water demand, may be estimated using a variety of agricultural data collected by multiple sources. NRCS has attempted to combine this information for the purpose of estimating current and future agricultural water use in the basin. Table 3-3 shows historical irrigated acreage in the basin from 1974 to 1995.

Irrigated acres in the Ogeechee River basin grew from 3,025 in 1974 to an all time maximum for the basin of 104,300 in 1981. However, approximately 25,400 of these irrigated acres were lost between 1981 and 1984. Since 1984, irrigated acreage has varied above and below the 80,000 acre range to a 1995 total of 73,276 acres. Assuming the 1.8 percent annual growth rate observed in the Savannah River basin between 1984 and 1995 continues it will be experienced in the Ogeechee River basin as well, there will be approximately 112,774 acres under irrigation by 2020.

Table 3-3. Irrigated Acres in the Ogeechee River Basin, 1974-1995.

Ogeechee River Basin - Irrigated Acres					
	3060201	3060202	3060203	3060204	Basin Total
1974	323	613	2055	34	3025
1978	13090	14556	15548	58	43252
1979	21180	11707	17472	6	50364
1980	25885	26922	21892	113	74812
1981	36306	39918	27969	140	104333
1982	41599	33078	27394	469	102541
1984	30308	21994	26050	521	78874
1986	30779	23299	28159	555	82792
1989	31121	24147	28714	810	84791
1992	32963	22943	29954	1102	86963
1995	31727	19157	21585	808	73277

Source: USDA-NRCS estimates are based on county level data extrapolated to the basin.

Water Demand

Agricultural water demand is dependent upon a number of variables that include, but are not limited to, irrigated acreage, cropping mix and patterns, soil characteristics, climatic conditions, type of animal operation, best management practices, and market conditions. Water use in the Ogeechee River basin reflects the influence of these variables (Table 3-4). No distinct trend can be observed; however, from 1980 to 1995 there was a decrease of 3 MGD from 41 MGD in 1980 to 38 MGD in 1995.

Table 3-4. Historical Agricultural Water Use in the Ogeechee River Basin, 1980-1995.

Ogeechee River Basin - Agricultural Water Use					
	3060201	3060202	3060203	3060204	Basin Total
1980	14.24	15.09	10.95	0.97	41.25
1985	15.86	9.17	8.48	1.52	35.03
1987	17.96	11.79	8.64	1.22	39.61
1990	10.51	7.11	6.68	1.58	25.88
1995	14.03	11.78	9.84	2.62	38.27

Source: Georgia Geological Survey

Approximately 96 percent of the agricultural water used in 1995 was for irrigation purposes (36.74 MGD). The central portion of the basin just below the Fall Line is where the majority of agricultural irrigation occurs in the basin, the remaining 4 percent (1.53 MGD) was used for animal operations. Ground water sources provided 56 percent of the water used by this industry in 1995.

Future agricultural water demand is expected to increase slightly within the basin to 58.70 MGD by the year 2020. However, undesirable climate and market conditions could force producers to demand as much as 101 MGD on the projected 112,774 acres under irrigation by that time. Table 3-5 shows the likely range of agricultural water demand in the basin through the year 2020. The reader should note that significant increases in irrigated acreage will have the potential to result in a much higher demand.

Table 3-5. Projected water use in the Ogeechee River Basin, 1995-2020

Projected Water Use						
Ogeechee River Basin						
Irrigated Acres	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**
1.8% growth	73276	79871	87059	94895	103435	112744
Irrigated Water Use						
High		71.29	77.71	84.70	92.33	100.64
Medium	38.27	41.59	45.33	49.41	53.86	58.70
Low		29.71	32.38	35.29	38.47	41.93
Animal Water Use		3.8	3.8	3.8	3.8	3.8
Total Water Use						
High		75.09	81.51	88.50	96.13	104.44
Medium		45.39	49.13	53.21	57.66	62.50
Low		33.51	36.18	39.09	42.27	45.73

Power Generation Water Demand

There are no power generating plants located within the Ogeechee basin that use the water resources of the basin.

Navigational Water Demand

There is no commercial navigation in the Ogeechee basin.

Recreation

Recreation activities in the Ogeechee River Basin includes fishing, camping, boating, swimming, picnicking, and other activities. Skidaway Island, Fort Mc Alister and Sapelo Island State Parks are located in the Ogeechee basin. Fort Morris and Fort King George Historic Sites are also located in the basin.

Waste Assimilation Water Demand

Water quantity, wastewater treatment, and wastewater discharge permitting are addressed in Section 4. However, it should be noted that the guidelines for discharge of treated effluent into the rivers and streams of the Ogeechee River basin assume that sufficient surface water flow will be available to assimilate waste and ensure that water quality criteria will be met.

Environmental Water Demands

EPD recognizes the importance of maintaining suitable aquatic habitat in Georgia's lakes and streams to support viable communities of fish and other aquatic organisms. A substantial portion of the Ogeechee watershed has been channelized for agricultural and silvicultural purposes. This has decreased the basins ability to retain rainwater and causes the river to rise and fall faster.

A significant issue that is receiving increasing attention from EPD is the minimum stream flow policy. EPD's current miimum stream flow policy is to protect the lowest seven-day average flow, which would have occured during any ten-year period for a stream (commonly called the 7Q10). EPD is considering increasing the minimum flow requirement under recommendations of the Wildlife Resources Division.

3.2.3 Surface Water Withdrawal Permitting

The 1977 Surface Water Amendments to the Georgia Water Quality Control Act of 1964 require all non-agricultural users of more than 100,000 GPD on a monthly average (from any Georgia surface water body) to obtain a permit for this withdrawal from EPD. These users include municipalities, industries, military installations, and all other non-agricultural users. The statute stipulates that all pre-1977 users who could establish the quantity of their use prior to 1977 would be "grandfathered" for that amount of withdrawal. Table 3-2 lists the permits in effect in the Ogeechee River basin.

Applicants are required to submit details relating to the source of withdrawals, demand projections, water conservation measures, low flow protection measures (for non-grandfathered withdrawals), and raw water storage capacities. EPD issued permit identifies the source of withdrawal, the monthly average and maximum 24-hour withdrawal, the standard and special conditions under which the permit is valid, and the expiration date of the permit. The standard conditions section of the permit generally defines the reporting requirements (usually annual submission of monthly average withdrawals); the special conditions section of the permit usually specifies measures the permittee is required to undertake so as to protect downstream users and instream uses (e.g. waste assimilation, aquatic habitat). The objective of these permits is to manage and allocate water resources in a manner that both efficiently and equitably meets the needs of all the users.

Farm Irrigation Permits

The 1988 Amendments to the Water Quality Control Act establish the permitting authority within EPD to issue farm irrigation water use permits. As with the previously mentioned surface water permitting statute, the lower threshold is 100,000 GPD; however users of less water may apply for and be granted a permit. With two exceptions, farm use is defined as irrigation of any land used for general farming, aquaculture, pasture, turf production, orchards, nurseries, watering for farm animals and poultry, and related farm activities. One relevant exception is that the processing of perishable agricultural products is not considered a farm use.

Applicants for these permits who can establish that their use existed prior to July 1, 1988, *and* when these applications are received prior to July 1, 1991, are "grandfathered" for the operating capacity in place prior to July 1, 1988. Other applications are reviewed and granted with an eye towards protection of grandfathered users and the integrity of the resource. Generally, agricultural users are not required to submit any water use reports.

3.2.4 Flooding and Floodplain Management

The Ogeechee River basin was unaffected by the massive flooding that occurred in parts of Georgia in 1994, however, seventeen counties within the two basins were included in Federal Disaster Declaration #1209 as a result of the 1998 floods that affected a total of 115 counties across the state. The Floods of 1998 further substantiated the fact that flooding is the number one natural hazard in Georgia.

With the exception of Candler, Emanuel and Evans Counties, all disaster declared counties in the Ogeechee River basin participate in the National Flood Insurance Program (NFIP). Of the thirty-five counties associated with the basins, 62 percent are NFIP communities.

Floodplain development is a constant concern, because development within floodplain areas can increase flood levels, thereby increasing the number of people and the amount of property at risk. The term "floodplain management" is often used as a synonym for program or agency-specific projects and regulations. It is in fact quite a broad concept. Floodplain management is a continuous process of making decisions about whether flood plains are to be used for development and how they are to be developed.

The majority of communities in the Ogeechee River basin are impacted by riverine flooding. As for communities along the coast, they are susceptible to both riverine flooding and flooding from storm-induced waves. Coastal floodplain areas are divided into two adjacent zones that define the different degrees of hazard present. The V zone (velocity zone), as referenced on the community's flood map, is that portion of the coastal 100-year floodplain that would be inundated by tidal surges with velocity wave action. The A zone is that portion of the 100-year floodplain not subject to wave actions (riverine flooding). The minimum standards established by the NFIP for construction in V zones different significantly from the minimum standards for construction in coastal A zones (riverine areas). These minimum standards are incorporated into local flood ordinances adopted by communities as required for participation in the NFIP.

Floodplain Management Activities

To increase understanding and maintain a working knowledge of floodplain management, Georgia's Floodplain Management Office periodically conducts training workshops throughout the State for local officials. On March 24, 1998 at the Regional Development Center (RDC) in Augusta a floodplain management workshop was help for elected officials and floodplain administrators from communities within the Savannah and Ogeechee River basins. On February 25, 1998, the City of Savannah was host to a floodplain management technical workshop for local building officials from coastal communities participating in the National Flood Insurance Program (NFIP). Savannah was also the site for a Community Rating System (CRS) workshop on November 18, 1997. The CRS is a Federal Emergency Management Agency (FEMA) program that rewards communities that implement floodplain management measures that exceed the minimum standards of the NFIP. Citizens within CRS communities receive discounts on their flood insurance premiums ranging from 5 percent to 45 percent. Chatham County and the cities of Pooler, Savannah and Tybee Island currently participate in the CRS.

The City of Savannah as well as Chatham County and neighboring Bryan, Liberty and McIntosh Counties in the Ogeechee River basin have joined a new effort of the Federal Emergency Management Agency (FEMA) to create more disaster resistant communities. This new initiative is called "Project Impact." Project Impact works with state and local governments across the country to build communities that are more likely to withstand the ravages of natural disasters. The Savannah area's low elevation makes it vulnerable to tidal flooding and hurricanes. Project Impact's goal is to erase the ceaseless damage-repair-damage cycle by implementing preventive measures before disaster occurs.

3.3 Ground Water Quantity

3.3.1 Ground Water Sources

Generally the Ogeechee River basin in Georgia is divided into three groundwater regimes. North of the fall line is the Piedmont area, a region underlain by igneous and metamorphic crystalline basement rocks. Water is to be found in the overlying weathered zone, in cracks and crevices in the solid rock and in the zones of lithologic contacts. This lack of extensive aquifer greatly limits the amounts of groundwater that can be produced in the Piedmont, so most of the water used is from surface water.

In Washington, Jefferson, Glascock and northern Emanuel and western Burke counties, the aquifer of choice is the Cretaceous Sand aquifer. This is a sheet of sand and clay sediments deposited on top of the crystalline basement rock. While the aquifers can deliver a lot of water, high demands in concentrated areas may lead to extensive drawdown, since the aquifer cannot deliver large amounts of water quickly. This is of concern in the Kaolin areas, where extensive dewatering in the clay pits sometimes puts a local strain on the resource.

From Eamanuel and Jenkins Counties south to the coast, the main groundwater source is the Floridan aquifer. This delivers tremendous amounts of water quickly, leading to very heavy municipal, industrial and agricultural usage from this source.

3.3.2 Ground Water Supply Demands

Municipal and Industrial Uses

Municipal and Industrial (M&I) water demands include public supplied and private supplied residential, commercial, governmental, institutional, manufacturing and other demands such as distribution system losses.

Existing permitted municipal and industrial groundwater users are shown on Table 3-6, by county. These permits are for users equal to or greater than 100,000 gallons per day. Users below this amount of groundwater are not required to have a permit for their withdrawals.

Agricultural Water Demand

Agricultural groundwater demand in the Ogeechee River basin is large. The counties to the north of the fall line are not generally used for farmland. Irrigated crops are grown throughout Emmanuel, Jenkins, Evans and Treutlen Counties. The Vidalia onion crop is centered in the Montgomery, Toombs, Candler, and Tattnall counties in the area. Tree nursery and pulp land irrigation is used in Tattnall and Bulloch Counties. Generally these areas use the Floridan aquifer for their source of groundwater.

3.3.3 Ground Water Supply Permitting

Nonagricultural Permits

The Georgia Ground Water Use Act of 1972 requires permits from EPD for all non-agricultural users of ground water of more than 100,000 GPD. General information required of the applicant includes location (latitude and longitude), past, present, and expected water demand, expected unreasonable adverse effects on other users, the aquifer system from which the water is to be withdrawn, and well construction data. The permits

Table 3-6. Active Municipal and Industrial Ground Water Withdrawal Permits in the Ogeechee River Basin

County	Permit Number	Permit User Name	Permitted Monthly Avg W/D (MGD)	Permitted Yearly Avg W/D (MGD)	Permitted Aquifer
Bryan	015-0001	Richmond Hill, City of	1.500	1.500	Floridan
Bryan	015-0002	Pembroke, City of	0.500	0.256	Floridan
Bryan	015-0004	Sterling Bluff	0.350	0.350	Miocene
Bryan	015-0005	H.R. Blake & Associates (Waterford Landing)	0.271	0.271	Floridan
Bryan	015-0006	WL Grainger - Buckland Hall Plantation	0.020	0.020	Floridan
Bulloch	016-0001	Georgia Southern College	1.000	0.503	Floridan
Bulloch	016-0002	Statesboro, City of	3.218	2.700	Floridan
Bulloch	016-0003	Brooklet, Town of	0.165	0.150	Floridan
Bulloch	016-0004	Cooper Industries - Hand Tools	0.200	0.170	Floridan
Bulloch	016-0005	Brooks Instrument System - City of Statesboro	0.220	0.175	Floridan
Bulloch	016-0006	Grinnell Flow Control	1.008	1.008	Floridan
Candler	021-0001	Metter, City of	0.890	0.630	Floridan
Effingham	051-0005	Guyton, City of	0.270	0.220	Floridan
Emanuel	053-0003	Twin City, City of	0.300	0.250	Floridan
Evans	054-0001	Claxton, City of	0.386	0.300	Floridan
Evans	054-0002	Claxton Poultry Farms	1.500	1.500	Floridan
Jefferson	081-0002	Wadley, City of	0.450	0.450	Cretaceous Sand, Eocene Sand
Jefferson	081-0003	Louisville, City of	1.400	1.196	Cretaceous Sand, Eocene Sand
Jefferson	081-0005	Forstmann & Company - Louisville Plant	3.500	3.500	Cretaceous Sand
Jefferson	081-0008	Thiele Kaolin Co - Lamb Tract	3.000	3.000	Dublin - Midville, Gordon
Jenkins	082-0001	Jockey International	0.141	0.100	Miocene, Lisbon
Jenkins	082-0002	Millen, City of	0.823	0.600	Floridan
Liberty	089-0001	Interstate Paper Corp	13.000	13.000	Floridan
Liberty	089-0002	Hinesville, City of	4.500	4.000	Floridan
Liberty	089-0003	Fort Stewart - Department of the Army	5.500	4.500	Floridan
Liberty	089-0004	Walthourville, City of	0.200	0.150	Floridan
Liberty	089-0005	Liberty County Industrial Authority	0.100	0.100	Floridan
McIntosh	098-0004	Greenwood Development	0.100	0.100	Floridan
Screven	124-0001	King Finishing Co - Div of Spartan Mills	3.720	2.930	Cretaceous Sand, Floridan
Screven	124-0003	Wall Timber Products	0.175	0.100	Floridan
Washington	150-0019	Davisboro, Town of	0.260	0.260	Cretaceous Sand

issued by EPD stipulate both the allowable monthly average and annual average withdrawal rates, standard and special conditions under which the permit is valid, and the expiration date of the permit. Ground water use reports are generally required of the applicant on a semi-annual basis. The objective here is the same as with surface water permits. A list of active Georgia municipal and industrial ground water withdrawal permits is provided in Table 3-6.

Farm Irrigation Permits

The 1988 Amendments to the Ground Water Use Act establishes the permitting authority within EPD to issue farm irrigation water use permits. As with the previously mentioned ground water permitting statute, the lower threshold is 100,000 GPD; however users of less water may apply and be granted a permit. Agricultural withdrawal permits are too numerous to list in this document.

Applicants for these permits who could establish that their use existed prior to July 1, 1988, *and* when their applications were received prior to July 1, 1991, were "grandfathered" for the operating capacity in place prior to July 1, 1988. Other applications are reviewed and granted with an eye towards protection of grandfathered users and the integrity of the resource. Generally, agricultural users are not required to submit any water use reports.

Excessive Ground Water Withdrawals

Excessive ground water withdrawal can lead to lowering or drawdown of the water table. Localized groundwater drawdowns are generally discovered only after the fact of permitting has occurred and withdrawal operations begun. To avoid such a possibility, if an application for a very large use of groundwater is received, the Water Resources Management Program of the Georgia EPD can take certain steps to possibly contain drawdowns effects. Modeling the hydrogeologic impact of such a large user may be required of the potential permittee. If this computer analysis indicates no unreasonable impact on existing users, such a water use permit may be approved. Another recommended possibility is a negotiated reduction in permit amounts to a more moderate amount of withdrawal, with lessened impacts. Prior to full scale production of a well field, well pumping tests run at or near actual production rates can be required. These may give the permittee and the EPD some real idea of the amount of water that may pumped safely, without endangering other users nor drawing down the aquifer too greatly. Permit withdrawal limits may then be set at some safer yield which is determined by these pumping tests. These tests may also indicate that proposed pumping amounts may require more wells drilled to spread out the ultimate production impact on the aquifer.

References

Georgia Environmental Protection Division. 1987. Water Availability And Use Report, Coastal Plain River Basins.

In This Section

- Sources and Types of Environmental Stressors
- Summary of Stressors Affecting Water Quality

Section 4

Water Quality: Environmental Stressors

Sections 4, 5, 6, and 7 are closely linked, providing the foundation for the water quality concerns in the basin, identifying the priority issues based on these concerns, and finally, recommending management strategies to address these concerns. Therefore, the reader will probably want to flip back and forth between sections to track specific issues.

This section describes the important environmental stressors that impair or threaten water quality in the Ogeechee River basin. Section 4.1 first discusses the major sources of environmental stressors. Section 4.2 then provides a summary of individual stressor types as they relate to all sources. These include both traditional chemical stressors, such as metals or oxygen demanding waste, and less traditional stressors, such as modification of the flow regime (hydromodification) and alteration of physical habitat.

4.1 Sources and Types of Environmental Stressors

Environmental stressors are first catalogued by type of source in this section. This is the traditional programmatic approach, and it provides a match to regulatory lines of authority for permitting and management. Assessment requires an integration of stressor loads across all sources, as described in Section 4.2.

4.1.1 Point Sources and Non-discharging Waste Disposal Facilities

Point sources are defined as discharges of treated wastewater to the river and its tributaries, regulated under the National Pollutant Discharge Elimination System (NPDES). These are divided into two main types–permitted wastewater discharges, which tend to be discharged at relatively stable rates, and permitted storm water discharges, which tend to be discharged at highly irregular, intermittent rates, depending on precipitation. Nondischarging waste disposal facilities, including land application systems and landfills, which are not intended to discharge treated effluent to surface waters, are also discussed in this section.

NPDES Permitted Wastewater Discharges

The EPD NPDES permit program regulates municipal and industrial waste discharges, monitors compliance with limitations, and takes appropriate enforcement action for violations. For point source discharges, the permit establishes specific effluent limitations and specifies compliance schedules that must be met by the discharger. Effluent limitations are designed to achieve water quality standards in the receiving water and are reevaluated periodically (at least every 5 years).

Municipal Wastewater Discharges

Municipal wastewater treatment plants are among the most significant point sources regulated under the NPDES program in the Ogeechee River basin, accounting for the majority of the total point source effluent flow (exclusive of cooling water). These plants collect, treat, and release large volumes of treated wastewater. Pollutants associated with treated wastewater include pathogens, nutrients, oxygen-demanding waste, metals, and chlorine residuals. Over the past several decades, Georgia has invested more than $12.5 million in construction and upgrade of municipal water pollution control plants in the Ogeechee River basin; a summary of these investments is provided in Appendix C. These upgrades have resulted in significant reductions in pollutant loading and consequent improvements in water quality below wastewater treatment plant outfalls. As of the 1998-1999 water quality assessment, 8 miles of rivers/streams were identified in which municipal discharges contributed to not fully supporting designated uses, all of which are being addressed through the NPDES permitting process.

Table 4-1 displays the major municipal wastewater treatment plants with permitted discharges of 1 million gallons per day (MGD) or greater in the Ogeechee River basin. The geographic distribution of dischargers is shown in Figure 4-1. In addition, there are discharges from a variety of smaller wastewater treatment plants, including both public facilities (small public water pollution control plants, schools, marinas, etc.) and private facilities (package plants associated with non-sewered developments and mobile home parks) with less than a 1-MGD flow. These minor discharges might have the potential to cause localized stream impacts, but they are relatively insignificant from a basin perspective. A complete list of permitted dischargers in the Ogeechee River Basin in presented in Appendix D.

Table 4-I. Major Municipal Wastewater Treatment Plant Discharges with Permitted Monthly Flow Greater than I MGD in the Ogeechee River Basin

NPDES Permit No.	Facility Name	County	Receiving Stream	Permitted Monthly Avg. Flow
HUC 03060202				
GA0037648	Richmond Hill Elbow Swamp	Bryan	Elbow Swamp to Sterling Cr	1.500
HUC 03060203				
GA0047180	Hinesville/fort Stewart	Liberty	Canoochee Cr Trib	7.150
GA0023108	Statesboro WPCP	Bulloch	Little Lots Cr	5.000
HUC 03060204				
GA0046418	Savannah Georgetown	Chatham	Ogeechee River	2.450

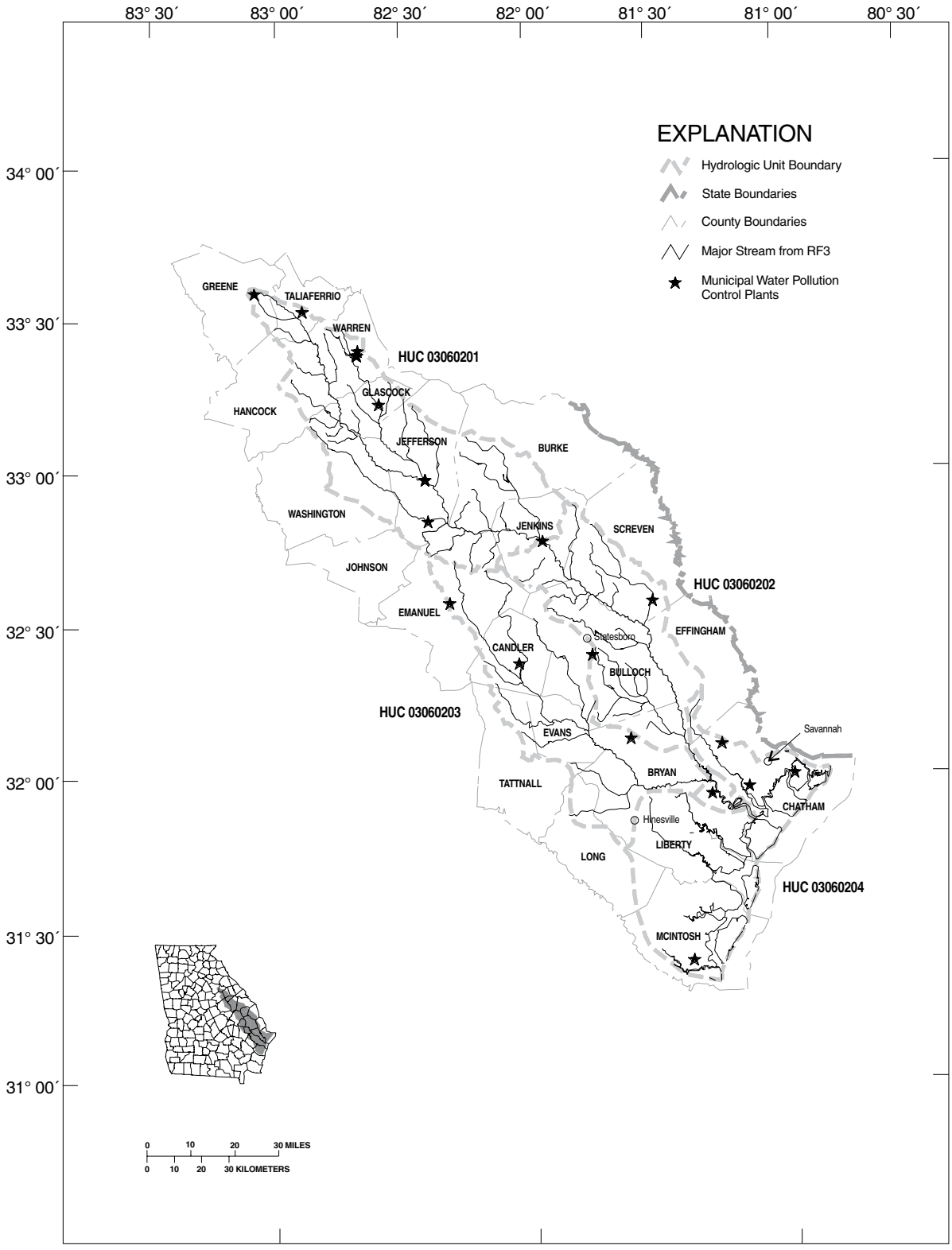

Figure 4-I. Location of Municipal Wastewater Treatment Plants in the Ogeechee River Basin

Most urban wastewater treatment plants also receive industrial process and nonprocess wastewater, which can contain a variety of conventional and toxic pollutants. The control of industrial pollutants in municipal wastewater is addressed through pretreatment programs. The major publicly owned wastewater treatment plants in this basin have developed and implemented approved local industrial pretreatment programs. Through these programs, the wastewater treatment plants are required to establish effluent limitations for their significant industrial dischargers (those which discharge in excess of 25,000 gallons per day of process wastewater or are regulated by a Federal Categorical Standard) and to monitor the industrial user's compliance with those limits. The treatment plants are able to control the discharge of organics and metals into their sewerage system through the controls placed on their industrial users.

Industrial Wastewater Discharges

Industrial and federal wastewater discharges are also significant point sources regulated under the NPDES program. There are a total of 44 permitted municipal, state, federal, private, and industrial wastewater and process water discharges in the Ogeechee River basin, as summarized in Table 4-2. The complete permit list is summarized in Appendix D.

Table 4-2. Summary of NPDES Permits in the Ogeechee River Basin

HUC	Major Municipal Facilities	Major Industrial and Federal Facilities	Minor Public Facilities	Minor Private and Industrial Facilities	Total
03060201	0	1	12	5	18
03060202	1	1	2	3	7
03060203	2	0	3	1	6
03060204	1	1	2	9	13
Total	4	3	19	18	44

The nature of industrial discharges varies widely compared to discharges from municipal plants. Effluent flow is not usually a good measure of the significance of an industrial discharge. Industrial discharges can consist of organic, heavy oxygen-demanding waste loads from facilities such as pulp and paper mills; large quantities of noncontact cooling water from facilities such as power plants; pit pumpout and surface runoff from mining and quarrying operations, where the principal source of pollutants is the land-disturbing activity rather than the addition of any chemicals or organic material; or complex mixtures of organic and inorganic pollutants from chemical manufacturing, textile processing, metal finishing, etc. Pathogens and chlorine residuals are rarely of concern with industrial discharges, but other conventional and toxic pollutants must be addressed on a case-by-case basis through the NPDES permitting process. Table 4-3 lists the major industrial and federal wastewater treatment plants with discharges into the Ogeechee River basin in Georgia.

Table 4-3. Major Industrial and Federal Wastewater Treatment Facilities in the Ogeechee River Basin

NPDES Permit No.	Facility Name	County	Description	Flow (Mgd)	Receiving Stream
HUC 03060201					
GA0003778	Forstmann & Company Louisville	Jefferson	Textile	1.4	Ogeechee Rv
HUC 03060202					
GA0003280	King Finishing Company	Screven	Textile	2.0	Jackson Br
HUC 03060204					
GA0003590	Interstate Paper Corp	Liberty	Pulp and Paper	8.1	Riceboro Cr

There are also minor industrial discharges which may have the potential to cause localized stream impacts, but are relatively insignificant from a basin perspective. The locations of permitted point source discharges of treated wastewater in the Ogeechee River basin are shown in Figures 4-2 through 4-5.

Combined Sewer Overflows

Combined sewers are sewers that carry both storm water runoff and sanitary sewage in the same pipe. Most of these combined sewers were built at the turn of the century and were present in most large cities. At that time both sewage and storm water runoff were piped from the buildings and streets to the small streams that originated in the heart of the city. When these streams were enclosed in pipes, they became today's combined sewer systems. As the cities grew, their combined sewer systems expanded. Often new combined sewers were laid to move the untreated wastewater discharge to the outskirts of the town or to the nearest waterbody.

In later years wastewater treatment facilities were built and smaller sanitary sewers were constructed to carry the sewage (dry weather flows) from the termination of the combined sewers to these facilities for treatment. However, during wet weather, when significant storm water is carried in the combined system, the sanitary sewer capacity is exceeded and a combined sewer overflow (CSO) occurs. The surface discharge is a mixture of storm water and sanitary waste. Uncontrolled CSOs thus discharge raw diluted sewage and can introduce elevated concentrations of bacteria, BOD, and solids into a receiving water body. In some cases, CSOs discharge into relatively small creeks.

CSOs are considered a point source of pollution and are subject to the requirements of the Clean Water Act. Although CSOs are not required to meet secondary treatment effluent limits, sufficient controls are required to protect water quality standards for the designated use of the receiving stream. In its 1990 session, the Georgia Legislature passed a CSO law requiring all Georgia cities to eliminate or treat CSOs.

There are no known combined sewer overflows in the Ogeechee River basin.

NPDES Permitted Storm Water Discharges

Urban storm water runoff in the Ogeechee basin has been identified as a source of stressors from pollutants such as oxygen-demanding waste (BOD) and fecal coliform bacteria. Storm water may flow directly to streams as a diffuse, nonpoint process, or may be collected and discharged through a storm sewer system. Storm sewers are now subject to NPDES permitting and are discussed in this section. Contributions from nonpoint storm water is discussed in later sections.

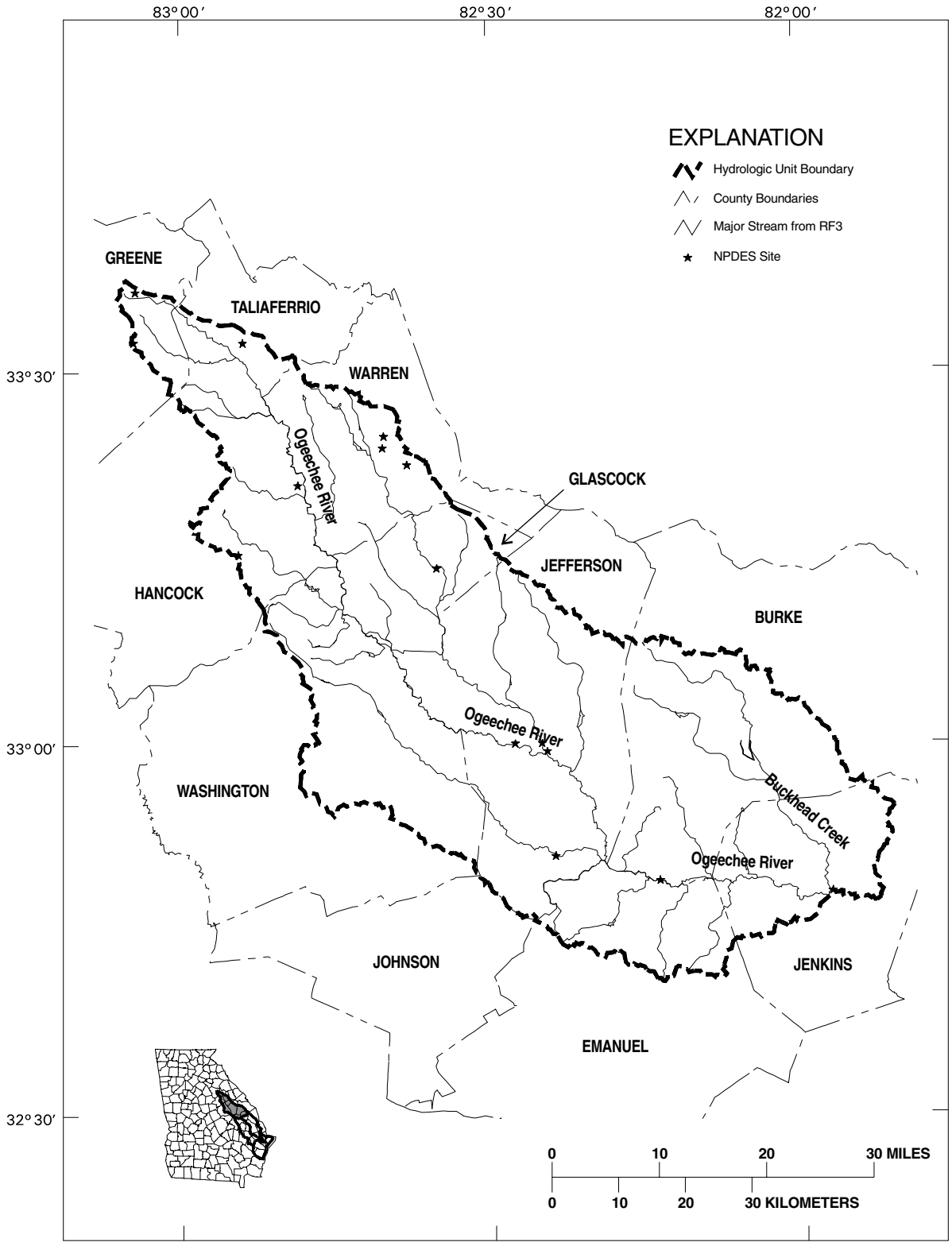

Figure 4-2. NPDES Sites Permitted by GAEPD, Ogeechee River Basin, HUC 03060201

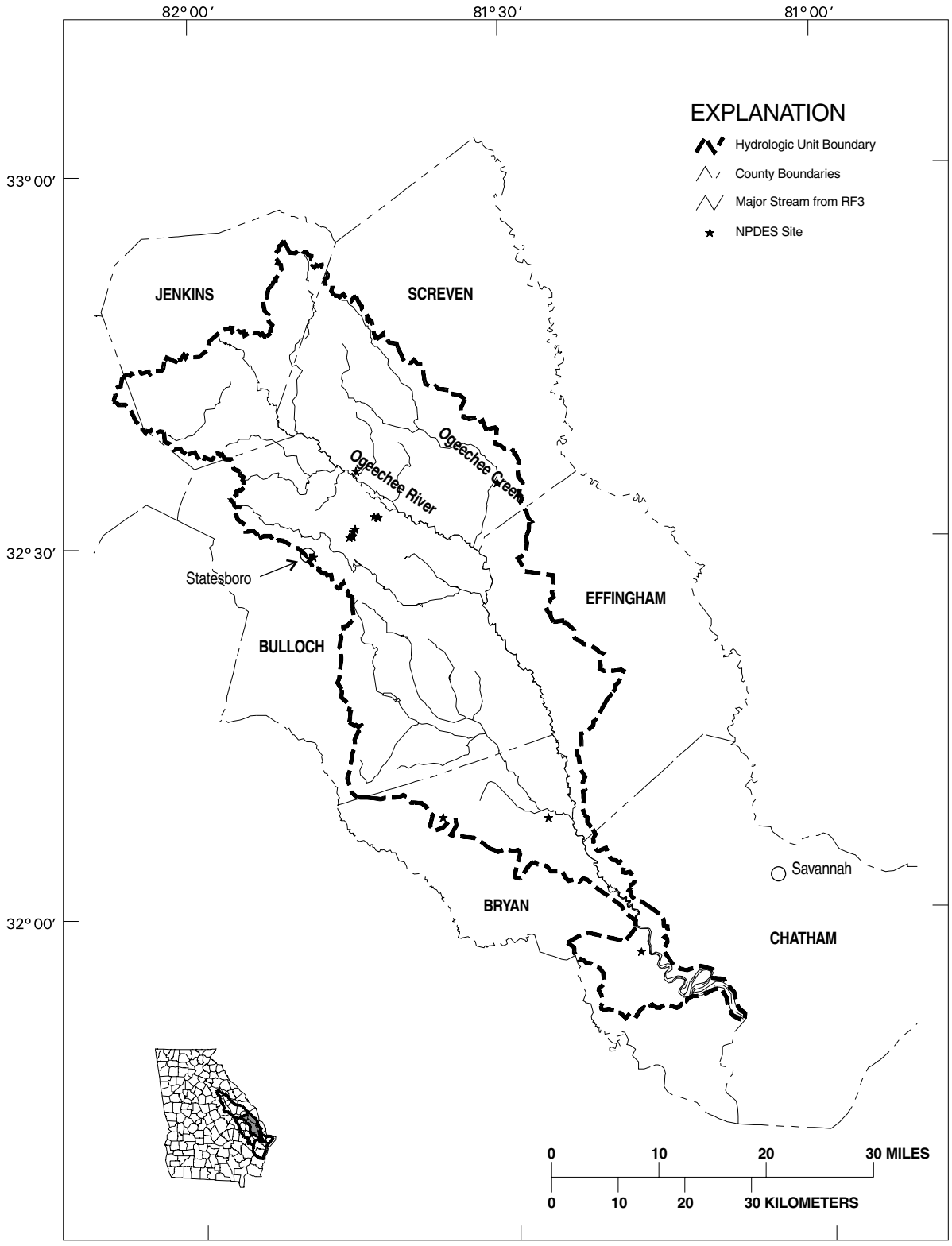

Figure 4-3. NPDES Sites Permitted by GAEPD, Ogeechee River Basin, HUC 03060202

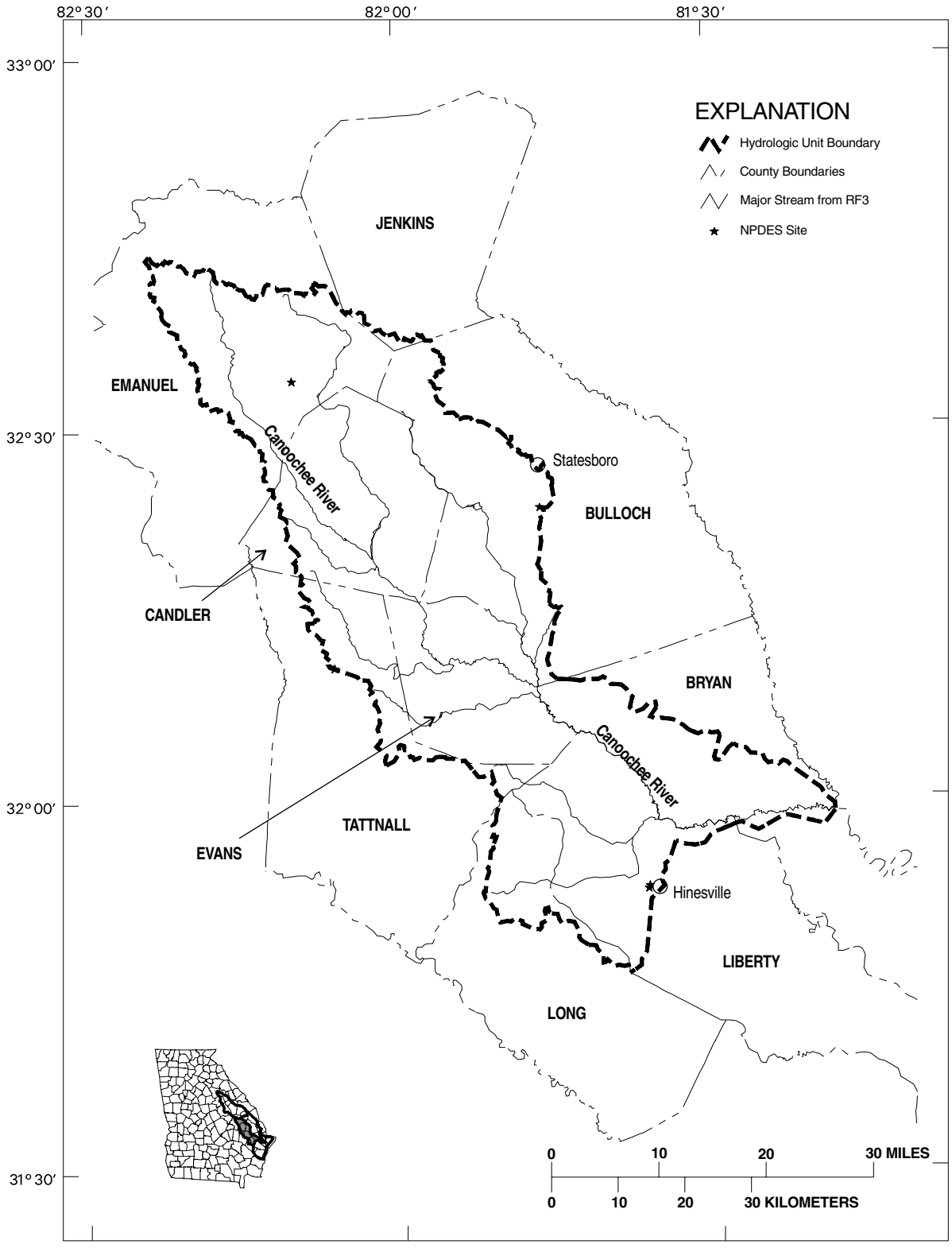

Figure 4-4. NPDES Sites Permitted by GAEPD, Ogeechee River Basin, HUC 03060203

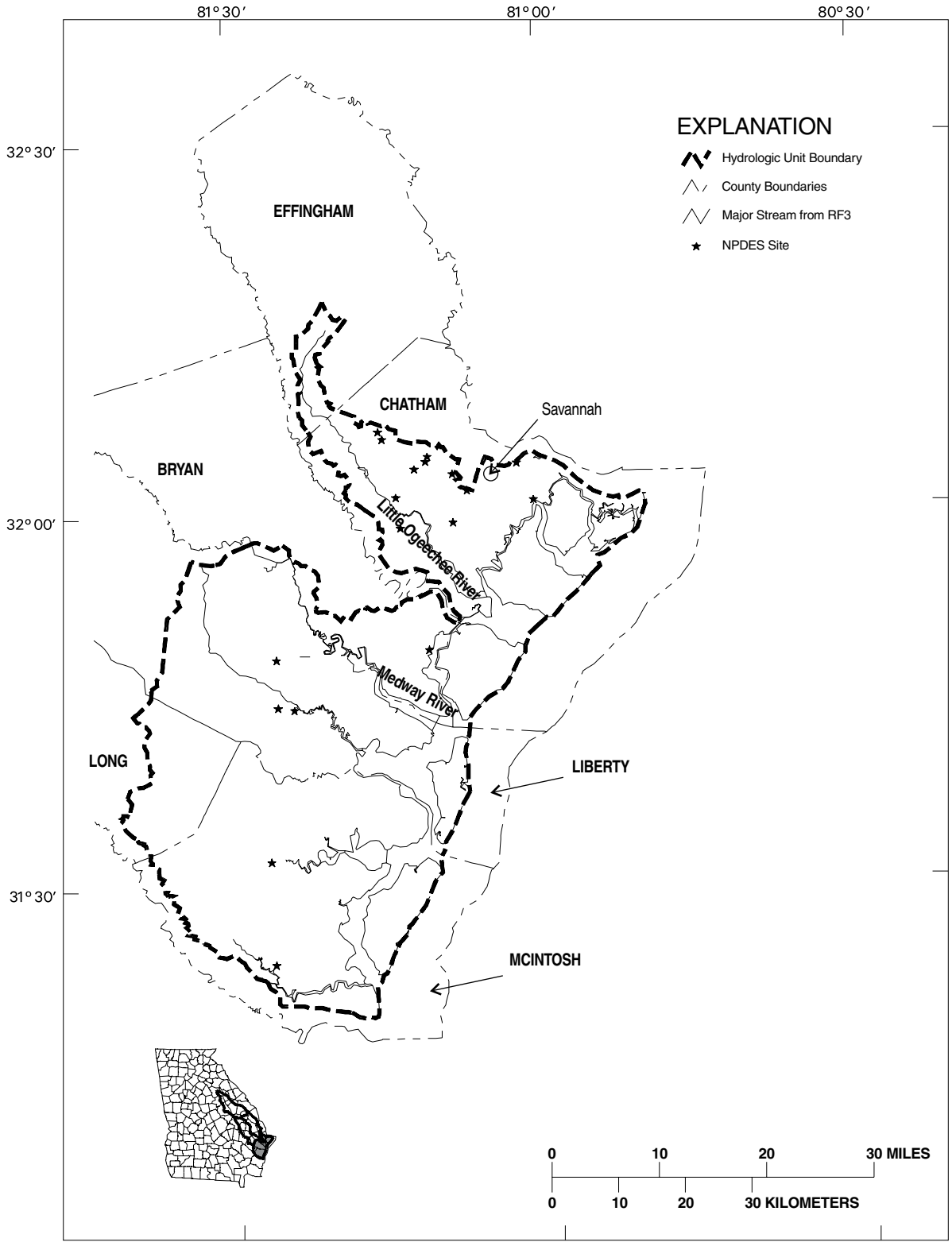

Figure 4-5. NPDES Sites Permitted by GAEPD, Ogeechee River Basin, HUC 03060204

Pollutants typically found in urban storm water runoff include pathogens (such as bacteria and viruses from human and animal waste), heavy metals, debris, oil and grease, petroleum hydrocarbons and a variety of compounds toxic to aquatic life. In addition, the runoff often contains sediment, excess organic material, fertilizers (particularly nitrogen and phosphorus compounds), herbicides, and pesticides which can upset the natural balance of aquatic life in lakes and streams. Storm water runoff may also increase the temperature of a receiving stream during warm weather, which potentially threatens valuable trout fisheries in the Ogeechee River basin. All of these pollutants, and many others, influence the quality of storm water runoff. There are also many potential problems related to the quantity of urban runoff, which can contribute to flooding and erosion in the immediate drainage area and downstream.

Municipal Storm Water Discharges

In accordance with Federal "Phase I" storm water regulations, the state of Georgia has issued individual areawide NPDES municipal separate storm sewer system (MS4) permits to 58 cities and counties in municipal areas with populations greater than 100,000 persons. There were no permits issued in the Ogeechee River basin.

Industrial Storm Water Discharges

Industrial sites often have their own storm water conveyance systems. The volume and quality of storm water discharges associated with industrial activity is dependent on a number of factors, such as the industrial activities occurring at the facility, the nature of the precipitation, and the degree of surface imperviousness (hard surfaces). These discharges are of intermittent duration with short-term pollutant loadings that can be high enough to have shock loading effects on the receiving waters. The types of pollutants from industrial facilities are generally similar to those found in storm water discharges from commercial and residential sites; however, industrial facilities have a significant potential for discharging at higher pollutant concentrations, and may include specific types of pollutants associated with a given industrial activity.

EPD has issued one general permit regulating storm water discharges for 10 of 11 federally regulated industrial subcategories. The general permit for industrial activities requires the submission of a Notice of Intent (NOI) for coverage under the general permit; the preparation and implementation of storm water pollution prevention plan; and, in some cases, analytical testing of storm water discharges from the facility. As with the municipal storm water permits, implementation of site-specific best management practices is the preferred method for controlling storm water runoff. As of August 2000 approximately 71 NOIs had been filed for the Ogeechee River basin. The approximate distribution of NOIs by HUC is as follows:

HUC 03060203 (Canoochee River Basin)	41
HUC 03070202 (Lower Ogeechee River Basin)	15
HUC 03060204 (Ogeechee Coastal River Basin)	65
HUC 03060201 (Upper Ogeechee River Basin)	24

The 11th federally regulated industrial subcategory (construction activities) is covered under NPDES General Permit No. GAR100000. This general permit regulates storm water discharges associated with construction activity at sites and common developments disturbing more than five acres. The general permit requires the submission of a Notice of Intent (NOI) to obtain coverage under the permit, the preparation and implementation of an Erosion, Sedimentation, and Pollution Control Plan, and the preparation and implementation of a Comprehensive Monitoring Program which provides for monitoring of turbidity levels in the receiving stream(s) and/or storm water outfalls(s) during certain

rain events. The general permit became effective on August 1, 2000 and will expire on July 31, 2003.

Nondischarging Waste Disposal Facilities

Land Application Systems (LASs)

In addition to permits for point source discharges, EPD has developed and implemented a permit system for land application systems (LASs). LASs for final disposal of treated wastewaters have been encouraged in Georgia and are designed to eliminate surface discharges of effluent to waterbodies. LASs are used as an alternative to advanced levels of treatment or as the only alternative in some environmentally sensitive areas.

When properly operated, an LAS should not be a source of stressors to surface waters. The locations of LASs are, however, worth noting because of the (small) possibility that a LAS could malfunction and become a source of stressor loading.

A total of 128 municipal and 35 industrial permits for land application systems were in effect in Georgia in 1998. Municipal and other wastewater land application systems within the Ogeechee Basin are listed in Table 4-4. The locations of all LASs within the basin are shown in Figures 4-6 through 4-9.

Table 4-4. Wastewater Land Application Systems in the Ogeechee River Basin

Facility Name	County	Permit No.	Permitted Flow (Mgd)
Bartow Las	Jefferson	GA02-215	0.050
Chatham Co Pine Barren	Chatham	GA02-285	0.060
Chemtall Inc	Liberty	GA01-403	0.023
Claxton	Evans	GA02-111	0.520
Claxton Poultry Farms Inc	Evans	GA01-380	1.150
Davisboro Las	Washington	GA02-242	0.300
Metter	Candler	GA02-185	1.000
Midway Industrial Park	Liberty	GA02-094	0.050
Midway Las	Liberty	GA02-131	0.500
Skidaway Island Utilities	Chatham	GA03-941	1.250
US Army Ft Stewart/Camp Ol	Evans	GA03-624	0.070
US Army Ft Stewart/Wright Aaf	Liberty	GA03-834	0.002
Waterford Landing Dev	Bryan	GA03-768	0.152
Webb Bros Sandhill Farms	Candler	GA01-355	0.660

Landfills

Permitted landfills are required to contain and treat any leachate or contaminated runoff prior to discharge to any surface water. The permitting process encourages either direct connection to a publicly owned treatment works (although vehicular transportation is allowed in certain cases) or treatment and recirculation on site to achieve a no-discharge system. Direct discharge in compliance with NPDES requirements is allowed but is not currently practiced any landfills in Georgia. Groundwater contaminated by landfill leachate from older, unlined landfills represents a potential threat to waters of the state. Ground water and surface water monitoring and corrective action requirements are in place for all landfills operated after 1988 to identify and rededicate potential threats.

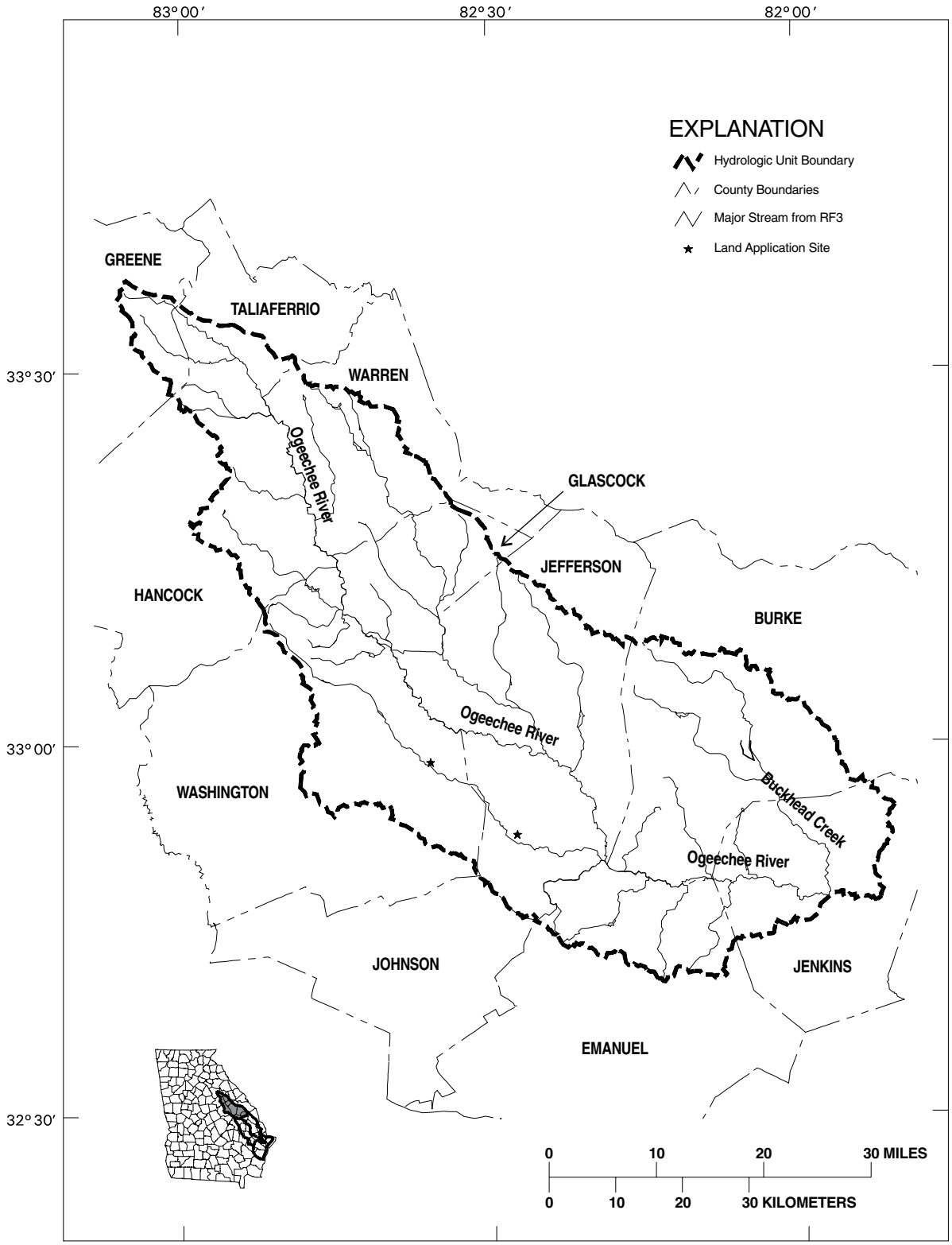

Figure 4-6. Land Application Systems, Ogeechee River Basin, HUC 03060201

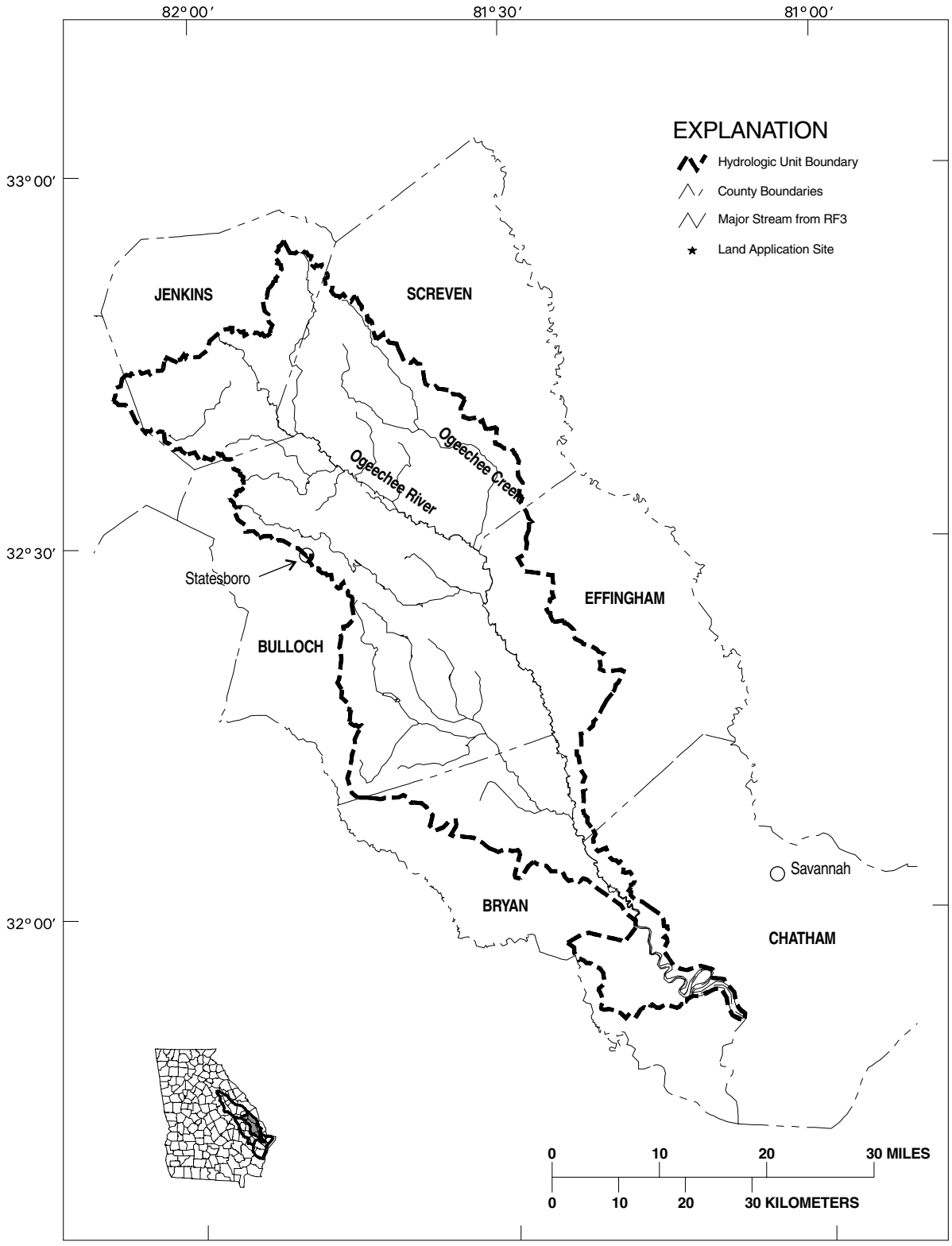

Figure 4-7. Land Application Systems, Ogeechee River Basin, HUC 03060202

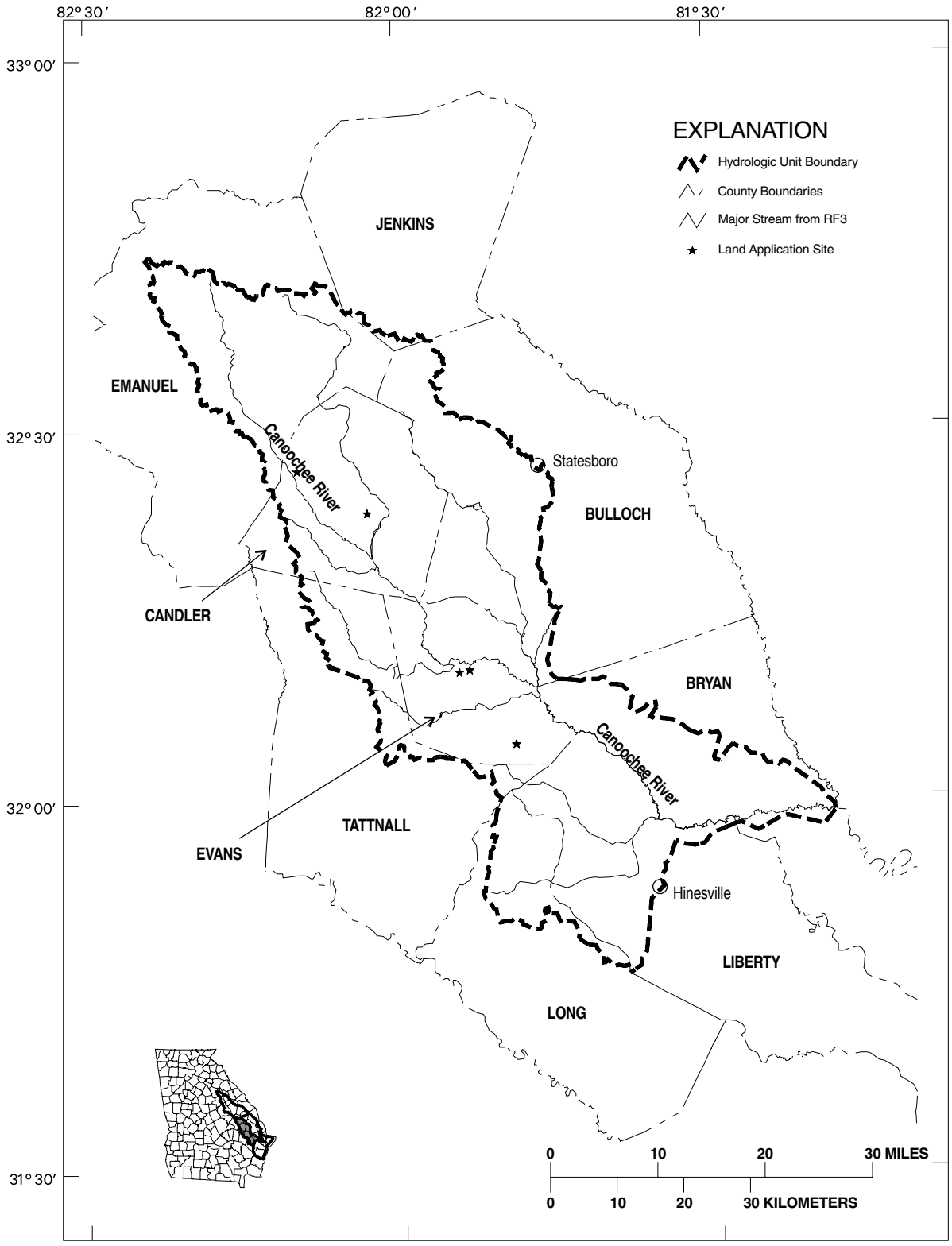

Figure 4-8. Land Application Systems, Ogeechee River Basin, HUC 03060203

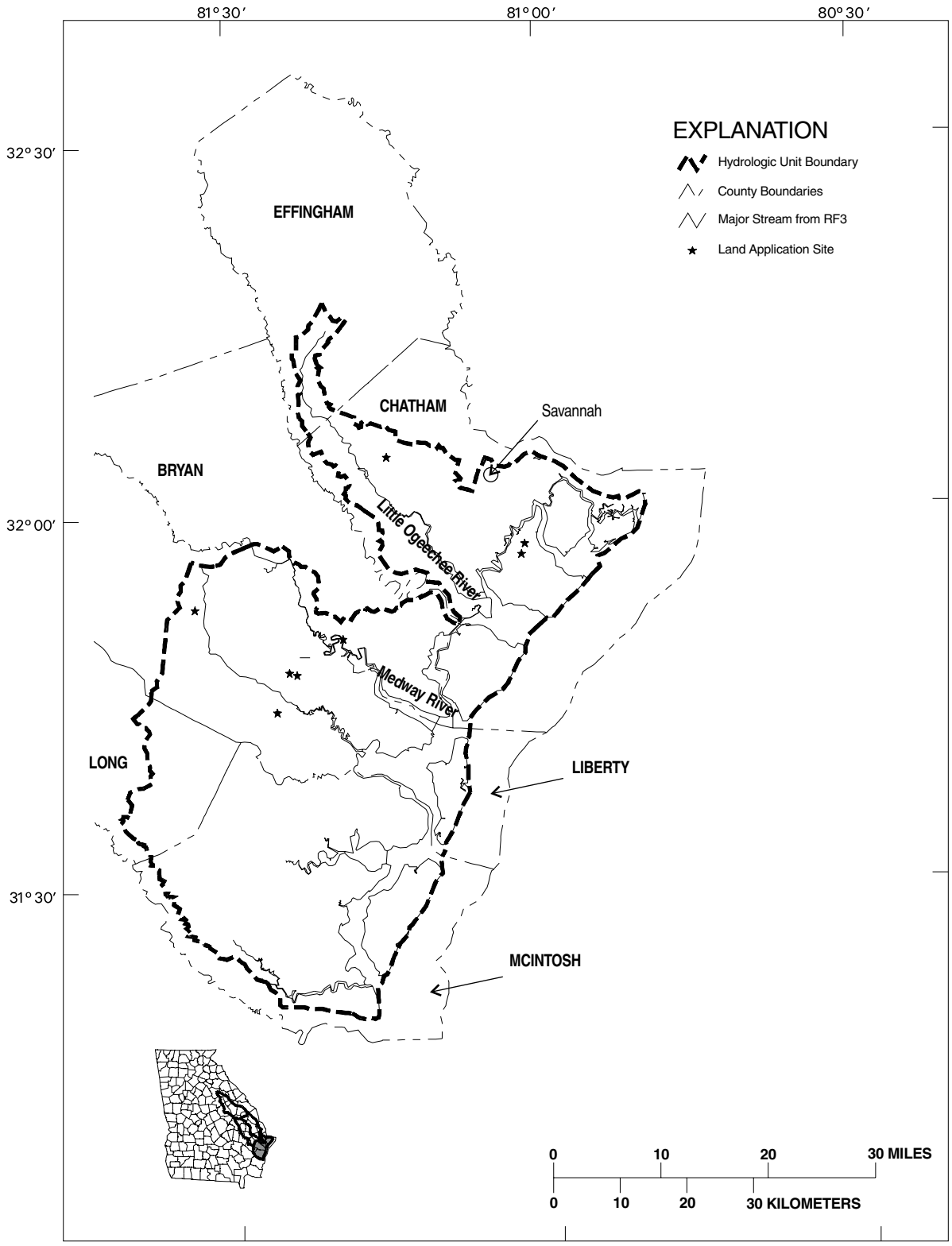

Figure 4-9. Land Application Systems, Ogeechee River Basin, HUC 03060204

The provisions of the Hazardous Sites Response Act address threats posed by older landfills as releases of hazardous constituents are identified. All new municipal solid waste landfills are required to be lined and to have a leachate collection system installed.

EPD's Land Protection Branch is responsible for permitting and compliance of municipal and industrial Subtitle D landfills. The location of permitted landfills within the basin is shown in Figure 4-10 through 4-13.

4.1.2 Nonpoint Sources

The pollution impact on Georgia's streams has radically shifted over the last two decades. Steams are no longer dominated by untreated or partially treated sewage discharges, which had resulted in little or no oxygen and little or no aquatic life. The sewage is now treated, oxygen levels have recovered, and healthy fisheries have followed. Industrial discharges have also been placed under strict regulation. However, other sources of pollution are still affecting Georgia's streams. These sources are referred to as *nonpoint sources*. Nonpoint sources are diffuse in nature. Nonpoint source pollution can generally be defined as the pollution caused by rainfall or snowmelt moving over and through the ground. As water moves over and through the soil, it picks up and carries away natural pollutants and pollutants resulting from human activities, finally depositing them in lakes, rivers, wetlands, coastal waters, or ground water. Habitat alteration (e.g., removal of riparian vegetation) and hydrological modification (e.g., channelization, bridge construction) can also cause adverse effects on the biological integrity of surface waters and are also treated as nonpoint sources of pollution.

Nonpoint pollutant loading comprises a wide variety of sources not subject to point source control through NPDES permits. The most significant nonpoint sources are those associated with precipitation, washoff, and erosion, which can move pollutants from the land surface to water bodies. Both rural and urban land uses can contribute significant amounts of nonpoint pollution. A review of the 1998-1999 water quality assessment results for the Ogeechee basin indicates that urban runoff and rural nonpoint sources contribute significantly to lack of full support for designated uses. The major categories of stressors for nonpoint sources are discussed below.

Nonpoint Sources from Agriculture

Agricultural operations can contribute stressors to water bodies in a variety of ways. Tillage and other soil-disturbing activities can promote erosion and loading of sediment to water bodies unless controlled by management practices. Nutrients contained in fertilizers, animal wastes, or natural soils may be transported from agricultural land to streams in either sediment-attached or dissolved forms. Loading of pesticides and pathogens is also of concern for various agricultural operations.

Sediment and Nutrients

Sediment is the most common pollutant resulting from agricultural operations. It consists mainly of mineral fragments resulting from the erosion of soils, but is can also include crop debris and animal wastes. Excess sediment loads can damage aquatic habitat by smothering and shading food organisms, alter natural substrate, and destroying spawning areas. Runoff with elevated sediment concentrations can also scour aquatic habitat, causing significant impacts on the biological community. Excess sediment can also increase water treatment costs, interfere with recreational uses of water bodies, create navigation problems, and increase flooding damage. In addition, a high percentage of nutrients lost from agricultural lands, particularly phosphorus, are transported attached to sediment. Many organic chemicals used as pesticides or herbicides are also transported predominantly attached to sediment.

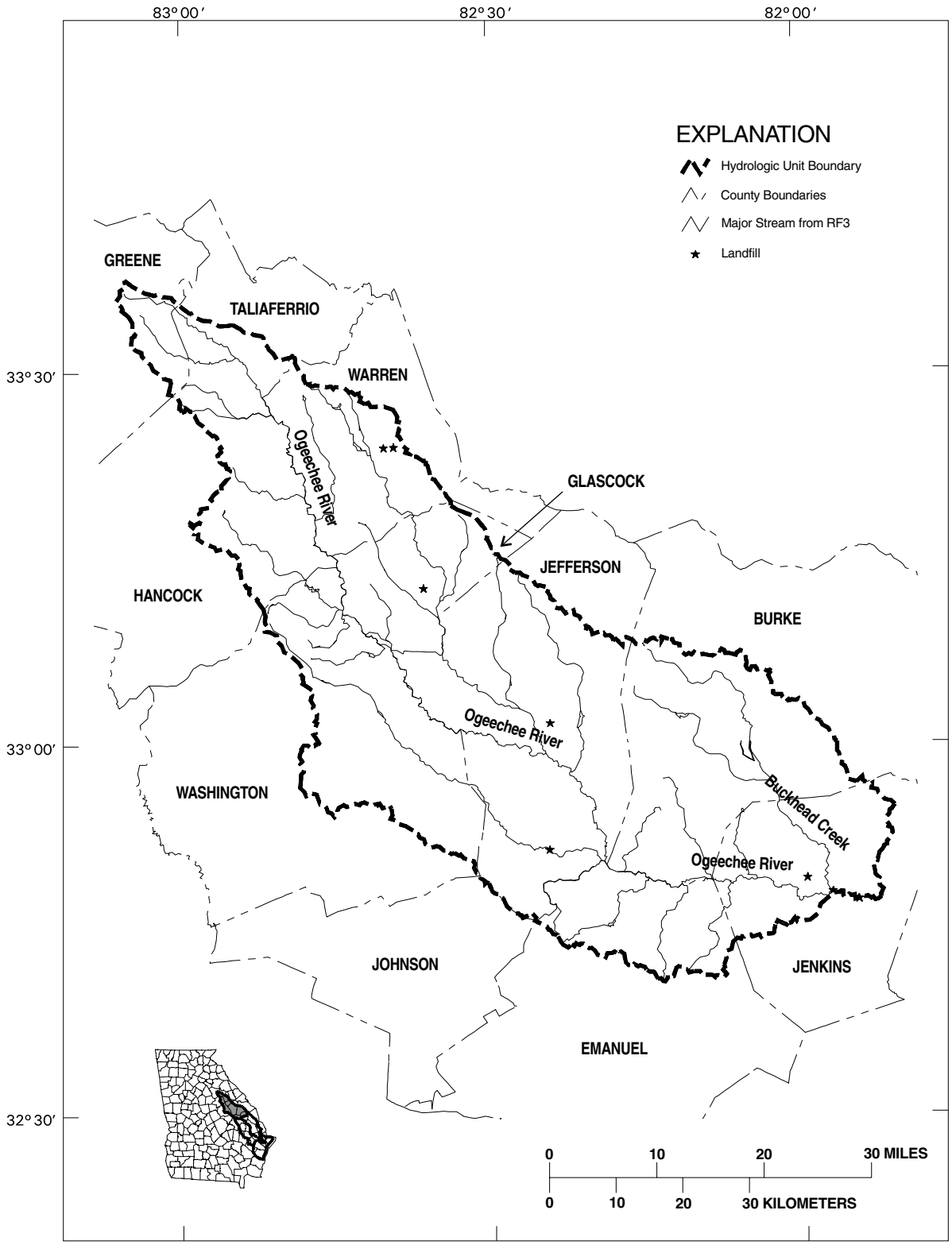

Figure 4-10. Landfills, Ogeechee River Basin, HUC 03060201

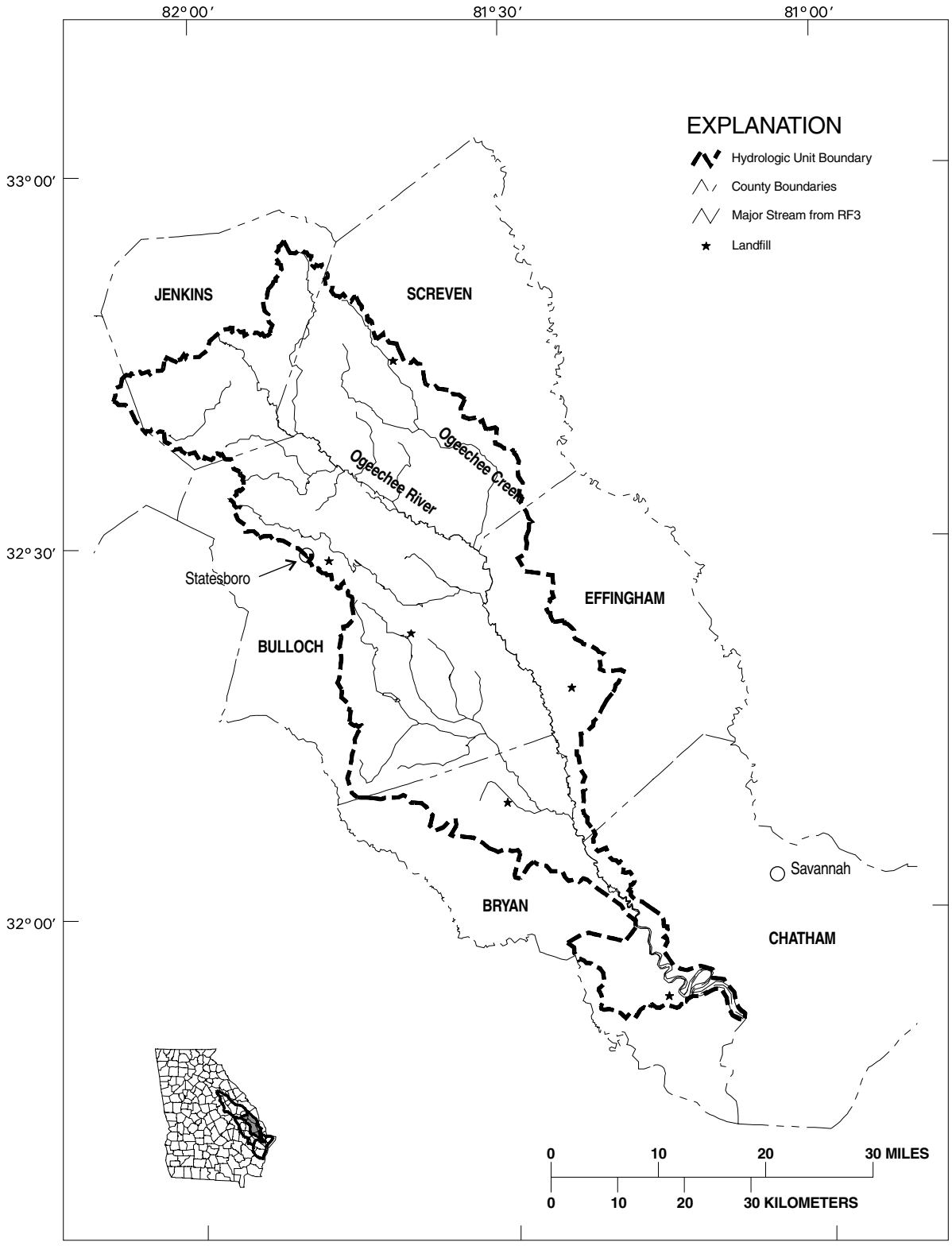

Figure 4-II. Landfills, Ogeechee River Basin, HUC 03060202

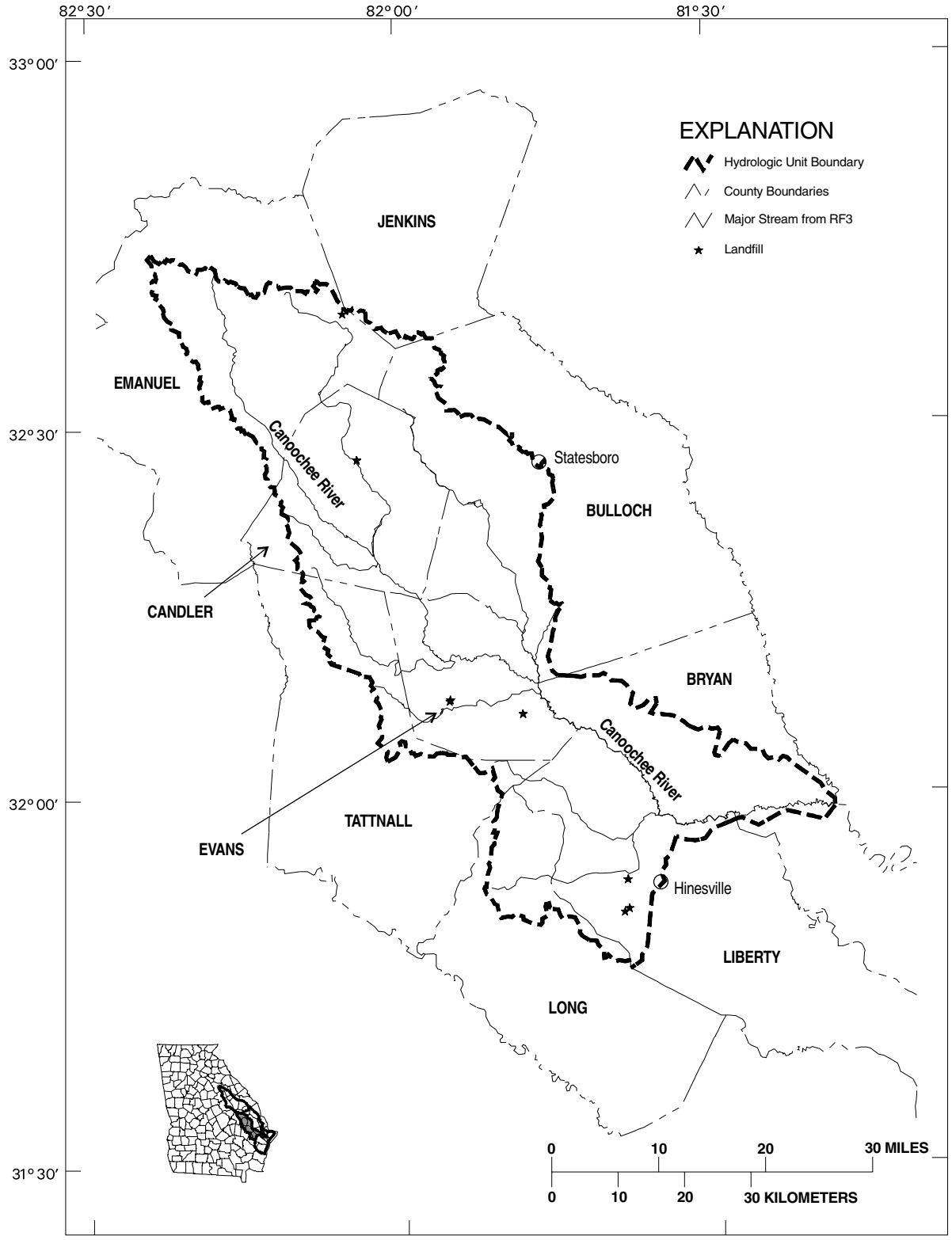

Figure 4-12. Landfills, Ogeechee River Basin, HUC 03060203

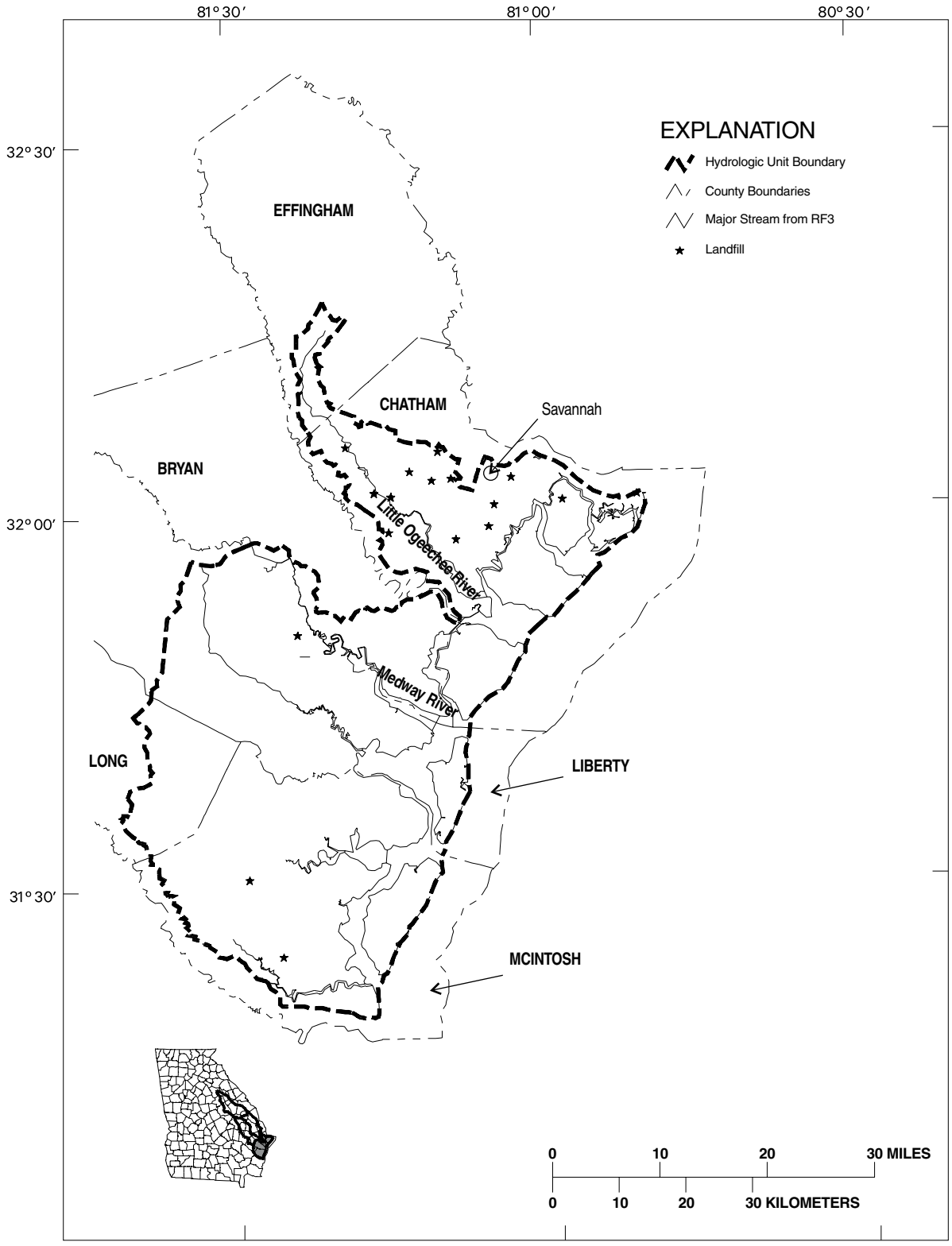

Figure 4-I3. Landfills, Ogeechee River Basin, HUC 03060204

Agriculture can be a significant source of nutrients, which can lead to excess or nuisance growth of aquatic plants and depletion of dissolved oxygen. The nutrients of most concern from agricultural land uses are nitrogen (N) and phosphorus (P), which may come from commercial fertilizer or land application of animal wastes. Both nutrients assume a variety of chemical forms, including soluble ionic forms (nitrate and phosphate) and less-soluble organic forms. Less soluble forms tend to travel with sediment, whereas more soluble forms move with water. Nitrate-nitrogen is very weakly adsorbed by soil and sediment and is therefore transported entirely in water. Because of the mobility of nitrate-nitrogen, the major route of nitrate loss is to streams by interflow or ground water in deep seepage.

Phosphorus transport is a complex process that involves different components of phosphorus. Soil and sediment contain a pool of adsorbed phosphorus, which tends to be in equilibrium with the phosphorus in solution (phosphate) as water flows over the soil surface. The concentrations established in solution are determined by soil properties and fertility status. Adsorbed phosphorus attached to soil particles suspended in runoff also equilibrates with phosphorus in solution.

In 1993, the Soil Conservation Service (SCS, now NRCS) completed a study to identify hydrologic units in Georgia with a high potential for nonpoint source pollution problems resulting from agricultural land uses (SCS 1993). This study concluded that there is not a major statewide agricultural pollution problem in Georgia. However, the assessment shows that some watersheds have sufficient agricultural loading to potentially impair their designated uses, based on estimates of transported sediments, nutrients, and animal wastes from agricultural lands (Table 4-5).

Table 4-5. Estimated Loads from Agricultural Lands by County (SCS, 1993)

County	Percent of Area in Basin	Acres with Nutrient Application	Sediment (tons)	Sediment (ppm)	Nitrogen (tons)	Nitrogen (ppm)	Phosphorus (tons)	Phosphorus (ppm)
Bryan	100	12,264	3,081	0.2	13	0.03	5	0.011
Bulloch	100	143,721	184,649	43.5	526	0.15	196	0.056
Burke	38	140,992	144,222	28.9	411	0.12	153	0.045
Candler	93	41,173	45,074	31.1	141	0.14	51	0.051
Chatham	67	5,874	495	2.2	3	0.02	1	0.007
Effingham	28	36,182	14,798	10.4	48	0.04	18	0.014
Emanuel	53	83,335	91,292	31.1	247	0.12	95	0.047
Evans	98	30,246	22,619	22.7	93	0.13	30	0.041
Glascock	88	15,382	4,744	19.1	15	0.09	6	0.033
Greene	14	34,138	5,840	6	62	0.06	20	0.021
Hancock	31	19,267	9,754	16.1	30	0.06	12	0.022
Jefferson	80	94,533	112,866	39.3	342	0.15	121	0.053
Jenkins	95	56,007	68,295	34.6	233	0.18	80	0.059
Johnson	0.44	52,411	52,700	26.9	202	0.16	64	0.051
Long	36	9,588	2,351	6.9	36	0.11	9	0.027
McIntosh	100	3,664	211	2	33	0.25	13	0.1
Screven	58	106,179	96,231	29.1	272	0.11	103	0.04
Taliaferro	34	12,746	5,588	15	23	0.06	8	0.023
Tattnall	19	73,970	57,928	26.7	311	0.17	85	0.047
Warren	51	35,845	29,881	20.7	93	0.09	35	0.035
Washington	38	90,978	94,776	35.3	265	0.12	101	0.046

In July and August 1996, EPA conducted biological assessments on Georgia watersheds that had sufficient agricultural loading to potentially impair designated stream use to determine which of those waters should be added to Georgia's Section 303(d) list of streams with water quality limited segments. Those waters identified by EPA as potentially impaired by agricultural nonpoint source loading and added to the 303(d) list in December 1996 are shown in. Table 4-6. EPA will develop total maximum daily loads (TMDLs) for these waters in 2004.

Table 4-6. Waters Identified as Potentially Impacted by Agricultural Nonpoint Source Loading and Added to the Georgia 303[d] List.

Waterbody	County	Pollutnat[s] of Concern
Bull and Cedar Creeks	Evans and Tattnal	Biota, Habitat
Lotts Creek	Bulloch	Biota, Habitat
Fifteen Mile Creek	Emanuel and Candler	Biota, Habitat
Black Creek	Bulloch	Biota, Habitat

Animal Waste

In addition to contributing to nutrient loads, animal waste may contribute high loads of oxygen-demanding chemicals and bacterial and microbial pathogens. The waste may reach surface waters through direct runoff as solids or in their soluble form. Soluble forms may reach ground water through runoff, seepage, or percolation and reach surface waters as return flow. As the organic materials decompose, they place an oxygen demand on the receiving waters, which may adversely affect fisheries, and cause other problems with taste, odor, and color. When waters are contaminated by waste from mammals the possible presence of pathogens that affect human health, include fecal bacteria, is of particular concern. In addition to being a source of bacteria, cattle waste might be an important source of the infectious oocysts of the protozoan parasite *Cryptosporidium parvum*.

Pesticides

Pesticides applied in agricultural production can be insoluble or soluble and include herbicides, insecticides, miticides, and fungicides. They are primarily transported directly through surface runoff, either in dissolved forms or attached to sediment particles. Some pesticides can cause acute and chronic toxicity problems in the water or throughout the entire food chain. Others are suspected human carcinogens, although the use of such pesticides has generally been discouraged in recent years.

The major agricultural pesticide/herbicides use within the basin include 2,4-d, Prowl, Blazer/Basagran/Trifluralin/Treflan/Trilin, Aatrex/Atizine, Gramoxone, Classic, Lexone/Sencor, and Lasso (alachlor) (compiled from the Georgia Herbicide Use Survey summary (Monks and Brown 1991)). Since 1990, the use of alachlor in Georgia has decreased dramatically since peanut wholesalers no longer buy peanuts with alachlor.

Nonherbicide pesticide use is difficult to estimate. According to Stell et al. (1995), pesticides other than herbicides are currently used only when necessary to control some type of infestation (nematodes, fungi, and insects). Other common nonherbicie pesticides include chlorothalonil, aldicarb, chlorpyifos, methomyl, thiodicarb, carbaryl, acephate, fonofos, methyl parathion, terbufos, disulfoton, phorate, triphenyltin hydroxide (TPTH), and synthetic pyrethroids/pyrethrins. Application periods of principal agricultural pesticides span the calendar year in the basin. However, agricultural pesticides are

applied most intensively and on a broader rang of crops from March 1 to September 30 in any given year.

It should be noted that past uses of persistent agricultural pesticides that are now banned might continue to affect water quality within the basin, particularly through residual concentrations present in bottom sediments. A survey of pesticide concentration data by Stell et al. (1995) found that two groups of compounds had concentrations at or above minimum reporting levels in 56 percent of the water and sediment analyses. The first group included DDT and metabolites, and the second group included chlordane and related compounds (heptachlor, heptachlor epoxide)—while dieldrin was also frequently detected. The USEPA now bans all of these pesticides for use in the United States, but they might persist in the environment for long periods of time.

Nonpoint Sources from Urban, Industrial, and Residential Lands

Water quality in urban waterbodies is affected by both point source discharges and diverse land use activities in the drainage basin (i.e., nonpoint sources). One of the most important sources of environmental stressors in the Savannah River basin, particularly in the developed and rapidly growing areas is diffuse runoff from urban, industrial, and residential land uses (jointly referred to as "urban runoff"). Nonpoint source contamination an impair streams that drain extensive commercial and industrial areas due to inputs of storm water runoff, unauthorized discharges, and accidental spills. Wet weather urban runoff can carry high concentrations of many of the same pollutants found in point source discharges, such as oxygen-demanding waste, suspended solids, synthetic organic chemicals, oil and grease, nutrients, lead and other metals, and bacteria The major difference is that urban runoff occurs only intermittently, in response to precipitation events.

The characteristics of nonpoint urban sources of pollution are generally similar to those of NPDES permitted storm water discharges (these are discussed in the previous section). Nonpoint urban sources of pollution include drainage from areas with impervious surfaces, but also includes less highly developed areas with greater amounts of pervious surfaces such as lawns, gardens, and septic tanks, all of which may be sources of nutrient loading.

There is little site-specific data available to quantify loading in nonpoint urban runoff in the Ogeechee River basin, although estimates of loading rates by land use types have been widely applied in other areas.

Pesticides and Herbicides from Urban and Residential Lands

Urban and suburban land uses are also a potential source of pesticides and herbicides through application to lawns and turf, roadsides, and gardens and beds. Stell et al. (1995) provide a summary of usage in the Atlanta Metropolitan Statistic Area (MSA). The herbicides most commonly used by the lawn-care industry are combinations of dicamba, 2,4-D, mecoprop (MCPP), 2,4-DP, and MCPA, or other phenoxy-acid herbicides, while most commercially available weed control products contain one or more of the following compounds: glyphosphate, methyl sulfometuron, benefin (benfluralin), bensulide, acifluorfen, 2,4-D, 2,4-DP, or dicamba. Atrazine was also available for purchase until it was restricted by the State of Georgia on January 1, 1993. The main herbicides used by local and state governments are glyphosphate, methyl sulfometuron, MSMA, 2,4-D, 2,4-DP, dicamba, and chlorsulforon. Herbicides are used for preemergent control of crabgrass in February and October, and in the summer for postemergent control. Data from the 1991 Georgia Pest Control Handbook (Delaplane, 1991) and a survey of CES and SCS personnel conducted by Stell et al. Indicate that several insecticides could be considered ubiquitous in urban/suburban use, including chlorpyrifos, diazinon,

malathion, acephate, carbaryl, lindane, and dimethoate. Chlorothalonil, a fungicide, is also widely used in urban and suburban areas.

Other Urban/Residential Sources

Urban and residential storm water also potentially includes pollutant loads from a number of other terrestrial sources:

Septic Systems. Poorly sited and improperly operating septic systems can contribute to the discharge of pathogens and oxygen-demanding pollutants to receiving streams. This problem is addressed through septic system inspections by the appropriate County Health Department, extension of sanitary sewer service and local regulations governing minimum lot sizes and required pump-out schedules for septic systems.

Leaking Underground Storage Tanks. The identification and remediation of leaking underground storage tanks (LUSTs) is the responsibility of the EPD Land Protection Branch. Petroleum hydrocarbons and lead are typically the pollutants associated with LUSTs.

Nonpoint Sources from Forestry

Silvicultural operations may serve as sources of stressors, particularly excess sediment loads to streams, when Best Management Practices (BMPs) are not followed. From a water quality standpoint, woods roads pose the greatest potential threat of any of the typical forest practices. It has been documented that 90 percent of the sediment that entered streams from a forestry operation was directly related to either poorly located or poorly constructed roads. The potential impact to water quality from erosion and sedimentation is increased if BMPs are not adhered to.

Silviculture is also a potential source of pesticides/herbicides. According to Stell et al. (1995), pesticides are mainly applied during site preparation after clear-cutting and during the first few years of new forest growth. Site preparation occurs on a 25-year cycle on most pine plantation land, so the area of commercial forest with pesticide application in a given year is relatively small. The herbicides glyphosate (Accord), sulfometuron methyl (Oust), hexazinone (Velpar), imazapyr (Arsenal), and metsulfuron methyl (Escort) account for 95 percent of the herbicides used for site preparation to control grasses, weeds, and broadleaves in pine stands. Dicamba, 2,4-D, 2,4,-DP (Banvel), triclopyr (Garlon), and picloram (Tordon) are minor use chemicals used to control hard to kill hardwoods and kudzu. The use of triclopyr and picloram has decreased since the early 1970's.

Most herbicides are not mobile in the soil and are targeted to plants, not animals. Applications made following the label and in conjunction with BMPs should pose little threat to water quality.

Chemical control of insects and diseases is not widely practices except in forest tree nurseries which is a very minor land use. Insects in pine stands are controlled by chlorpyrifos, diazinon, malathion, acephate, carbaryl, lindane, and dimethoate. Diseases are controlled using chlorothalonil, dichloropropene, and mancozeb. There are four commercial forest tree nurseries within the basin. Three are located in Evans County and one in is in Bulloch County.

According to the Georgia 1998-1999 water quality assessment, no streams were identified in the basin as impacted due to commercial forestry activities.

Statewide BMP Implementation Survey

In 1992, the Georgia Forestry Commission (GFC) conducted a statewide BMP implementation survey to determine to what extent forestry BMPs were being

implemented. Within the Ogeechee Basin, the GFC evaluated 31 sites involving 3,457 acres of land. Seventeen (17) sites involving 1,989 acres were on private lands and 14 sites involving 1,468 acres were on forest industry land. Overall compliance with BMPs was 91 percent. By ownership, compliance was approximately 88 percent on private lands and 96 percent on forest industry lands.

Approximately 90 percent of the 22.1 miles of main haul roads evaluated on 27 sites were in compliance with BMPs. Most noted problems were that roads were not reshaped and stabilized in critical areas such as stream crossings. Main haul roads crossed streams on 40 percent of the sites and culverts were sized correctly for the watershed. By ownership, road compliance for private lands and forest industry was 80 percent and 97 percent, respectively.

Approximately 91 percent of the 3,457 harvested acres evaluated on the 31 sites were in compliance with BMPs. Problem areas were that water bars were not installed in skid trails on sites with sloping terrain. Only 27 percent of the log decks were stabilized. Harvesting within the recommended Streamside Management Zones (SMZs) occurred on 58 percent of the sites and resulted in 27 percent of the SMZs rutted or damaged and excess logging debris left in the streams on 45 percent of the sites. Log decks were properly located outside of the recommended SMZs on 90 percent of the sites. Temporary stream crossings occurred on 37 percent of the sites and were properly removed after the harvest on half of the sites. By ownership, harvesting compliance for private lands was 88 percent and forest industry was 96 percent.

No sites were evaluated for site preparation or mechanical regeneration.

Atmospheric Deposition

Atmospheric deposition can be a significant source of nitrogen and acidity in watersheds. Nutrients from atmospheric deposition, primarily nitrogen, are distributed throughout the entire basin in precipitation. The primary source of nitrogen in atmospheric deposition is nitrogen oxide emissions from combustion of fossil fuels. The rate of atmospheric deposition is a function of topography, nutrient sources, and spatial and temporal variations in climatic conditions.

Atmospheric deposition can also be a source of certain mobile toxic pollutants, including mercury, PCBs, and other organic chemicals.

4.I.3 Flow and Temperature Modification

Many species of aquatic life are adapted to specific flow and temperature regimes. In addition, both flow and temperature affect the dissolved oxygen balance in water, and changes in flow regime can have important impacts on physical habitat.

Thus, flow and temperature modifications can be important environmental stressors. They also interact with one another to affect the oxygen balance: flow energy helps control reaeration rate, while water temperature controls the solubility of dissolved oxygen, and higher water temperatures reduce oxygen solubility and thus tend to reduce dissolved oxygen concentrations. Further, increased water temperature increases the rate of metabolic activity in natural waters, which in turn may increase oxygen consumption by aquatic species.

4.I.4 Physical Habitat Alteration

Many forms of aquatic life are sensitive to physical habitat disturbances. Probably the major disturbing factor is erosion and loading of excess sediment, which changes the

nature of the stream substrate. Thus, any land use practices that cause excess sediment input can have significant impacts.

Physical habitat disturbance is also evident in many urban streams. Increased impervious cover in urban areas can result in high flow peaks, which increase bank erosion. In addition, construction and other land-disturbing activities in these areas often provide an excess sediment load, resulting in a smothering of the natural substrate and physical form of streams with banks of sand and silt.

4.2 Summary of Stressors Affecting Water Quality

Section 4.1 described the major sources of loads of pollutants (and other types of stressors) to the Ogeechee basin. What happens in a river is often the result of the combined impact of many different types of loading, including point and nonpoint sources. For instance, excess concentrations of nutrients may result from the combined loads of wastewater treatment plant discharges, runoff from agriculture, runoff from residential lots, and other sources. Accordingly, Section 4.2 brings together the information contained in Section 4.1 to focus on individual stressor types, as derived from all sources.

4.2.1 Nutrients

All plants require certain nutrients for growth, including the algae and rooted plants found in lakes, rivers, and streams. Nutrients required in the greatest amounts include nitrogen and phosphorus. Some loading of these nutrients is needed to support normal growth of aquatic plants, an important part of the food chain. Too much loading of nutrients can, however, result in an overabundance of algal growth with a variety of undesirable impacts. The condition of excessive nutrient-induced plant production is known as eutrophication, and waters affected by this condition are said to be eutrophic. Eutrophic waters often experience dense blooms of algae, which can lead to unaesthetic scums and odors and interfere with recreation. In addition, overnight respiration of living algae, and decay of dead algae and other plant material, can deplete oxygen from the water, stressing or killing fish. Eutrophication of lakes typically results in a shift in fish populations to less desirable, pollution-tolerant species. Finally, eutrophication may result in blooms of certain species of blue-green algae which have the capability of producing toxins.

For freshwater aquatic systems, the nutrient in the shortest supply relative to plant demands is usually phosphorus. Phosphorus is then said to be the “limiting nutrient” because the concentration of phosphorus limits potential plant growth. Control of nutrient loading to reduce eutrophication thus focuses on phosphorus control.

Point and nonpoint sources to the Ogeechee also discharge large quantities of nitrogen, but nitrogen is usually present in excess of amounts required to match the available phosphorus. Nitrogen (unlike phosphorus) is also readily available in the atmosphere and ground water, so it is not usually the target of management to control eutrophication in freshwater. The bulk of the nitrogen in fresh-water systems is found in three ionic forms--ammonium (NH_4^+), nitrite (NO_2^-), or nitrate (NO_3^-). Nitrite and nitrate are more readily taken up by most algae, but ammonia is of particular concern because it can be toxic to fish and other aquatic life. Accordingly, wastewater treatment plant upgrades have focused on reducing the toxic ammonia component of nitrogen discharges, with corresponding increase in the nitrate fraction.

An increase in point and non-point source nutrients are now regularly being reflected through extensive blue-green phytoplankton blooms, as well as filamentous algae growth in this clearwater river during summer months when stream flows approach 7Q10 levels. Once white sandbars are now severely stained from algal growth.

Sources of Nutrient Loading

The major sources of nutrient loading in the Ogeechee basin are wastewater treatment facilities, urban runoff and storm water, and agricultural runoff. Concentrations found in the streams and rivers of the Ogeechee basin represent a combination of a variety of point and nonpoint source contributions.

Point source loads can be quantified from permit and effluent monitoring data, but nonpoint loads are difficult to quantify. Rough estimates of average nutrient loading rates from agriculture are available; however, nonpoint loads from urban/residential sources in the basin have not yet been quantified. The long-term trends in phosphorus within the Ogeechee River basin can be obtained by examining results from EPD long-term trend monitoring stations. The trend in instream total phosphorus concentrations at one site in the Ogeechee River are shown in Figure 4-14. In general, phosphorus concentrations have declined over time as a result of improvements in wastewater treatment technology.

4.2.2 Oxygen Depletion

Oxygen is required to support aquatic life, and Georgia water quality standards specify minimum and daily average dissolved oxygen concentration standards for all waters. Violations of water quality standards for dissolved oxygen was the second most commonly listed cause of nonsupport of designated uses in 1997-1998. Problems with oxygen depletion in rivers and streams of the Ogeechee basin are associated with oxygen-demanding wastes from point and nonpoint sources. Historically, the greatest threat to maintaining adequate oxygen levels to support aquatic life has come from the discharge of oxygen-demanding wastes from wastewater treatment plants. Treatment upgrades and more stringent permit limits have reduced this threat substantially. Today, dissolved oxygen issues in the Ogeechee River basin are mainly associated with nonpoint source discharges.

Trends in instream dissolved oxygen concentrations at one site in the Ogeechee River Basin are shown in Figure 4-15. All waters in the Ogeechee basin have a state water quality standard of 4.0 mg/L. As shown in Figure 4-15, dissolved oxygen concentrations are usually above this standard.

4.2.3 Metals

A violation of water quality standards for metals attributed to nonpoint sources was detected in one segment of the Ogeechee River during the 1997-1998 sampling. Point sources of metals in the Ogeechee basin (wastewater treatment plants and certain industrial discharges) have been brought into compliance with permit limits, leaving the more-difficult-to-control nonpoint sources as the primary cause of impairment.

4.2.4 Fecal Coliform Bacteria

Violations of the standard for fecal coliform bacteria were the most commonly listed cause of nonsupport of designated uses in the 1998-1999 water quality assessment. Fecal coliform bacteria are monitored as an indicator of fecal contamination and the possible presence of human bacterial and protozoan pathogens in water. Fecal coliform bacteria may arise from many of the different point and nonpoint sources discussed in Section 4.1.

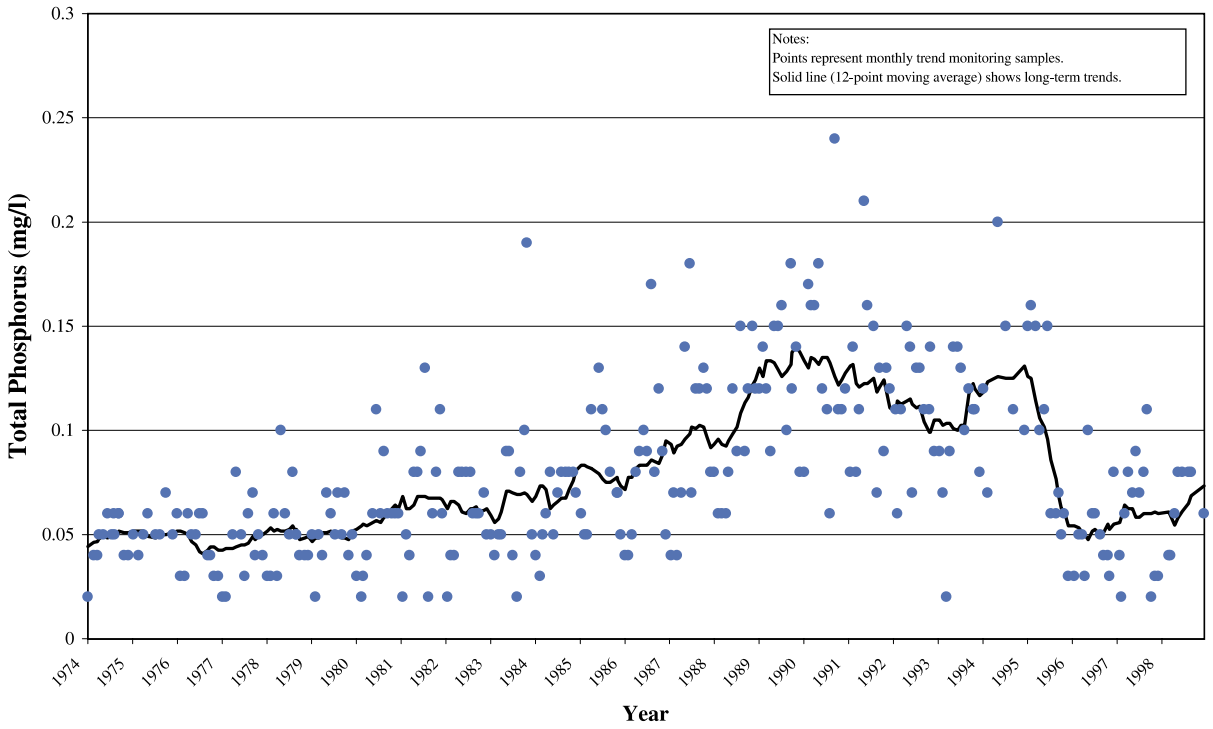

Figure 4-I4. Phosphorus Concentrations, Ogeechee River at State Road 24

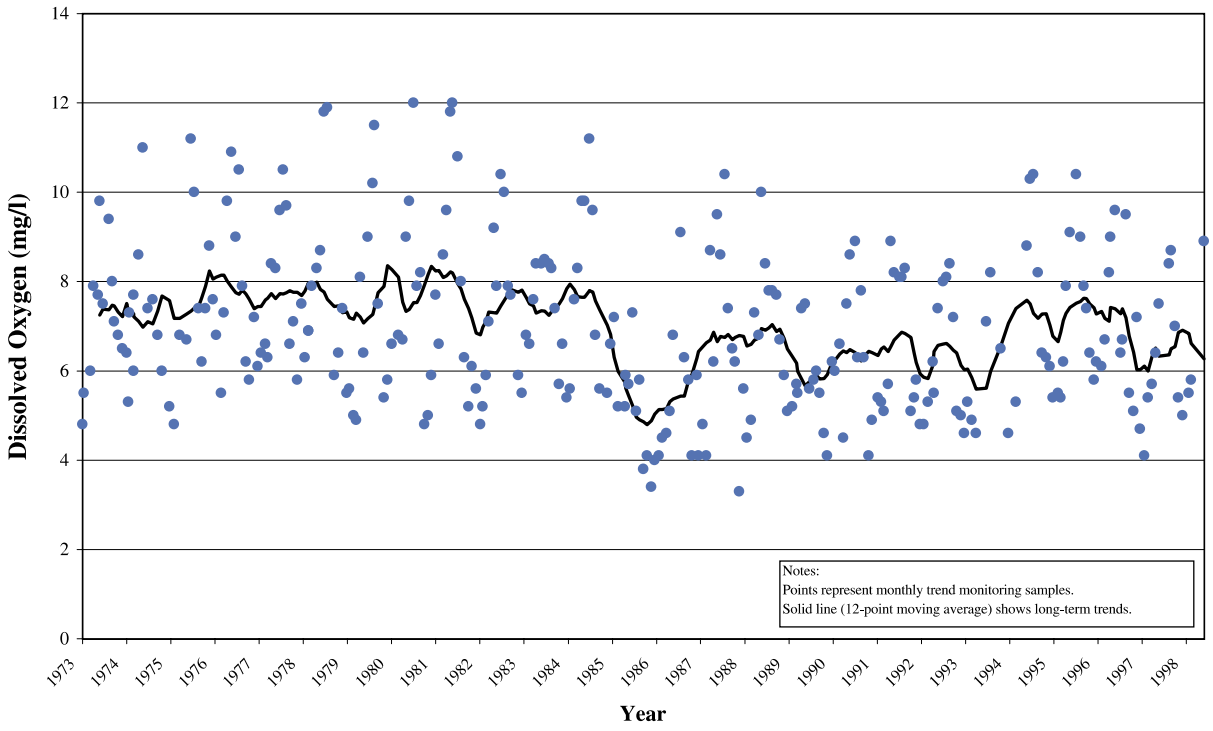

Figure 4-I5. Disolved Oxygen Concentrations, Ogeechee River at State Road 24

Human waste is of greatest concern as a potential source of bacteria and other pathogens. One primary function of wastewater treatment plants is to reduce this risk through disinfection. Observed violations of the fecal coliform standard below several wastewater treatment plants on the Ogeechee River have generally been rapidly corrected in recent years.

Trends in instream fecal coliform concentrations at one site in the Ogeechee River basin are shown in Figure 4-16.

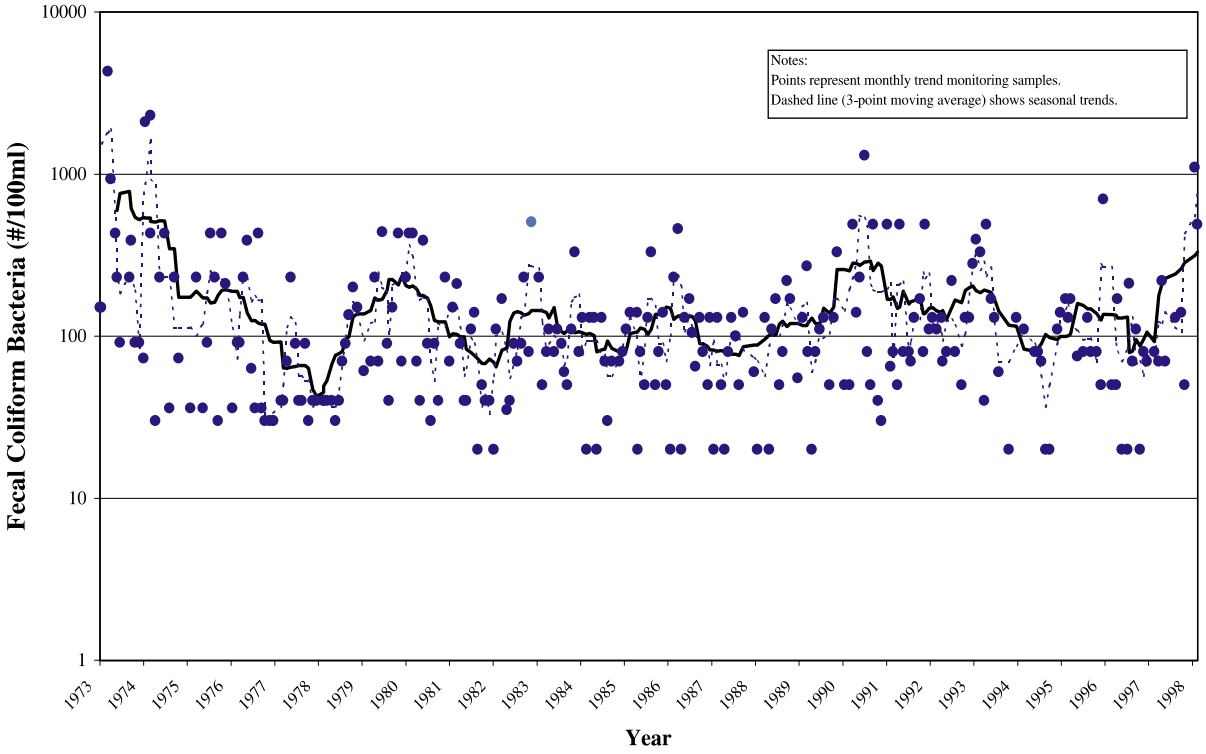

Figure 4-16. Fecal Coliform Concentrations, Ogeechee River at State Road 24

As point sources have been brought under control, nonpoint sources have become increasingly important as potential sources of fecal coliform bacteria. Nonpoint sources may include

- Agricultural nonpoint sources, including concentrated animal operations and spreading and/or disposal of animal wastes.
- Runoff from urban areas transporting surface dirt and litter, which may include both human and animal fecal matter, as well as a fecal component derived from sanitary sewer overflows.
- Urban and rural input from failed or ponding septic systems.

4.2.5 Synthetic Organic Chemicals

Synthetic organic chemicals (SOCs) include pesticides, herbicides, and other man-made toxic chemicals. SOCs may be discharged to waterbodies in a variety of ways, including

- Industrial point source discharges.

- Wastewater treatment plant point source discharges, which often include industrial effluent as well as SOCs from household disposal of products such as cleaning agents and insecticides.
- Nonpoint runoff from agricultural and silvicultural land with pesticide and herbicide applications.
- Nonpoint runoff from urban areas, which may load a variety of SOCs such as horticultural chemicals and termiticides.
- Illegal disposal and dumping of wastes.

SOCs were not detected in the surface waters of the Ogeechee River basin in problem concentrations at only one location. It should be noted, however, that most monitoring has been targeted to waters located below point sources where potential problems were suspected. Agricultural sources were potentially important in the past, particularly from cotton production in the Coastal Plain, but the risk has apparently greatly declined with a switch to less persistent pesticides. Recent research by USGS (Hippe et al., 1994; Stell et al., 1995) suggests pesticide/herbicide loading in urban runoff and storm water may be of greater concern than agricultural loading, particularly in streams of the metropolitan Atlanta area.

4.2.6 Stressors from Flow Modification

Stress from flow modification is primarily associated with stormflow in smaller streams associated with development and increased impervious area.

4.2.7 Sediment

Erosion and discharge of sediment can have a number of adverse impacts on water quality. First, sediment can carry attached nutrients, pesticides, and metals into streams. Second, sediment is itself a stressor. Excess sediment loads can alter habitat, destroy spawning substrate, and choke aquatic life, while high turbidity also impairs recreational and drinking water uses. Sediment loading is of concern throughout the basin, but is of greatest concern in the developing urban areas and major transportation corridors. The rural areas are of lesser concern with the exception of rural unpaved road systems and areas where cultivated cropland exceeds 20 percent of the total land cover.

Long term observation of river bathymetry associated with fisheries studies indicate evidence of fish habitat alteration through sedimentation. Suspended sediments for the most part appear to be originating from the upper part of the watershed where agriculture (i.e. cotton) is expanding again.

4.2.8 Habitat Degradation and Loss

In many parts of the Ogeechee basin, support for native aquatic life is potentially threatened by degradation of aquatic habitat. Habitat degradation is closely tied to sediment loading, and excess sediment is the main threat to habitat in rural areas with extensive land-disturbing activities, as well as in urban areas where increased flow peaks and construction can choke and alter stream bottom substrates. A second important type of habitat degradation in the Ogeechee basin is loss of riparian tree cover, which can lead to increased water temperatures.

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In This Section

- Assessment of Water Quantity
- Assessment of Water Quality

Section 5

Assessments of Water Quantity and Quality

This section provides an evaluation of the current conditions in the Ogeechee River basin, in terms of both water quantity (Section 5.1) and water quality (Section 5.2) issues. The assessment results are then combined with the evaluation of environmental stressors from Section 4 to produce a listing of Concerns and Priority Issues in Section 6.

5.1 Assessment of Water Quantity

General information about water quantity issues in the Ogeechee basin is taken from the Georgia Environmental Protection Water Availability and Use Report, Coastal Plain River Basins, Regional Economic Forecast of Population and Employment Comprehensive Study, Volume 1and updated from other Georgia Environmental Protection Division sources where available.

5.1.1 Municipal and Industrial Water Uses

As stated in Section 3.2, the City of Warrenton is the sole municipal user of surface water in the basin. Warrenton is a small city (withdrawal permit 0.75 mgd) and it is not expected to expand or experience double digit rate of growth into the foreseeable future. Other cities in the basin rely upon groundwater for their potable water supplies, and this is expected to continue. The sole industrial user of surface water in the basin is Thiele Kaolin (withdrawal permit 1.5 mgd). It is unknown if surface water will be more heavily relied upon in the future to support kaolin industry activities in the basin.

Overview of Surface Public Water Systems

Most surface water system plants, in the State of Georgia, are facilities that utilize conventional treatment which includes coagulation, flocculation, sedimentation, filtration, and disinfection. There are a number of small package plants which use the same treatment but on a smaller scale. Intakes located in urban areas with upstream development or in rural areas with large amounts of agriculture upstream have higher

amounts of sediments (turbidity) in the rivers, streams and creeks that provide the raw surface water. These waters are prone to sudden erosion and sedimentation problems, also known as flashing, during hard rain storms which increases the amount of sediment (dirt, mud, and sand) in the water. Water with excess sediment or turbidity can clog intakes (also known as muddying) and filters requiring more sophisticated treatment and higher cost. Many plants have reservoirs to store large amounts of water and to settle out excess sediment (turbidity). Often taste and odor problems come from a natural sources of iron and manganese or algae blooms in shallow surface water. However, algae blooms can also indicate an increase in the level of nutrients in the water. All known raw water quality problems listed have been identified and fall under the individual HUC assessments in Section 7.0. All community surface public water systems are in compliance with the Georgia Rules for Safe Drinking Water.

Drinking Water Quality: Surface Water

Overall the surface water quality in the Ogeechee River basin is good for use as drinking water. All public water systems in the state of Georgia that use surface water meet federal Surface Water Treatment Rules for filtration and treatment. However, surface water quality problems due to nonpoint source pollution such as agricultural and storm water runoff are concerns to municipalities which withdraw surface water from the Ogeechee River and tributaries. The contaminant of most concern is high turbidity, especially rapid increases in turbidity, due to erosion and sediment runoff. Water high in turbidity can clog filters, interrupt the proper treatment of raw water, and increase the cost of the water to the consumers because more chemicals are needed to settle out the sediment. Many water plants have reservoirs to store large amounts of water and to settle out excess sediment (turbidity). Table 5-1 summarizes the known and potential raw water quality problems affecting drinking water supplies associated with surface water intakes within the Ogeechee basin.

Table 5-I. Known and Potential Raw Water Quality Problems Affecting Drinking Water Supplies in the Ogeechee River Basin

HUC 03060201 -						
Water System Name	**Water Source Name**	**Number of Intakes**	**Reservoir that allow for WQ**	**Number of Water Plants**	**Known Raw Water Quality Problems in the Past and Potential Future Problems**	**Other Comments**
City of Warrenton – 3010001	Rocky Comfort Creek	1	Y	1	Water quality good. High iron and manganese problems. Highly colored due to organics, low alkaline. Taste and odor problems due to algae.	Water system in compliance.

Drinking Water Quality: Groundwater

Overall ground water quality is very good for use as drinking water from wells. Since most wells used in public water systems are constructed by licensed well drillers and draw from deeper aquifers, the number of contaminated wells is small. However, in the Ogeechee River basin some public water system wells have been contaminated by local pollution sources such as leaky underground storage tanks, malfunctioning septic tank systems, and spills. Those wells that exceed the Maximum Contaminant Level (MCL) for a contaminant are either removed from service or added treatment to the system. Also, a few wells in the basin have been found to be under the direct influence of surface water

due to the geology of the area in which the well is located. These wells are monitored and have additional treatment requirements.

An additional area of concern is the Floridan aquifer in the coastal area of Georgia, specifically Chatham and the surrounding areas. Sea-water is entering the aquifer in South Carolina at Port Royal Sound and beginning to move towards the production wells on Hilton Head Island and eventually towards the City of Savannah. The Georgia Environmental Protection Division has developed a policy document relating to this contamination issue called the *"Interim Strategy for Managing Salt Water Intrusion in the Upper Floridan Aquifer of Southeast Georgia"* dated April 23, 1997. Certain policy measures like reducing Floridan aquifer usage in Chatham County and limiting increased usage from the Floridan aquifer elsewhere in the coastal area are in force. Within the Ogeechee River basin no wells have yet been closed because of increased salt content in the aquifer and none are anticipated to be closed in the near future.

5.1.2 Agriculture

As stated in Section 3.2.2, water demand for agricultural use in the Ogeechee River basin is considerable. Irrigated crops are grown in eight counties of the basin. In 1995, approximately 96% of the agriculture water used was for irrigation purposes (35.74 MGD). The remaining 4% was used for amimal operations. Future agricultural water demand is expected to increase slightly within the basin to 58.70 MGD by the year 2020.

5.1.3 Recreation

As stated in Section 3.3.3, recreation activities include boating, swimming, fishing and picnicking.

5.1.4 Hydropower

There are no hydropower facilities in the Ogeechee basin.

5.1.5 Navigation

There is no commercial navigation in the Ogeechee basin.

5.1.6 Waste Assimilation Capacity

Water quality, wastewater treatment, and wastewater discharge permitting are addressed in Section 4. However, it should be noted that the guidelines for discharge of treated effluent into the rivers and streams of the Ogeechee River basin assume that sufficient surface water flow will be available to assimilate waste and ensure that water quality criteria will be met.

5.1.7 Assessment of Ground Water

Serious Floridan aquifer difficulties are being experienced in the coastal counties of Georgia impacted by the Interim Strategy. At present there are serious restrictions on use throughout the basin, including outright bans on new users in portions of southern Bryan, southern Effingham and all of Chatham county. The agricultural area from Emanuel and Jenkins to Bulloch and Evans shall soon be included in this ban. When that occurs, new irrigation in this farming area may come to a halt. Withdrawals contribute to a regional decline in aquifer levels and cannot be continued. In the past there have also been

concerns that the amount of water withdrawn from the various aquifers is leading to diminishment of river flow.

While the northern portion of the basin has had little development, there is extensive development occurring along the coastal tier of counties. Hinesville in Liberty, retirement communities near Darien in McIntosh, the suburban growth of Effingham and Bryan counties continues unchecked. More water is being requested and cannot be approved or permitted. Some areas can use alternate aquifers, but this is a very limited option. Aquifer storage and recovery (ASR) is now an issue in regard to the TSG application for a private surface water treatment facility on the Ogeechee River in Chatham County. Water would be pumped into the aquifer, and withdrawn at the same locale.

5.2 Assessment of Water Quality

This assessment of water quality is generally consistent with Georgia's water quality assessments for CWA Section 305(b) reporting to EPA. It begins with a discussion of (1) water quality standards, (2) monitoring programs, and (3) data analyses to assess compliance with water quality standards and determine use support. Following this introductory material, detailed assessment results by subbasin are presented in Section 5.2.4.

5.2.1 Water Quality Standards

Assessment of water quality requires a baseline for comparison. A statewide baseline is provided by Georgia's water quality standards, which contain water use classifications, numeric standards for chemical concentrations, and narrative requirements for water quality.

Georgia's water use classifications and standards were first established by the Georgia Water Quality Control Board in 1966. The water use classification system was applied to interstate waters in 1972 by EPD. Table 5-2 provides a summary of water use classifications and basic water quality criteria for each water use. Georgia also has general narrative water quality standards, which apply to all waters. These narrative standards are summarized in Table 5-3.

In addition to the basic water quality standards shown above, Congress made changes in the Clean Water Act in 1987 which required each state to adopt numeric limits for toxic substances for the protection of aquatic life and human health. In order to comply with these requirements, in 1989 the Board of Natural Resources adopted 31 numeric standards for protection of aquatic life and 90 numeric standards for the protection of human health. Appendix B provides a complete list of the toxic substance standards that apply to all waters in Georgia. Georgia has adopted all numeric standards for toxic substances promulgated by the USEPA's resources are made available, Georgia is also developing site-specific standards for major lakes where control of nutrient loading is required to prevent problems associated with eutrophication.

5.2.2 Surface Water Quality Monitoring

EPD's monitoring program integrates physical, chemical, and biological monitoring to provide information for water quality and use attainment assessments and for basin planning. EPD monitors the surface waters of the state to:

- collect baseline and trend data,
- document existing conditions,
- study impacts of specific discharges,

Table 5-2. Georgia Water Use Classifications and Instream Water Quality Standards for Each Use

	Bacteria (fecal coliform)		Dissolved Oxygen (other than trout streams)[1]		pH	Temperature (other than trout streams)[1]	
Use Classification	**30-Day Geometric Mean[2] (MPN/100 ml)**	**Maximum (MPN./100 ml)**	**Daily Average (mg/l)**	**Minimum (mg/l)**	**Std. Units**	**Maximum Rise (°F)**	**Maximum (°F)**
Drinking Water requiring treatment	1,000 (Nov-April) 200 (May-October)	4,000 (Nov-April)	5.0	4.0	6.0-8.5	5	90
Recreation	200 (Freshwater) 100 Coastal)	--	5.0	4.0	6.0-8.5	5	90
Fishing Coastal Fishing[3]	1,000 (Nov-April) 200 (May-October)	4,000 (Nov-April)	5.0	4.0	6.0-8.5	5	90
Wild River	No alteration of natural water quality						
Scenic River	No alteration of natural water quality						

[1] *Standards for Trout Streams for dissolved oxygen are an average of 6.0 mg/l and a minimum of 5.0 mg/l. No temperature alteration is allowed in Primary Trout Streams and a temperature change of 2 °F is allowed in Secondary Trout Streams.*

[2] *Geometric means should be "based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours." The geometric mean of a series of N terms is the Nth root of their product. Example: the geometric mean of 2 and 18 is the square root of 36.*

[3] *Standards are same as fishing with the exception of dissolved oxygen which is site specific.*

Table 5-3. Georgia Narrative Water Quality Standards for All Waters (Excerpt from Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6-.03 - Water Use Classifications and Water Quality Standards)

(5) General Criteria for All Waters. The following criteria are deemed to be necessary and applicable to all waters of the State:

(a) All waters shall be free from materials associated with municipal or domestic sewage, industrial waste or any other waste which will settle to form sludge deposits that become putrescent, unsightly or otherwise objectionable.

(b) All waters shall be free from oil, scum and floating debris associated with municipal or domestic sewage, industrial waste or other discharges in amounts sufficient to be unsightly or to interfere with legitimate water uses.

(c) All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

(d) All waters shall be free from toxic, corrosive, acidic and caustic substances discharged from municipalities, industries or other sources, such as nonpoint sources, in amounts, concentrations or combinations which are harmful to humans, animals or aquatic life.

(e) All waters shall be free from turbidity which results in a substantial visual contrast in a waterbody due to man-made activity. The upstream appearance of a body of water shall be observed at a point immediately upstream of a turbidity-causing man-made activity. The upstream appearance shall be compared to a point which is located sufficiently downstream from the activity so as to provide an appropriate mixing zone. For land disturbing activities, proper design, installation and maintenance of best management practices and compliance with issued permits shall constitute compliance with [this] Paragraph...

- determine improvements resulting from upgraded water pollution control plants,
- support enforcement actions,
- establish wasteload allocations for new and existing facilities,
- verify water pollution control plant compliance,
- document water use impairment and reasons for problems causing less than full support of designated water uses, and
- develop Total Maximum Daily Loads.

EPD used a variety of monitoring tools to collect information to determine if the waterbodies are supporting its designated use. These tools include trend monitoring, intensive surveys, lake, coastal, biological, fish tissue, and toxic substance monitoring, and facility compliance sampling. Each of these is briefly described in the following sections.

Trend Monitoring

Long term monitoring of streams at strategic locations throughout Georgia, trend or ambient monitoring, was initiated by EPD during the late 1960s. This work was and continues to be accomplished to a large extent through cooperative agreements with federal, state, and local agencies who collect samples from groups of stations at specific, fixed locations throughout the year. The cooperating agencies conduct certain tests in the field and send stream samples to EPD for additional laboratory analyses. Although there have been a number of changes over the years, routine chemical trend monitoring is still accomplished through similar cooperative agreements.

Today EPD contracts with the United States Geological Survey (USGS) for the majority of the trend sampling work. In addition to monthly stream sampling, a portion of the work with the USGS involves continuous monitoring at several locations across the state. EPD associates also collect water and sediment samples for toxic substance analyses, as well as macroinvertebrate samples to characterize the biological community at selected locations as a part of the trend monitoring effort. WRD associates also assess fish communities as a part of the monitoring effort. Additional samples used in the assessment were collected by other federal, state and local governments, universities, contracted Clean Lakes projects and utility companies. Trend monitoring stations located in the Ogeechee basin are shown in Figure 5-1.

Focused Trend Monitoring in the Ogeechee River Basin

In 1995, EPD adopted and implemented significant changes to the strategy for trend monitoring in Georgia. The changes were implemented to support the River Basin Management Planning program. The number of fixed stations statewide was reduced in order to focus resources for sampling and analysis in a particular group of basins in any one year in accordance with the basin planning schedule. Sampling focus was placed on the Savannah River basin and Ogeechee River basin during the 1997 sampling. In mid-1997 an additional effort was made to provide for quarterly sampling of fecal coliform (with four samples collected in a thirty day period), and for metals sampling twice per day. To accomplish this effort sampling in the Savannah and Ogeechee basins was continued through 1998.

Figure 5-2 shows the focused trend monitoring network for the Ogeechee River basin used in 1997-1998. During this period statewide trend monitoring was continued at the 37 core station locations statewide, in the Savannah Harbor, and at all continuous monitoring locations. The remainder of the trend monitoring resources were devoted to

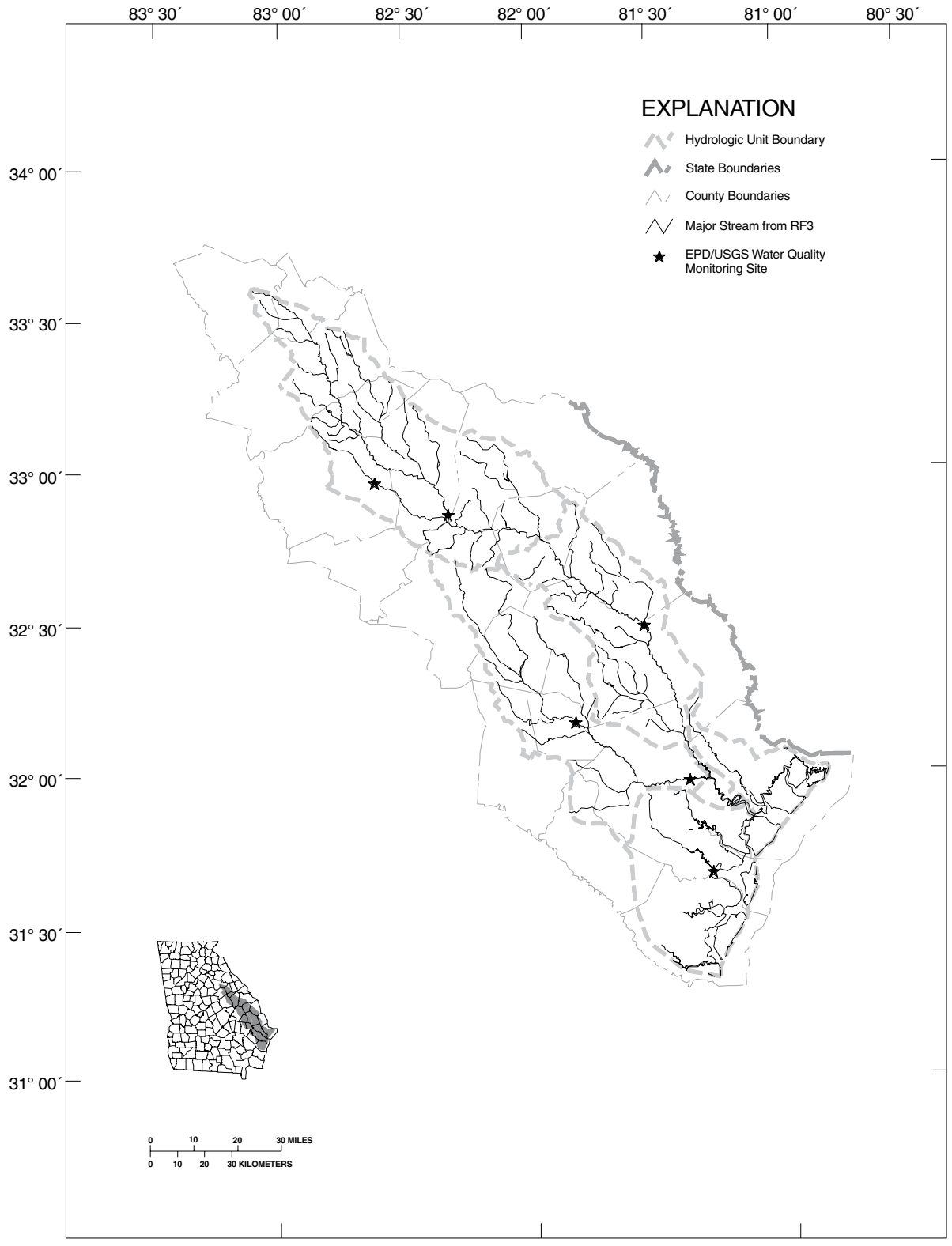

Figure 5-I. Ogeechee River Basin Fixed Sampling Station Locations

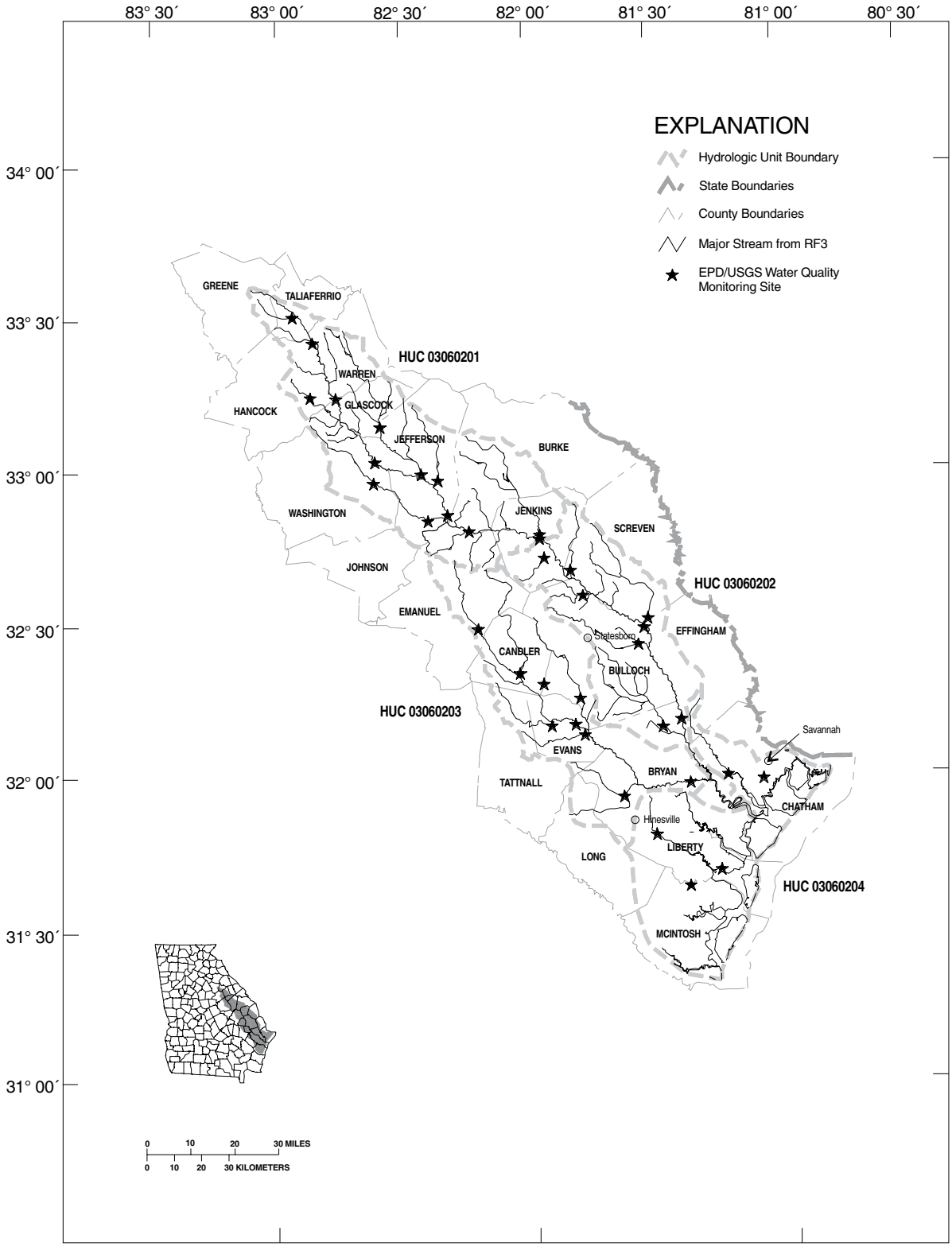

Figure 5-2. Ogeechee River Basin Trend Monitoring Network Station Locations

the Savannah and Ogeechee River basins. As a result, more sampling was conducted in the focus river basins. Increasing the resolution of the water quality monitoring improves the opportunity to identify impaired waters, as well as the causes of impairment.

Intensive Surveys

Intensive surveys complement long-term fixed station fixed station monitoring to focus on a particular issue or problem over a shorter period of time. Several basic types of intensive surveys are conducted, including model calibration surveys and impact studies. The purpose of a model calibration survey is to collect data to calibrate a mathematical water quality mode. Models are used for wasteload allocations and/or TMDLs and as tools for use in making regulatory decisions. Impact studies are conducted when information on the cause-and-effect relationships between pollutant sources and receiving waters is needed. In many cases biological information is collected along with chemical data for use in assessing environmental impacts.

Lake Monitoring

EPD has maintained monitoring programs for Georgia's public access lakes for many years. In the late 1960s, a comprehensive statewide study was conducted to assess fecal coliform levels at public beaches on major lakes in Georgia as the basis for water use classifications and establishment of water quality standards for recreational waters. In 1972, EPD staff participated in the USEPA National Eutrophication Survey, which included 14 lakes in Georgia. A postimpoundment study was conducted for West Point Lake in 1974. Additional lake monitoring continued through the 1970s. The focus of these studies was primarily problem/solution-oriented and served as the basis for regulatory decisions.

Trophic Condition Monitoring

In 1980-1981, EPD conducted a statewide survey of public access freshwater lakes. The study was funded in part by USEPA Clean Lakes Program funds. The survey objectives were to identify freshwater lakes with public access, assess each lake's trophic condition, and develop a priority listing of lakes as to need for restoration and/or protection. In the course of the survey, data and information were collected on 175 identified lakes in 340 sampling trips. The data collected included depth profiles for dissolved oxygen, temperature, pH, specific conductance, and Secchi disk transparency and chemical analyses for chlorophyll *a*, total phosphorus, nitrogen compounds, and turbidity.

Fish Tissue Monitoring

The DNR conducts fish tissue monitoring for toxic chemicals and issues fish consumption guidelines as needed to protect human health. It is not possible for the DNR to sample fish from every stream and lake in the state. However, high priority has been placed on the 26 major reservoirs which make up more than 90 percent of the total lake acreage. These lakes will continue to be sampled as part of the River Basin Management Planning 5-year rotating schedule to track trends in fish contaminant levels. The DNR has also made sampling fish in rivers and streams down-stream of urban and/or industrial areas a high priority. In addition, DNR will focus attention on areas which are frequented by a large number of anglers.

The program includes testing of fish tissue samples for the substances listed in Table 5-4. Of the 43 constituents tested, only PCBs, chlordane, and mercury have been found in fish at concentrations which could create risk to human health from fish consumption.

Table 5-4. Parameters for Fish Tissue Testing

Antimony	a-BHC	Heptachlor
Arsenic	b-BHC	Heptachlor Epoxide
Beryllium	d-BHC	Toxaphene
Cadmium	g-BHC (Lindane)	PCB-1016
Chromium, Total	Chlordane	PCB-1221
Copper	4,4-DDD	PCB-1232
Lead	4,4-DDE	PCB-1242
Mercury	4,4-DDT	PCB-1248
Nickel	Dieldrin	PCB-1254
Selenium	Endosulfan I	PCB-1260
Silver	Endosulfan II	Methoxychlor
Thallium	Endosulfan Sulfate	HCB
Zinc	Endrin	Mirex
Aldrin	Endrin Aldehyde	Pentachloroanisole
		Chlorpyrifos

The test results have been used to develop consumption guidelines which are updated annually and provided to fishermen when they purchase fishing licenses. This program will continue and will be coordinated as a part of the Rive Basin Management Planning process in the future.

In 1994, EPD began utilizing a "risk-based" approach to develop fish consumption guidelines for the state's waters. The EPD's guidelines are based on the use of USEPA potency factors for carcinogenicity and reference doses for noncancer toxicity, whichever is most protective. Inputs used in the derivation of guidelines include a 1×10^{-4} risk level for cancer, a 30 year exposure duration, 70 kg as body weight for an adult, and 70 years as the lifetime duration. A range of possible intakes from a low of 3g/day to a high of 30 g/day is evaluated and one of four different recommendations made: no restriction, limit consumption to 1 meal per week, limit consumption to 1 meal per month, or do not eat.

Toxic Substance Stream Monitoring

EPD has focused resources on the management and control of toxic substances in the state's waters for many years. Toxic substance analyses were conducted on samples from selected trend monitoring stations from 1973-1991. Wherever discharges were found to have toxic impacts or to include toxic pollutants, EPD has incorporated specific limitations on toxic pollutants in NPDES discharge permits.

In 1983 EPD intensified toxic substance stream monitoring efforts. This expanded toxic substance stream monitoring project includes facility effluent, stream, sediment, and fish sampling at specific sites downstream of selected industrial and municipal discharges. From 1983 through 1991, 10 to 20 sites per year were sampled as part of this project. Future work will be conducted as a part of the River Basin Management Planning process.

Facility Compliance Sampling

In addition to surface water quality monitoring, EPD conducts evaluations and compliance sampling inspections of municipal and industrial water pollution control plants. Compliance sampling inspections include the collection of 24-hour composite samples, as well as evaluation of the permittee's sampling and flow monitoring requirements.

More than 280 sampling inspections were conducted by EPD staff statewide in 1997. The results were used, in part, to verify the validity of permittee self-monitoring data and as supporting evidence, as applicable, in enforcement actions. Also, sampling inspections can lead to identification of illegal discharges. In 1997, this work was focused on facilities in the Savannah and Ogeechee River basins in support of the basin planning process.

Aquatic Toxicity Testing

In 1982 EPD incorporated aquatic toxicity testing into selected industrial NPDES permits. In January 1995, EPD issued approved NPDES Reasonable Potential Procedures, which further delineated required conditions for conducting whole effluent toxicity (WET) testing for municipal and industrial discharges. All major permitted discharges (flow greater than 1 MGD) are required to have WET tests run with each permit reissuance. Certain minor dischargers are also subject to this requirement if EPD determines that aquatic toxicity is a potential issue.

5.2.3 Data Analysis

Assessment of Use Support - General Procedures

EPD assesses water quality data to determine if water quality standards are met and if the waterbody supports its classified use. If monitoring data shows that standards are not achieved, depending on the frequency with which standards are not met, the waterbody is said to be not supporting or partially supporting the designated use (see box).

Appendix E includes lists of all streams and rivers in the basin for which data have been assessed. The lists include information on the location, data source, designated water use classification, criterion violated, potential cause, actions planned to alleviate the problem, and estimates of stream miles affected. The list is further coded to indicate status of each waterbody under several sections of the Federal Clean Water Act (CWA). Different sections of the CWA require states to assess water quality (Section 305(b)), to list waters still requiring TMDLs (Section 303(d)), and to document waters with nonpoint source problems (Section 319).

The assessed waters are described in three categories: waters supporting designated uses, waters partially supporting designated uses, and waters not supporting designated uses. Waters were placed on the partially supporting list if:

- The chemical data (dissolved oxygen, pH, temperature) indicated an excursion of a water quality standard in 11 percent - 25 percent of the samples collected.
- A fish consumption guideline was in place for the waterbody.

The partially supporting list also includes stream reaches based on predicted concentrations of metals at low stream flow (7Q10 flows) in excess of state standards as opposed to actual measurements on a stream sample. Generally, a stream reach was placed on the not supporting list if:

- The chemical data (dissolved oxygen, pH, temperature) indicated an excursion of a water quality standard in greater than 25 percent of the samples collected.
- A fish consumption ban was in place for the waterbody.
- Acute or chronic toxicity tests documented or predicted toxicity at low stream flow (7Q10) due to a municipal or industrial discharge to the waterbody.

Analysis of data for fecal coliform bacteria, metals, toxicity, dissolved oxygen, fish/shellfish consumption advisories, and biotic data.

Fecal Coliform Bacteria

Georgia water quality standards establish a fecal coliform criterion of a geometric mean (four samples collected over a 30-day period) of 200 MPN/100 mL for all waters in Georgia during the recreational season of May through October. This is the year-round standard for waters with the water use classification of recreation. For waters classified as drinking water, fishing, or coastal fishing, for the period of November through April, the fecal coliform criterion is a geometric mean (four samples collected over a 30-day period) of 1000 per 100 ml and not to exceed 4000 per 100 ml for any one sample. The goal of fecal coliform sampling in the Ogeechee and Savannah River basin focused mointoring in 1997-1998 was to collect four samples in a thirty day period in each of four quarters. If one geometric was in excess of the standard then the stream segment was placed on the partial support list. If more than one geometric mean was in excess of the standard the stream segment was placed on the not support list.

In come cases the number of samples was not adequate to calculate geometric means. In these cases, the USEPA recommends the use of a review criterion of 400 per 100 ml to evaluate sample results. This bacterial density was used to evaluate data for the months of May through October and the maximum criterion of 4000 per 100 ml was used in assessing the data from the months of November through April. Thus, where geometric mean data was not available, waters were deemed not supporting uses when 26 percent of the samples had fecal coliform bacteria densities greater than the applicable review criteria (400 or 4000 MPN/100 mL) and partially supporting when 11 to 25 percent of the samples were in excess of the review criterion.

Metals

Since data on metals from any one given site are typically infrequent, using the general evaluation technique of 26 percent excursion to indicate nonsupport and 11 to 25 percent excursion to indicate partial support was not meaningful. Streams were placed in the nonsupporting category if multiple excursions of state criteria occurred and the data were based on more than four samples per year. With less frequent sampling, streams with excursions were placed on the partially supporting list. In addition, an asterisk appears beside metals data in those cases where there is a minimal database. Data were collected in the winter and the summer seasons for the Ogeechee and Savannah for comparison to water quality standards. Clean techniques were used. If one of the samples was in excess of the standard the stream segment was placed on the partial support list. This approach is in accordance with US EPA guidance, which suggests any single excursion of a metals criteria be listed.

Toxicity Testing/Toxic Substances

Data from EPD toxicity testing of water pollution control plant effluents were used to predict toxicity in the receiving waterbody at critical, low flows. Effluent data for metals were used to designate either partial support or nonsupport based on whether instream corroborating metals data were available. When instreammetals data were available the stream was determined to be not supporting if a metal concentration exceeded stream standards; when instream data were not available, the stream was listed as partially supporting.

Dissolved Oxygen, pH, Temperature

When available data indicated that these parameters were out of compliance with state standards more than 25 percent of the time, the waters were evaluated as not supporting the designated use. Between 11 percent and 25 percent noncompliance resulted in a partially supporting evaluation.

Fish/Shellfish Consumption Guidelines

A waterbody was included in the not supporting category when an advisory for “no consumption” of fish, a commercial fishing ban, or a shellfishing ban based on actual data was in effect. A waterbody was placed in the partially supporting category if a guideline for restricted consumption of fish had been issued for the waters.

Biotic Data

A “Biota Impacted” designation for “Criterion Violated” indicates that studies showed a modification of the biotic community. Communities used were fish. Studies of fish populations by the DNR Wildlife Resources Division used the Index of Biotic Integrity (IBI) to identify affected fish populations. The IBI values were used to classify the population as Excellent, Good, Fair, Poor, or Very Poor. Stream segments with fish populations rated as “Poor” or “Very Poor” were included in the partially supporting list.

Additional specific detail is provided in the following paragraphs on analysis of data for fecal coliform bacteria, metals, toxicity, dissolved oxygen, fish/shellfish consumption advisories, and biotic data.

5.2.4 Assessment of Water Quality and Use Support

This section provides a summary of the assessment of water quality and support of designated uses for streams and major lakes in the Ogeechee River basin. Most of these results were previously summarized in the Georgia 2000 305(b)/303(d) listing (Georgia DNR, 2000). Results are presented by HUC. A geographic summary of assessment results is provided by HUC in Figures 5-3 through 5-6.

Upper Ogeechee River (HUC 03060201)

Appendix E summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2000).

Monitoring data was collected from 14 trend monitoring stations located within this subbasin during the 1997-1998 period, eight of which were on the mainstem. Historically, no trend monitoring stations were sampled within this subbasin. The following assessment is based on data from these trend monitoring stations.

Data from the mainstem stations indicate that water quality conditions are being affected by nonpoint source pollution.

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in one Ogeechee River mainstem segment and six tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in one segment of the Ogeechee River mainstem due to fish consumption guidelines recommended because of mercury residues. The guidelines are for largemouth bass, spotted sucker and redbreast sunfish. The water use classifications was not fully supported in Short Creek, a tributary to the Ogeechee River, due to fish consumption guidelines recommended because of mercury residue in sunfish.

Lower Ogeechee River (HUC 03060202)

Appendix E summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2000).

Monitoring data was collected from 8 trend monitoring stations located within this subbasin during the 1997-1998 period, two of which were on the mainstem. Historically, one trend monitoring station has been sampled within this subbasin. The following assessment is based on data from these trend monitoring stations.

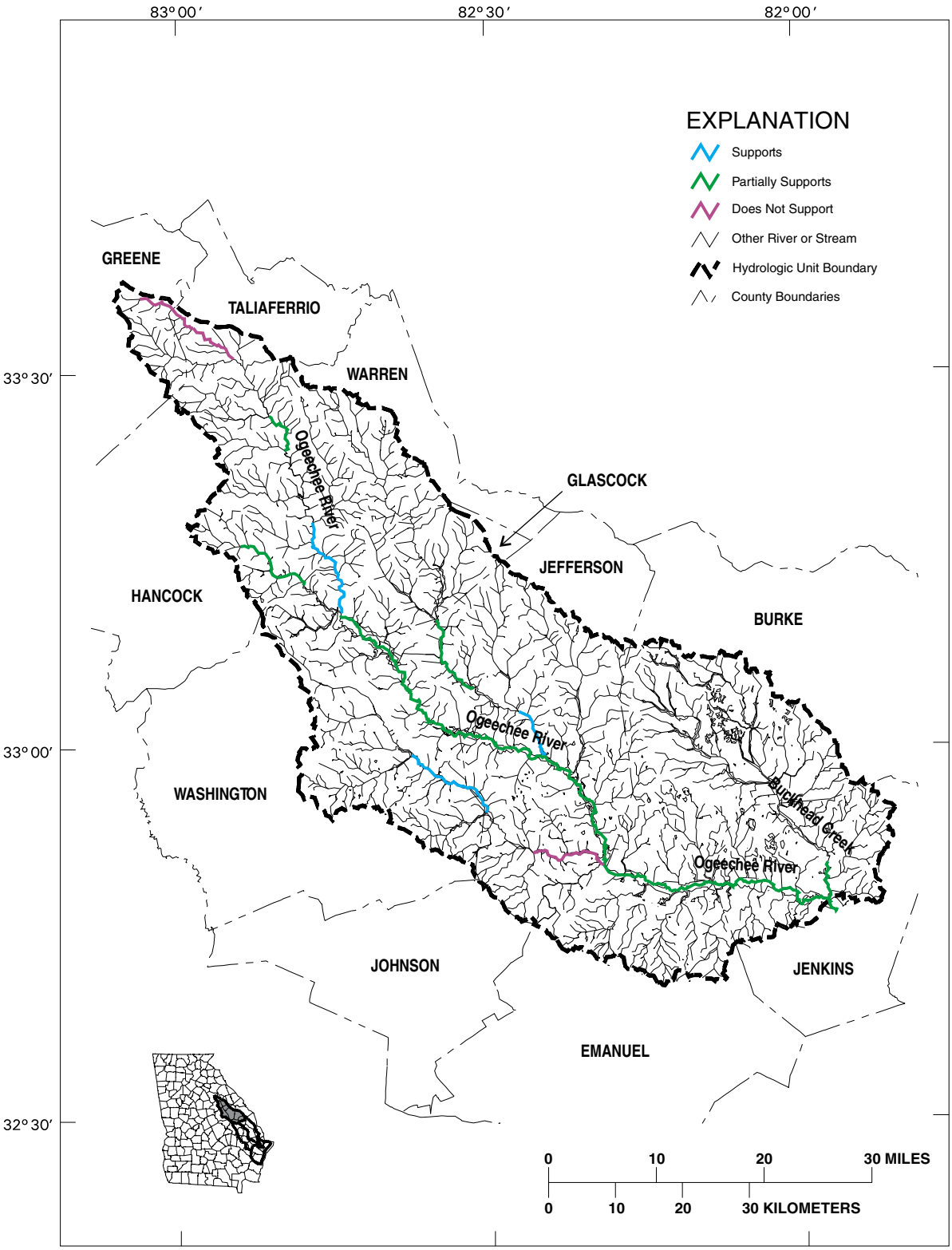

Figure 5-3. Assessment of Water Quality Use Support in the Ogeechee River Basin, HUC 03060201

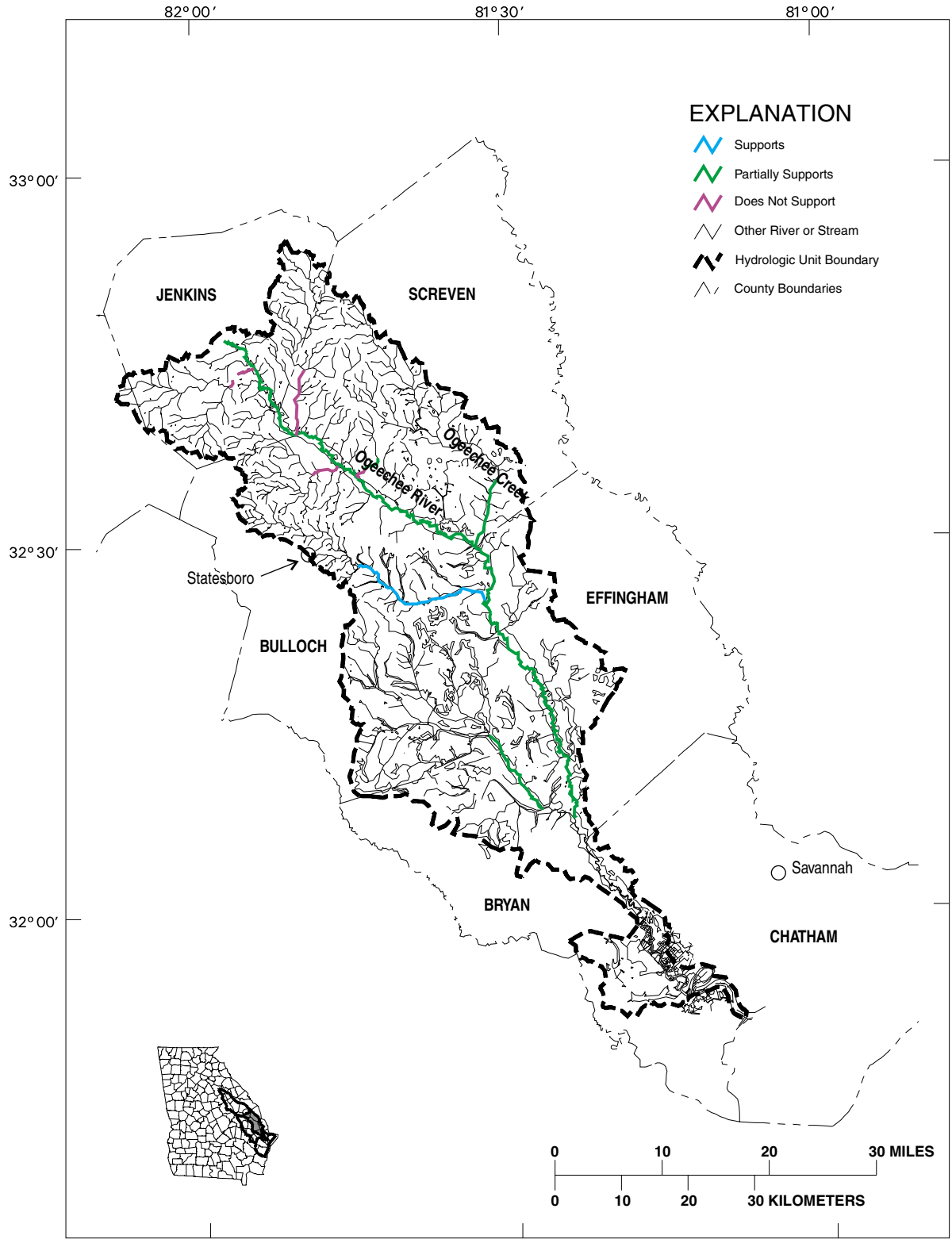

Figure 5-4. Assessment of Water Quality Use Support in the Ogeechee River Basin, HUC 03060202

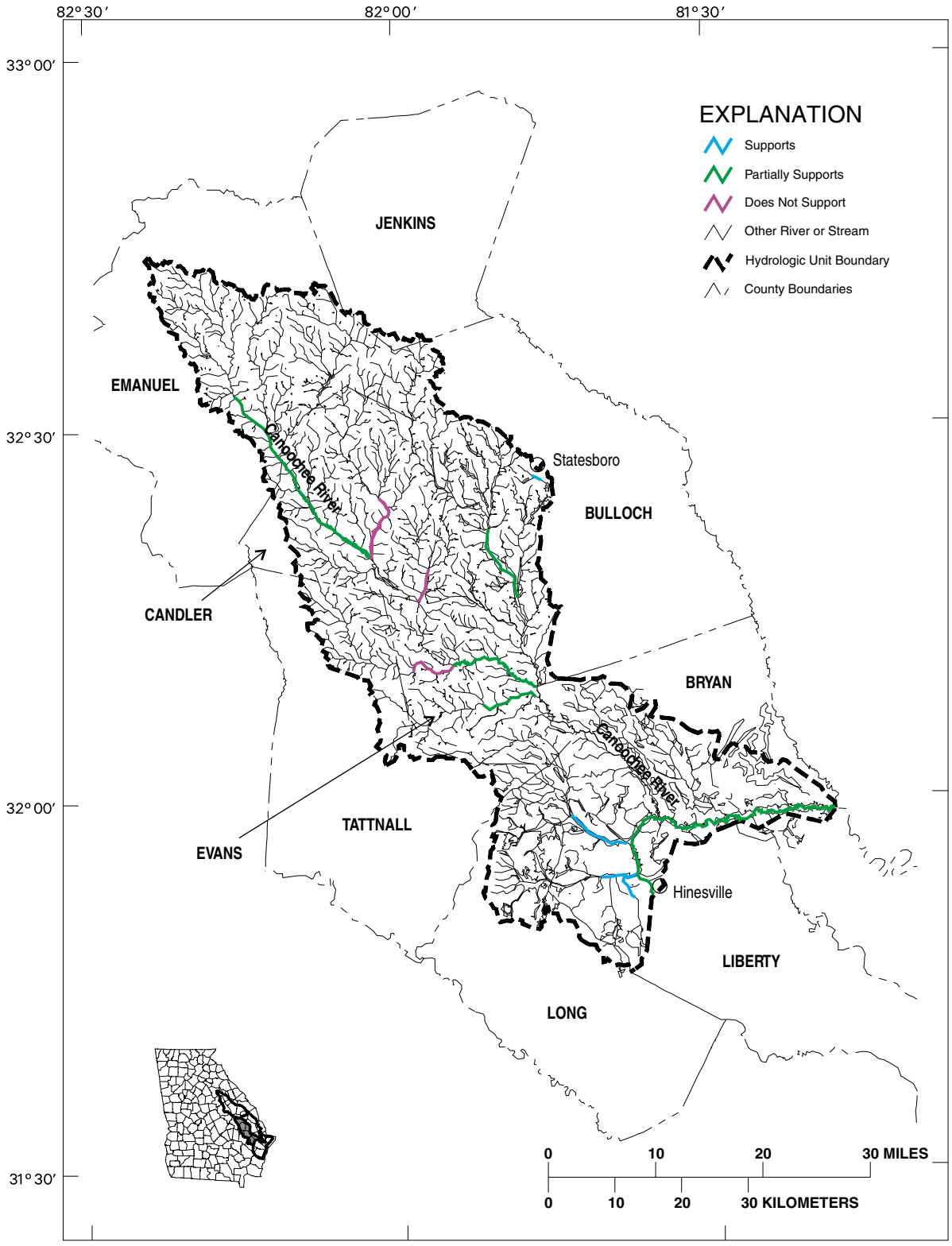

Figure 5-5. Assessment of Water Quality Use Support in the Ogeechee River Basin, HUC 03060203

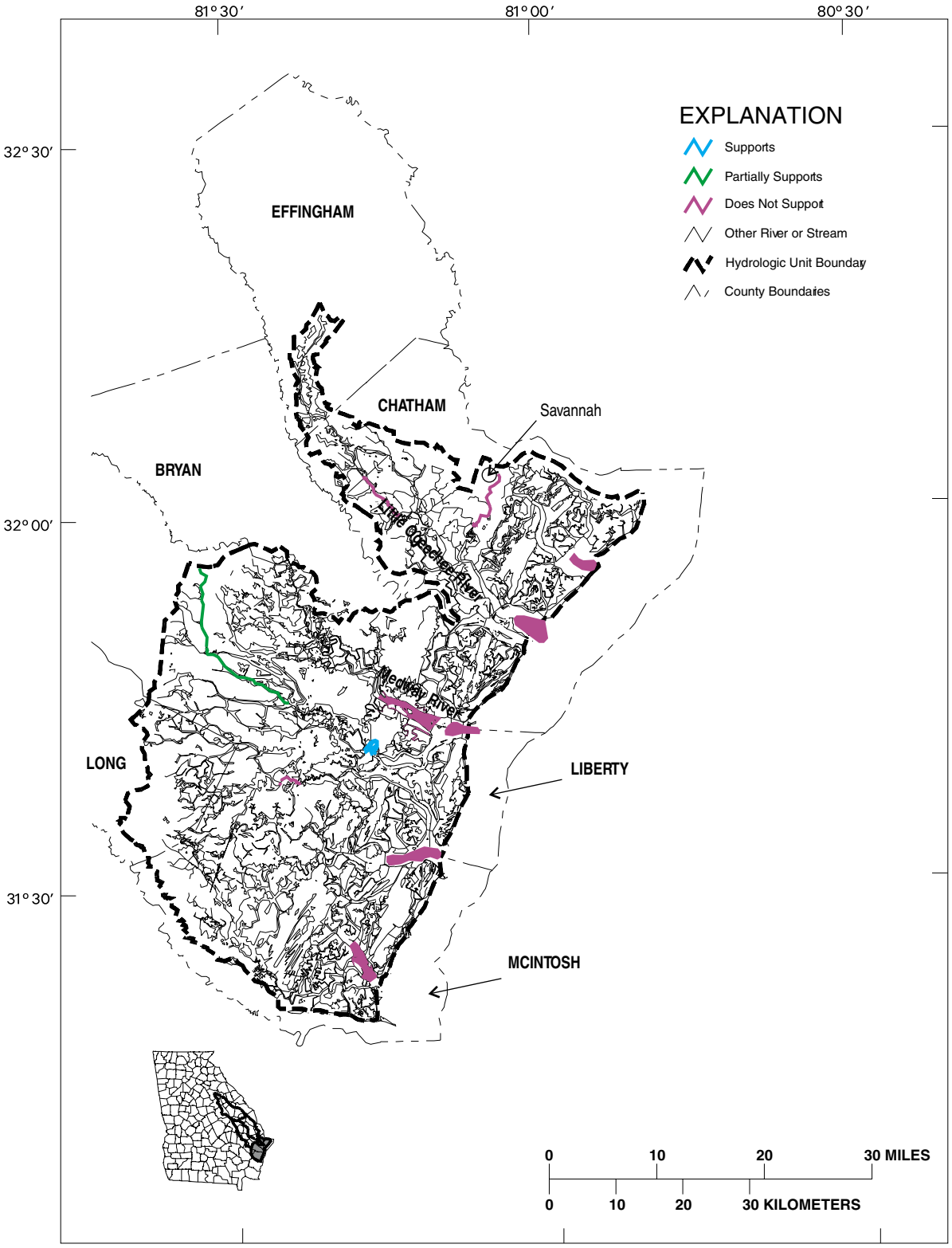

Figure 5-6. Assessment of Water Quality Use Support in the Ogeechee River Basin, HUC 03060204

Data from the mainstem stations indicate that water quality conditions are being affected by nonpoint source pollution.

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in five tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in two Ogeechee River mainstem segments based on fish consumption guidelines due to mercury. The guidelines are for largemouth bass in one river segment and largemouth bass and redbreast sunfish in the second river segment.

Low Dissolved Oxygen

The water use classification of fishing was not fully supported in five tributaries due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the tributaries was due to nonpoint sources. Dissolved oxygen may be lower in these areas due to natural conditions.

Canoochee River (HUC 03060203)

Appendix E summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2000).

Monitoring data was collected from 9 trend monitoring stations located within this subbasin during the 1997-1998 period, three of which were on the mainstem. Historically, no trend monitoring stations were sampled within this subbasin. The following assessment is based on data from these trend monitoring stations.

Data from the mainstem stations indicate that water quality conditions are being affected by urban runoff and nonpoint source pollution.

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in one Canoochee River mainstem segment and three tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry

practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in the Canoochee River mainstem and the Evans County Public Fishing Area (PFA) due to fish consumption guidelines recommended because of mercury residues. The guidelines are for largemouth bass, redbreast sunfish, and channel catfish in the river and largemouth bass in the PFA.

Low Dissolved Oxygen

The water use classification of fishing was not fully supported in one Canoochee River mainstem segment and seven tributaries due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the mainstem segment was due to urban runoff and low dissolved oxygen in the tributaries was due to nonpoint sources, urban runoff and a water pollution control plant discharge. Dissolved oxygen may be lower in these areas due to natural conditions.

Nutrients

The water use classifications of fishing; potentially threatened due to input of nutrients from agricultural runoff.

Ogeechee Coastal (HUC 03060204)

Appendix E summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2000).

Monitoring data was collected from 5 trend monitoring stations located within this subbasin during the 1997-1998 period. Historically, no trend monitoring stations were sampled within this subbasin. The following assessment is based on data from these trend monitoring stations.

Metals

The water use classification of fishing was not fully supported in one segment of the Newport River due to an exceedence of the water quality standard for selenium due to nonpoint sources.

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in six tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Low Dissolved Oxygen

The water use classification of fishing was not fully supported in four tributary stream segments due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the tributaries was due to urban runoff. Dissolved oxygen may be lower in these areas due to natural conditions.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in Casey Canal due to fish consumption conditions recommended because of dieldrin residues in striped mullet.

Prohibited Shellfish Harvesting Areas

Georgia's one-hundred linear mile coastline contains approximately 700,000 acres of potential shellfish habitat. Only about 10% of that area, however, actually produces viable shellfish stocks. Lack of suitable clutch, tidal amplitudes, littoral slope, and other geomorphological features contribute to the limited occurrence of natural shellfish resources along the Georgia coast. Most shellfish in Georgia grow in the narrow inter-tidal zone and are exposed between high water and low water tidal periods. Very few shellfish are naturally produced in sub-tidal waters.

Georgia maintains approximately 32,000 acres approved for the harvest of shellfish for commercial and/or personal consumption. In order to classify any growing area as "Approved" for the harvest of shellfish, the National Shellfish Sanitation Program's (NSSP) Manual of Operations (Part 1, Section 3,a) requires that Georgia show that the growing area "is not subject to contamination from human and/or animal fecal matter in amounts that in the judgement of the SSCA [State Shellfish Control Authority] may present an actual or potential hazard to public health." Georgia currently has three harvest areas comprised of commercial leases and public recreational plots. Table 5-5 indicates the location and size of those areas approved for shellfish harvest. Only those areas designated for Public Recreational Harvest or those areas under commercial lease are classified as "Approved". Approved areas are monitored regularly an discussed below. All other waters of the state are classified "Prohibited", are not monitored and are closed to the taking of shellfish due to the presence of human activities.

Table 5-5. Location and Size of Areas Approved for Shellfish Harvest

County	Approved	Leased	Public
Chatham	2,903 acres	1,400 acres (51.7%)	1,403 acres (48.3%)
Bryan/Liberty	0	0	0
McIntosh	14,902 acres	9,782 acres (65.6%)	5,120 acres (34.4%)
Glynn/Camden	14,011 acres	6,402 acres (45.7%)	7,609 acres (54.3%)

Standards of the NSSP further require the state to regularly collect water samples from each approved harvest area and to perform certain analytical procedures to ensure that the area is free from fecal matter as indicated by the absence of coliform bacteria. Georgia is vigorous in its approach to protecting the health of shellfish consumers. Although the guidelines of the National Shellfish Sanitation Program call for testing shellfish growing waters for contaminants on six occasions per year, the Coastal Resources Division doubles that effort by testing the waters twelve times per year.

During FY97 the Growing Area Element of the Georgia Shellfish Sanitation Project was evaluated by the Federal Food and Drug Administration. The project administered by Georgia Department of Natural Resources Coastal Resources Division was found to be in full compliance with the National Shellfish Sanitation Program (NSSP) requirements.

References

Georgia Environmental Protection Division 1987. Water Availability and Use Report, Coastal Plain River Basins.

DRI/McGraw Hill. 1996. The Regional Economic Forecast of Population and Employment Comprehensive Study, Volume 1. Prepared for: Georgia Department of Natural Resources Environmental Protection Division. DRI/McGraw-Hill, Lexington, MA.

In This Section

- Identified Basin Planning and Management Concerns
- Priorities for Water Quality Concerns
- Priorities for Water Quantity Concerns

Section 6

Concerns and Priority Issues

The assessments in Section 5 present a number of water quality and quantity concerns within the Ogeechee River basin. This section aggregates the assessment data to identify priority issues for development of management strategies.

6.1 Identified Basin Planning and Management Concerns

Sections 4 and 5 identified both site-specific and generalized sources of water quality stressors. Some issues are limited to specific segments, but a number of water quality concerns apply throughout the basin. The criterion listed most frequently in the assessment report.

Section 4 and 5 identified both Site-specific and generalized sources of water quality stressors. Some issues are limited to specific segments, but a number of water quality concerns apply throughout the basin. The criterion listed most frequently in the Georgia 2000 305(b)/303(d) List as contributor to nonsupporting or partial supporting status was fish consumption guidelines (274 out of 452, or 61% of stream miles within the basin assessed as not fully supporting), followed by fecal coliform bacteria (109 out of 452, or 24% of stream miles within the basin assessed as not fully supporting). Fish consumption issues are associated primarily with mercury as a result of air deposition and possibly naturally occurring sources and fecal coliform is associated primarily with urban runoff or nonpoint sources.

Within some individual stream reaches, other sources may be of greater importance (e.g., WPCP effluent); however, urban runoff and general nonpoint sources represent a basin-wide concern. Further, strong population growth and development pressure in parts of the basin will tend to increase the importance of urban runoff as a stressor of concern. For such widespread concerns, basin-wide management strategies will be needed.

Major water quality and quantity concerns for the Ogeechee River basin are summarized by geographic area in terms of the concerns and sources of these concerns in Table 6-1. Table 6-2 summarizes the pollutants identified as causing impairment of

designated uses in the basin; however, not all identified concerns are related to pollutant loads. Ongoing control strategies are expected to result in support of designated uses in a number of waters. In other waters, however, the development of additional management strategies may be required or implemented in order to achieve water quality standards.

Table 6-I. Summary of Concerns in the Ogeechee River Basin

	Potential Source of the Stressor by HUC			
Stressors of Concern	**Upper Ogeechee River HUC 03060201**	**Lower Ogeechee River HUC 03060202**	**Canoochee River HUC 03060203**	**Ogeechee Coastal River HUC 03060204**
Metals				Urban and rural NPS
Fecal Coliform Bacteria	Multiple source potential	Multiple source potential	Multiple source potential	Multiple source potential
Erosion and Sedimentation	Urban and Rural NPS	Urban and Rural NPS	Agricultural NPS	Urban and Rural NPA
Dissolved Oxygen		Urban and rural NPS	Urban and rural NPS, WPCP effluent	Urban and rural NPS
Nutrients			Agricultural NPS	
Fish Consumption Guidelines	Nonpoint mercury	Nonpoint mercury	Nonpoint mercury	Nonpoint dieldrin
Water Quantity		Groundwater availability for residential and commercial growth		
Source Water Protection		Groundwater Potentially threatened		

Table 6-2. Summary of Pollutants Causing Water Quality Impairment in the Ogeechee River Basin

	Geographic Area			
Use Classification of Waterbody Segments	**Upper Ogeechee River HUC 03060201**	**Lower Ogeechee River HUC 03060202**	**Canoochee River HUC 03060203**	**Ogeechee Coastal River HUC 03060204**
Fishing (Support for Aquatic Life)		DO	DO	DO, metals
Fishing (Fish Consumption)	Mercury	Mercury	Mercury	Dieldrin
Drinking Water				

In the following pages, priority water quality and quantity concerns are presented by Hydrologic Unit. For some water quality and quantity concerns, problem statements are identical for each HUC, others differ between HUCs. Detailed strategies for addressing these concerns are then supplied in Section 7.

Each concern is listed in the form of a "Problem Statement" which summarizes the linkage between stressor sources and water quality impacts. The order in which concerns are listed for each HUC should not be considered to be significant. Prioritization of basin concerns requires consensus among all stakeholders, and has not been finalized;

however, short-term water quality action priorities for EPD are summarized in Section 6.2.

6.1.1 Problem Statements

Upper Ogeechee River Subbasin (HUC 03060201)

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in one Ogeechee River mainstem segment and six tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in one segment of the Ogeechee River mainstem due to fish consumption guidelines recommended because of mercury residues. The guidelines are for largemouth bass, spotted sucker and redbreast sunfish. The water use classifications was not fully supported in Short Creek, a tributary to the Ogeechee River, due to fish consumption guidelines recommended because of mercury residue in sunfish.

Lower Ogeechee River Subbasin (HUC 03060202)

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in five tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in two Ogeechee River mainstem segments based on fish consumption guidelines due to mercury. The guidelines are for largemouth bass in one river segment and largemouth bass and redbreast sunfish in the second river segment.

Low Dissolved Oxygen

The water use classification of fishing was not fully supported in five tributaries due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the tributaries was due to nonpoint sources. Dissolved oxygen may be lower in these areas due to natural conditions.

Groundwater Quality and Quantity

Water needs for residential and commercial development growth is a concern for Southeast Bryan County. The limit on availability of groundwater is having an impact on continued development, especially with pressures to reduce usage of the Floridian aquifer and without any other convenient source of water.

Groundwater levels are also threatened due to high rates of pumpage of groundwater for agricultural irrigation. USGS presented evidence that agricultural groundwater usage may be responsible for a lower groundwater table and less recharge to streams. The data suggested that preagricultural irrigation 7Q10s in the Lower Ogeechee River were higher than 7Q10s since irrigation pressures began.

Canoochee River Subbasin (HUC 03060203)

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in one Canoochee River mainstem segment and three tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water use due to poor fish communities or sedimentation.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in the Canoochee River mainstem and the Evans County Public Fishing Area (PFA) due to fish consumption guidelines recommended because of mercury residues. The guidelines are for largemouth bass, redbreast sunfish, and channel catfish in the river and largemouth bass in the PFA.

Low Dissolved Oxygen

The water use classification of fishing was not fully supported in one Canoochee River mainstem segment and seven tributaries due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the mainstem segment was due to urban runoff and low dissolved oxygen in the tributaries was due to nonpoint sources, urban runoff and a water pollution control plant discharge. Dissolved oxygen may be lower in these areas due to natural conditions.

Nutrients

The water use classifications of fishing; potentially threatened due to input of nutrients from agricultural runoff.

Ogeechee Coastal Subbasin (HUC 03060204)

Metals

The water use classification of fishing was not fully supported in one segment of the Newport River due to an exceedance of the water quality standard for selenium due to nonpoint sources.

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in six tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Low Dissolved Oxygen

The water use classification of fishing was not fully supported in four tributary stream segments due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the tributaries was due to urban runoff. Dissolved oxygen may be lower in these areas due to natural conditions.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in Casey Canal due to fish consumption conditions recommended because of dieldrin residues in striped mullet.

Prohibited Shellfish Harvesting Areas

The water use classification of fishing was not fully supported in several estuarine waters including Doboy Sound, Medway River, Ossabaw Estuary, Sapelo Sound, St. Catherines Sound and Wassaw Sound due to prohibited shellfish harvesting areas. These are administrative in nature and not based on water quality data.

Georgia's one-hundred linear mile coastline contains approximately 700,000 acres of potential shellfish habitat. Only about 10% of that area, however, actually produces viable shellfish stocks. Lack of suitable clutch, tidal amplitudes, littoral slope, and other geomorphological features contribute to the limited occurrence of natural shellfish resources along the Georgia coast. Most shellfish in Georgia grow in the narrow inter-tidal zone and are exposed between high water and low water tidal periods. Very few shellfish are naturally produced in sub-tidal waters.

Georgia maintains approximately 32,000 acres approved for the harvest of shellfish for commercial and/or personal consumption. In order to classify any growing area as "Approved" for the harvest of shellfish, the National Shellfish Sanitation Program's (NSSP) Manual of Operations (Part 1, Section 3,a) requires that Georgia show that the growing area "is not subject to contamination from human and/or animal fecal matter in amounts that in the judgement of the SSCA [State Shellfish Control Authority] may present an actual or potential hazard to public health." Georgia currently has three harvest areas comprised of commercial leases and public recreational plots. Table 5-5 indicates

the location and size of those areas approved for shellfish harvest. Only those areas designated for Public Recreational Harvest or those areas under commercial lease are classified as "Approved". Approved areas are monitored regularly an discussed below. All other waters of the state are classified "Prohibited", are not monitored and are closed to the taking of shellfish due to the presence of human activities.

Standards of the NSSP further require the state to regularly collect water samples from each approved harvest area and to perform certain analytical procedures to ensure that the area is free from fecal matter as indicated by the absence of coliform bacteria. Georgia is vigorous in its approach to protecting the health of shellfish consumers. Although the guidelines of the National Shellfish Sanitation Program call for testing shellfish growing waters for contaminants on six occasions per year, the Coastal Resources Division doubles that effort by testing the waters twelve times per year.

During FY97 the Growing Area Element of the Georgia Shellfish Sanitation Project was evaluated by the Federal Food and Drug Administration. The project administered by Georgia Department of Natural Resources Coastal Resources Division was found to be in full compliance with the National Shellfish Sanitation Program (NSSP) requirements.

6.2 Priorities for Water Quality Concerns

6.2.1 Short-Term Water Quality Action Priorities for EPD

Section 6.1 identifies known priority concerns for which management and planning are needed in the Ogeechee River basin. Because of limited resources, and, in some cases, limitations to technical knowledge, not all of these concerns can be addressed at the same level of detail within the current 5-year cycle of basin management. It is therefore necessary to assign action priorities for the short term based on where the greatest return for available effort can be expected.

Current priorities for action by EPD (2000) are summarized in Table 6-3 and discussed below. These reflect EPD's assessment of where the greatest short-term return can be obtained from available resources. These priorities were presented to and discussed with the local advisory committee in March 2000. The priorities were also public noticed and approved by the USEPA as part of the Georgia CWA 303(d) listing process in 2000 and discussed in the report, *Water Quality in Georgia, 1998-1999.*

Assigning Priorities for Stream Segments

For several waters in the Ogeechee River basin and other river basins around the state, currently planned control strategies are expected to result in attainment of designated uses. EPD resources will be directed to ensure that the ongoing pollution control strategies are implemented as planned and water quality improvements are achieved.

Table 6-3. EPD's Short-Term Priorities for Addressing Waters Not Fully Supporting Designated Use

Priority	Type
1	Segments where ongoing pollution control strategies are expected to result in achieving support of designated uses; active special projects.
2	Segments with multiple data points which showed metals in excess of water quality standards and segments in which dissolved oxygen is an issue.
3	Waters for which urban runoff and generalized nonpoint sources have resulted in violations of standards for fecal coliform bacteria and waters for which fish consumption guidelines are in place due to air deposition of mercury.

These waters on the Georgia 2000 305(b)/303(d) List are identified as active 305(b) waters, and are the highest priority waters, as these segments will continue to require resources to complete actions and ensure standards are achieved. These stream segments have been assigned priority one.

Second priority was allocated to segments with multiple data points which showed metals concentrations from nonpoint sources in excess of water quality standards and to segments in which dissolved oxygen concentration was an issue (See Appendix E).

Third priority was assigned to waters where air deposition, urban runoff or general nonpoint sources caused fish consumption guidelines listings, and/or metal or fecal coliform bacteria standards violations. Waters added to the Georgia 303(d) list by EPA were also assigned to third priority. Within the current round of basin planning these sources will be addressed primarily through general strategies of encouraging best management practices for control of stressor loadings. In addition, additional work will be initiated to implement approved TMDLs on waters in this group. TMDLs have been completed on those waters in Appendix E that have a “3" in the column labeled 303(d).

Several issues helped forge the rationale for priorities. First, strategies are currently in place to address the significant water quality problems in the Ogeechee River basin and significant resources will be required to ensure that these actions are completed. Second, the vast majority of waters for which no control strategy is currently in place are listed due to fish consumption guidelines or as a result of exceedance of fecal coliform bacteria due to urban runoff or nonpoint At the present time, the efficacy of the standards for fecal coliform bacteria standard are in question in the scientific community, as described in Section 4.2. Also, there is no national strategy in place to address air deposition of mercury which is thought to cause the mercury which contributes to the fish tissue guidance listings.

6.2.2 General Long-Term Priorities for Water Quality Concerns

Long-term priorities for water quality management in the Ogeechee River basin will need to be developed by EPD and all other stakeholders during the next iteration of the basin management cycle. Long-term priorities must seek a balance between a number of different basinwide objectives. These objectives include:

- Protecting water quality in lakes, rivers, streams, and estuaries through attainment of water quality standards and support for designated uses;
- Providing adequate, high quality water supply for municipal, agricultural, industrial, and other human activities;
- Preserving habitat suitable for the support of healthy aquatic and riparian ecosystems;
- Protecting human health and welfare through prevention of water-borne disease; minimization of risk from contaminated fish tissue, and reduction of risks from flooding; and
- Ensuring opportunities for economic growth, development, and recreation in the region.

6.3 Priorities for Water Quantity Concerns

Section 5 identified groundwater overuse and saltwater intrusion as a major concern for water quantity in the Ogeechee basin. GAEPD has placed limitations on additional withdrawals of groundwater in the affected areas. This has effectively slowed the rate of

additional contamination. In April, 1997, GAEPD implemented an Interim Strategy to protect the Upper Floridan Aquifer in the 24 coastal counties from salt-water intrusion which includes 12 counties in the Ogeechee basin. The strategy, developed in consultation with South Carolina and Florida, will continue until December 31, 2005 at which time GAEPD plans to implement a Final Strategy that will (a) stop salt-water intrusion before municipal water supply wells on Hilton Head Island, South Carolina and Savannah, Georgia are contaminated and (b) prevent an existing salt-water problem at Brunswick, Georgia from worsening. To accomplish this objective, GAEPD will do the following:

(1) Assuming the General Assembly provides funds, conduct expanded scientific and feasibility studies to determine with certainty how to permanently stop the salt-water intrusion moving towards Hilton Head Island, South Carolina and Savannah, Georgia and how to prevent the existing salt-water intrusion at Brunswick, Georgia from worsening.

(2) Require the development of comprehensive local water supply plans in a 24 county area of southeast Georgia. These are required by December 31, 2000 from all 24 counties as a condition of issuing any future proposed public water, agriculture, or industry water withdrawal permits.

(3) Impose caps on groundwater use in Glynn County, Chatham County, and portions of Bryan and Effingham Counties, to avoid worsening the rate of salt-water intrusion at HiltonHead-Savannah and at Brunswick.

(4) Reduce groundwater use in Chatham County by at least 10 million gallons per day by December 31, 2005 through conservation and substitution of surface water for groundwater. This will be affirmed through reductions in groundwater use permits.

(5) Allow, on an interim basis, increases in groundwater withdrawals in the areas of southeast Georgia that have little impact on salt-water intrusion problems.

(6) Encourage and promote water conservation and reduced groundwater usage wherever feasible, throughout southeast Georgia.

Some wells in Georgia produce water containing relatively high levels of naturally occurring iron and manganese. Another natural source of contamination is from radioactive minerals that are a minor rock constituent in some Georgia aquifers. While natural radioactivity may occur anywhere in Georgia, the most significant problems have occurred at some locations near the Gulf Trough, a geologic feature of the Floridan Aquifer in Coastal Plain. Wells can generally be constructed to seal off the rocks producing the radioactive elements to provide safe drinking water. Radon, a radioactive gas produced by the radioactive minerals mentioned above, also has been noted in highly variable amounts in groundwater from some Georgia wells, especially in the Piedmont region. Treatment systems may be used to remove radon from groundwater.

Tritium, a radioactive isotope of hydrogen, in excess of expected background levels, was found in 1991 by GAEPD sampling in Burke County aquifers. While the greatest amount of tritium found lie across the Savannah River from the Savannah River Plant in South Carolina, where tritium was produced for nuclear weapons. The tritium does not exceed MCLs for drinking water, therefore it does not represent a health threat to Georgia citizens at the present time.

6.3.1 Priorities for Competing Demands

With regard to the priority to be placed on meeting competing demands for future water use, the EPD (in conjunction with a broad group of stakeholders from north,

central, and southwest Georgia) has established a set of "guiding principles" which will be followed in developing the state's position regarding the allocation of water. These principles are partially based upon the prioritization given to meeting categories of water needs under Georgia law (i.e., municipal needs are the first priority, and agricultural water needs are second; all other water needs follow these two). The principles are summarized below:

1. Municipal (M&I) demands have the highest priority.
2. Agriculture needs must be satisfied.
3. Minimum instream flow rates must be met in order to preserve water quality.
4. If other demands (e.g., industrial, recreation, hydropower, navigation, and environment) can not be met under conditions of water shortage, efforts will be made to optimize the mix of economic and environmental values.

While these "guiding principles" were specifically developed to give expression to Georgia's water needs priorities in those areas of Georgia within the study area of the Alabama-Coosa-Tallapoosa/Appalachicola-Chattahoochee-Flint (ACT/ACF) Comprehensive Study, it is likely that they characterize water needs priorities throughout the state. Thus, Georgia places highest value on the use of water for its citizens to use in drinking and water for agricultural needs. It is also extremely important to address needs for sufficient instream flows to maintain acceptable quality of aquatic habitat.

In This Section

- "Big Picture" Overview for the Ogeechee River Basin
- General Basinwide Management Strategies
- Targeted Management Strategies

Section 7

Implementation Strategies

This section builds on the priority issues identified in Section 6 and proposes strategies to address the major water quality problems in the Ogeechee River basin.

Georgia's Mission Statement for river basin management planning is "to develop and implement a river basin planning program to protect, enhance, and restore the waters of the state of Georgia that will provide for effective monitoring, allocation, use, regulation, and management of water resources". Associated with this mission are a variety of goals which emphasize coordinated planning necessary to meet all applicable local, state, and federal laws, rules, and regulations, and provide for water quality, habitat, and recreation. For the Ogeechee basin, these goals will be implemented through a combination of a variety of general strategies, which apply across the basin and across the state, and targeted or site-specific strategies. Section 7.1 describes the big-picture management goals for the Ogeechee River basin. Section 7.2 describes the general and basinwide implementation strategies most relevant to the Ogeechee River. Targeted strategies for specific priority concerns within each subbasin, as identified in Section 6, are then presented in 7.3.

7.1 "Big Picture" Overview for the Ogeechee River Basin

This Ogeechee River Basin Management Plan includes strategies to address a number of different basinwide objectives. These include:

- Protecting water quality in lakes, rivers, streams, estuaries, and coastal waters through attainment of water quality standards and support for designated uses;
- Providing adequate, high quality water supply for municipal, agricultural, industrial, and other human activities;
- Preserving habitat suitable for the support of healthy aquatic and riparian ecosystems;

- Protecting human health and welfare through prevention of water-borne disease; minimization of risk from contaminated fish tissue, and reduction of risks from flooding; and
- Ensuring opportunities for economic growth, development, and recreation in the region.

Achieving these objectives is the responsibility of a variety of state and federal agencies, local governments, business, industry, and individual citizens. Coordination between partners is difficult, and impacts of actions in one locale by one partner on conditions elsewhere in the basin are not always understood or considered. River Basin Management Planning (RBMP) is an attempt to bring together stakeholders in the basin to increase coordination and to provide a mechanism for communication and consideration of actions on a broad scale to support water resource objectives for the entire basin. RBMP provides the framework to begin to understand the consequences of local decisions on basinwide water resources.

RBMP, begun in 1993, is changing the way EPD and other state agencies do business. At the same time, local government comprehensive planning requirements require a higher degree of effort and awareness by local governments to address resource protection and planning for the future.

This plan presents general broad-scale goals and strategies for addressing the most significant existing and future water quality and quantity issues within the Ogeechee basin. The basin plan provides a whole-basin framework for appropriate local initiatives and controls, but cannot specify all the individual local efforts which will be required. The basin plan will, however, provide a context and general management goals for the local-scale plans needed to address local-scale nonpoint loads in detail. EPD expects local governments and agencies to take the initiative to develop local strategies consistent with the basin-scale strategies presented in this plan.

A number of concerns identified in this plan will affect planning and decision-making by local governments, state agencies, and business interests. Detailed strategies for addressing identified concerns are presented in Section 7.4. This section provides an overview of the key “big picture” issues and planning opportunities in the Ogeechee River basin.

7.1.1 Water Quality Overview

As discussed in Section 5, water quality in the Ogeechee River basin is generally good at this time, although problems remain to be addressed and proactive planning is needed to protect water quality into the future. Many actions have already been taken to protect water quality. Programs implemented by federal, state, and local governments, farmers, foresters, and other individuals have greatly helped to protect and improve water quality in the basin over the past twenty years. Streams are no longer dominated by untreated or partially treated sewage or industrial discharges, which resulted in little oxygen and impaired aquatic life. For the most part, local government and industrial wastewaters are properly treated, oxygen levels have returned, and fish have followed.

The primary source of pollution that continues to affect waters of the Ogeechee River basin results from nonpoint sources. Key types of nonpoint source pollution impairing or potentially threatening water quality in the Ogeechee River basin include erosion and sedimentation, bacteria from urban and rural nonpoint sources, metals from urban and rural sources, excess nutrient loads to reservoirs, and increases in water temperature resulting from loss of riparian canopy and increased paved surface areas. These problems result from the cumulative effect of activities of many individual landowners or managers. Population is growing every year, increasing the potential risks from nonpoint

source pollution. Growth is essential to the economic health of the Ogeechee River basin, yet growth without proper land use planning and implementation of best management practices to protect streams and rivers can create harmful impacts on the environment.

Because there are so many small sources of nonpoint loading spread throughout the watershed, nonpoint sources of pollution cannot effectively be controlled by state agency permitting and enforcement, even where regulatory authority exists. Rather, control of nonpoint loading will require the cooperative efforts of many partners, including state and federal agencies, individual landowners, agricultural and forestry interests, local county and municipal governments, and Regional Development Centers. A combination of regulatory and voluntary land management practices will be necessary to maintain and improve the water quality of rivers, streams, and lakes in the Ogeechee River basin.

Key Actions by EPD

The Georgia EPD Water Protection Branch has responsibility for establishing water quality standards, monitoring water quality, river basin planning, water quality modeling, permitting and enforcement of point source NPDES permits, and developing Total Maximum Daily Loads (TMDLs) where ongoing actions are not sufficient to achieve water quality standards. Much of this work is regulatory. EPD is also one of several agencies responsible for facilitating, planning, and educating the public about management of nonpoint source pollution. Nonpoint source programs implemented by Georgia and by other states across the nation are voluntary in nature. The Georgia EPD Water Resources Branch regulates the use of Georgia's surface and ground water resources for municipal and agricultural uses, which includes source water assessment and protection activities in compliance with the Safe Drinking Water Act.

Actions being taken by EPD at the state level to address water quality problems in the Ogeechee River basin include the following:

- **Watershed Assessments and Watershed Protection Implementation Plans**. When local governments propose to expand an existing wastewater facility, or propose a new facility with a design flow greater than 0.5 million gallons per day, EPD requires a comprehensive watershed assessment and development of a watershed protection implementation plan. The watershed assessment includes monitoring and assessment of current water quality and land use in the watershed and evaluation of the impacts of future land use changes. A watershed protection implementation plan includes specific strategies such as land use plans and local actions designed to ensure that existing problems are being addressed and that future development will be conducted in a way to prevent water quality standards violations.
- **Total Maximum Daily Loads (TMDLs)**. Where water quality sampling has documented standards violations and ongoing actions are not sufficient to achieve water quality standards in a two year period, a TMDL will be established for a specific pollutant on the specific stream segment in accordance with EPA guidance. The TMDL will specify the allowable loading of a pollutant from both point and nonpoint sources. EPD will implement TMDLs through a watershed approach using a combination of regulatory and non-regulatory tools. TMDL's established under the Clean Water Act for stream segments within this basin are included in this River Basin Plan and are incorporated by reference herein. Those stream segments are identified with a "3" in the 303(d) column of the table in Appendix E of this plan. The TMDL's for this river basin are too voluminous to be attached to this plan, but copies of any of the TMDLs adopted by reference may be obtained from EPD by sending a request to the address in the Preface.

- **Source Water Protection**. The public water supply in the Ogeechee basin is drawn from surface and groundwater. To provide for the protection of public water supplies, Georgia EPD is developing a Source Water Assessment Program in alignment with the 1996 amendments to the Safe Drinking Water Act and corresponding recent EPA initiatives. This new initiative is expected to result in assessments of threats to drinking water supplies and, ultimately, local Source Water Protection Plans. Recent "Criteria for Watershed Protection" (a sub-section of the Rules for Environmental Planning Criteria) produced by the Department of Community Affairs set minimum guidelines for protection of watersheds above "governmentally owned" water supply intakes.
- **Fish Consumption Guidelines**. EPD and the Wildlife Resources Division work to protect public human health by testing fish tissue and issuing fish consumption guidelines as needed, indicating the recommended rates of consumption of fish from specific waters. The guidelines are based on conservative assumptions and provide the public with factual information for use in making rational decisions regarding fish consumption.

Key Actions by Resource Management Agencies

Nonpoint source pollution from agriculture and forestry activities in Georgia is managed and controlled with a statewide non-regulatory approach. This approach is based on cooperative partnerships with various agencies and a variety of programs.

Agriculture in the Ogeechee River basin is primarily restricted to livestock and poultry operations. Key partners for controlling agricultural nonpoint source pollution are the Soil and Water Conservation Districts, the Georgia Soil and Water Conservation Commission, and the USDA Natural Resources Conservation Service. These partners promote the use of environmentally sound best management practices (BMPs) through education, demonstration projects, and financial assistance. In addition to incentive payments and cost-sharing for BMPs, three major conservation programs from USDA will be available to producers and rural landowners. These are the Conservation Reserve Program, which protects highly erodible and environmentally sensitive land; the Wetland Reserve Program, designed to protect, restore, and enhance wetlands with cost-share incentives; and the Wildlife Habitat Incentives Program, which will help landowners develop and improve wildlife habitat.

Forestry is a major part of the economy in the Ogeechee basin. The Georgia Forestry Commission (GFC) is the lead agency for controlling silvicultural nonpoint source pollution. The GFC develops forestry practice guidelines, encourages BMP implementation, conducts education, investigates and mediates complaints involving forestry operations, and conducts BMP compliance surveys. Recently, the State Board of Registration for Foresters adopted procedures to sanction or revoke the licenses of foresters involved in unresolved complaints where the lack of BMP implementation has resulted in water quality violations.

Key Actions by Local Governments

Addressing water quality problems resulting from nonpoint source pollution will primarily depend on actions taken at the local level. Particularly for nonpoint sources associated with urban and residential development, it is only at the local level that regulatory authority exists for zoning and land use planning, control of erosion and sedimentation from construction activities, and regulation of septic systems.

Local governments are increasingly focusing on water resource issues. In many cases, the existence of high quality water has not been recognized and managed as an economic

resource by local governments. That situation is now changing due to a variety of factors, including increased public awareness, high levels of population growth in many areas resulting in a need for comprehensive planning, recognition that high quality water supplies are limited, and new state-level actions and requirements. The latter include:

- Requirements for Watershed Assessments and Watershed Protection Implementation Plans when permits for expanded or new municipal wastewater discharges are requested;
- Development of Source Water Protection Plans to protect public drinking water supplies;
- Requirements for local comprehensive planning, including protection of natural and water resources, as promulgated by the Georgia Department of Community Affairs.

In sum, it is the responsibility of local governments to implement planning for future development which takes into account management and protection of the water quality of rivers, streams, and lakes within their jurisdiction. One of the most important actions that local governments should take to ensure recognition of local needs while protecting water resources is to participate in the basin planning process, either directly or through Regional Development Centers.

7.1.2 Water Quantity Overview

In addition to protecting water quality, it is essential to plan for water supply in the Ogeechee River basin. The Georgia EPD Water Resources Branch regulates the use of Georgia's surface and ground water resources for municipal and agricultural uses, and is responsible for ensuring sufficient instream flows are available during a critical drought condition to meet permitted withdrawal requirements without significant impact to the environment. The withdrawal permit process must not overuse the available resources. The Water Resources Branch is also responsible for regulation of public water systems for compliance with the Safe Drinking Water Act, and regulation of dams for compliance with the Safe Dams Act.

In 1997, to address concerns regarding overuse of groundwater in coastal Georgia, Georgia EPD developed the "Interim Strategy for Managing Salt Water Intrusion in the Upper Floridan Aquifer of Southeast Georgia" to address concerns regarding the general regional use of groundwater throughout coastal Georgia that is leading to declining water levels in the Floridan aquifer. Among the interim strategy inclusion policies such as establishing caps on ground water use in the capped areas of Glynn County, Chatham County and southern portions of Bryan and Effingham Counties, reduction in ground water use in Chatham County by at least 10 million gallons per day by December 2005.

7.2 General Basinwide Management Strategies

There are many statewide programs and strategies that play an important role in the maintenance and protection of water quality in the Ogeechee basin. These general strategies are applicable throughout the basin to address both point and nonpoint source controls.

7.2.1 General Surface Water Protection Strategies

Antidegradation

The State of Georgia considers all waters of the state as high quality and applies a stringent level of protection for each waterbody. Georgia Rules and Regulations for Water Quality Control, Chapter 391-3-6-03(2)(b) contains specific antidegradation provisions as follows:

> (b) Those waters in the State whose existing quality is better than the minimum levels established in standards on the date standards become effective will be maintained at high quality; with the State having the power to authorize new developments, when it has been affirmatively demonstrated to the State that a change is justifiable to provide necessary social or economic development and provided further that the level of treatment required is the highest and best practicable under existing technology to protect existing beneficial water uses. Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. All requirements in the Federal Regulations, 40 C.F.R. 131.12, will be achieved before lowering of water quality is allowed for high quality water.

The antidegradation review process is triggered at such time as a new or expanded point source discharge is proposed that may have some effect on surface water quality. Such proposals are reviewed to determine if the new discharge is justifiable to provide necessary social or economic development and that the level of treatment required is the highest and best practicable under existing technology to protect existing beneficial water uses.

Applicants for new or expanded point source discharges into any surface water must perform an alternative analysis comparing the proposed discharge alternative to a "no-discharge" land application or urban reuse alternative. The application for discharge to surface waters will only be considered if the less degrading alternatives are determined to be economically or technically infeasible. In all cases, existing instream water uses and the level of water quality necessary to protect the existing use shall be maintained and protected.

Water Supply Watershed Protection Strategy

As population continues to increase within the Ogeechee River basin, it will become ever more important to protect the water quality of already developed raw water sources. EPD is acting in concert with the Department of Community Affairs to produce a set of "guidelines" which define, among other things, measures that local governments are encouraged to take to protect drinking water sources. The "guidelines" are entitled Rules for Environmental Planning Criteria, and establish environmental protection criteria for five environmental categories: water supply watersheds, groundwater recharge areas, mountains, river corridors and wetlands. The *Criteria for Watershed Protection* (a sub-section of the Rules for Environmental Planning Criteria) set minimum guidelines for protection of watersheds above "governmentally owned" water supply intakes. The degree of protection depends upon the size of the watershed; watersheds with drainage areas of less than 100 square miles are subject to more strict criteria as summarized below:

- Impervious surface densities limited to 25 percent over the entire watershed.
- Buffer/setback requirements equal to 100/150 feet within seven (7) mile radius of the intake and 50/75 feet outside the seven (7) mile radius; and

- A reservoir management plan (including 150 foot buffer around the perimeter of the reservoir).

Watersheds with drainage areas of 100 square miles or more are subject to less strict criteria as summarized below:

- An intake on a flowing stream (as opposed to being located within a reservoir) shall have no specified minimum criteria; and
- An intake with a water supply reservoir shall have a minimum of 100 feet natural buffer within a seven mile radius of the reservoir, and no impervious cover constructed within a 150 foot setback area on both banks of the stream.

EPD is also actively working toward meeting the national goal that, by the year 2005, 60 percent of the population served by community water systems will receive their water from systems with source water protection programs (SWPP) in place under both wellhead protection and watershed protection programs. EPD intends to accomplish this goal by developing and implementing a source water assessment program (SWAP) in alignment with EPA's initiatives.

Although the procedures and strategies of the new program are incomplete to date, the Drinking Water Program (DWP) will compile a statewide source water assessment plan soliciting input from the public and approval from EPA. The plan will specify how the state will delineate areas providing source waters for public water systems, identify origins of contaminants in delineated areas, determine the susceptibility of public water sources to the contaminants and provide the basis for local individual source water protection plans for each different public water system. Once the statewide plan is approved the DWP will be allowed the flexibility to help complete the local source water protection plans for contracted public water systems and provide financial and technical assistance to help develop long range source water protection strategies for the public water system. The Source Water Assessment program will build upon EPD's other assessment and prevention programs, including the Well Head Protection Program, the Vulnerability Assessment and Waiver Program and the River Basin Management Plans, by soliciting active public participation from the local communities and assist in the preparation of the local water system's protection plan.

Total Maximum Daily Loads

Section 303(d) of the Clean Water Act (CWA) establishes the TMDL, or total maximum daily load, process as a tool to implement water quality standards. Georgia is required by the CWA to identify and list waterbodies where water quality standards are not met following the application of technology based controls, and to establish TMDLs for the listed stream segments. The USEPA is required to approve or disapprove Georgia's 303(d) list of waters and TMDLs.

The most recent requirement for 303(d) list submittal occurred in 2000. Georgia public noticed and submitted a draft 303(d) list package to the EPA in February 2000. The public and EPA reviewed the draft 303(d) list package and provided comments in March 2000. Georgia reviewed the input, made appropriate changes and submitted a final 303(d) listing to the EPA in April 2000. EPA approved the Georgia list in August 2000.

Georgia's 2000 303(d) listing is based on the Georgia 305(b) water quality assessments. The 305(b) assessment is presented in the report *Water Quality in Georgia, 1998-1999*. The 305(b) assessment tables are reprinted in Appendix E of this report. The tables provide a code indicating the 303(d) listing status of assessed segments within the Ogeechee River basin. An explanation of the codes is given below. An "X" in the 303(d) column indicates the segment is on the Georgia 303(d) list.

NA Waters assessed as supporting designated uses. These waters are not part of the Georgia 303(d) list.

1 Segments identified as not supporting or partially supporting designated uses where actions have been taken and compliance with water quality standards achieved. These segments are not part of the Georgia 303(d) list.

2 Segments identified as not supporting or partially supporting designated uses where existing enforceable State, local, or Federal requirements are expected to lead to attainment of water quality standards within two years without additional control strategies. These segments are not part of the Georgia 303(d) list.

3 Segments where TMDLs were completed and approved by EPA in 1998-2000. These waters are not part of the Georgia 303(d) list.

X Waters on the Geogia 303(d) list. These segments are assessed as not supporting or partially supporting designated uses, and may require additional controls to achieve designated uses. These segments make up the Georgia 303(d) list.

Georgia will address a number of the listed waters in the 2000-2001 time period, however, the majority of work on segments in the Ogeechee River will be addressed in the next iteration or cycle of Savannah river basin planning in 2001-2005.

7.2.2 Management of Permitted Point Sources

The strategies in this section strive to minimize adverse effects from municipal, industrial, and concentrated discharges. Permitted discharges of treated wastewater are managed via the National Pollutant Discharge Elimination system (NPDES) permit program. The NPDES permit program provides a basis for regulating municipal and industrial discharges, monitoring compliance with effluent limitations, and initiating appropriate enforcement action for violations. EPD has formulated general strategies for a number of types of environmental stressors under the NPDES program.

Analysis of Alternatives

Applicants for new or expanded point source discharges into any surface water must perform an alternative analysis comparing the proposed discharge alternative to a "no discharge", land application or urban reuse alternative. The application for discharge to surface waters will only be considered if the less degrading alternatives are determined to be economically or technically infeasible. In all cases, existing instream water uses and the level of water quality necessary to protect the existing use shall be maintained and protected.

Permit Issuance/Reissuance Strategies

During the basin plan implementation phase, issues identified in the written basin plan pertaining to point source discharges will be assessed. The assessment will include such things as 1) identified point source discharge problem areas, 2) data evaluations, 3) wasteload allocations and/or TMDLs with identified problem point sources, and 4) toxic pollutants identified with point source discharges. Permits associated with identified problems will be evaluated to determine if a reopening of the permit is appropriate to adequately address the problem.

Watershed Assessment Requirements

A watershed assessment is generally initiated when, due to growth and development, a local government sees a need to increase the hydraulic capacity of an existing

wastewater treatment facility (or propose a new facility) and contacts the EPD for a NPDES permit modification. If an antidegradation review demonstrates that it is not feasible to handle the additional capacity needs with a land treatment or other no discharge system, the community may pursue an increase in its surface water discharge. The initial step in this process is the completion of a watershed assessment, which is the first step towards assuring that all water quality standards will be maintained throughout a watershed during both critical dry and wet weather conditions in response to both point and nonpoint source loads.

The watershed assessment is actually a study, an assessment, and a plan. It is about collecting data and learning relationships between what is going on in a watershed and how these activities (land uses, etc.) impact water quality, then using this knowledge to develop both short and long term plans designed to ensure the attainment of water quality standards. The assessment should address current conditions and consider projected land use changes. Only when it can be demonstrated that water quality standards are and will continue to be maintained, can the EPD develop a wasteload allocation and prepare a defensible permit for a proposed new wastewater treatment facility or proposed hydraulic expansion of an existing wastewater treatment facility discharging to the watershed. The assessment should include a detailed plan to address both current water quality and biological problems and any predicted future water quality and biological problems. Key components of such a plan will likely be adopted by EPD as "special conditions" of the pertinent new or modified NPDES permit.

Facility Construction/Improvements

EPD has promoted continuing improvement in the quality of return flows from permitted point sources in the basin. Upgrading wastewater treatment facilities is a significant strategy to meet effluent limits from discharges. In the past ten years, various upgrades and improvements have been made to industrial and municipal treatment systems throughout the Ogeechee River Basin. The funding for these projects has come from state and federal construction grants and loans and the citizens of local municipalities. Appendix C provides detailed information on expenditures by city and county governments on upgrading wastewater treatment facilities in the basin.

Domestic Wastewater Systems

The collecting, treating and disposing of wastewater in Georgia is regulated by a number of environmental laws that are administered by various agencies in local and state government. When a local government or private concern (owner) identifies a need for a wastewater treatment and disposal system it is imperative that thorough and adequate planning take place.

Wastewater systems that discharge treated wastewater to a surface stream must be permitted through the federal National Pollution Discharge Elimination System (NPDES) and meet all the requirements of that system. In Georgia, with very few exceptions, surface discharge permits will only be issued to publicly owned systems.

Wastewater systems that do not result in a discharge to surface waters, such as slow rate land treatment systems and urban reuse systems (no discharge), are permitted through the State of Georgia's land application system (LAS) permitting process. Both publicly and privately owned systems can apply for and receive LAS permits.

Chlorine

If a chlorine limit is not already required in an NPDES permit, all major municipal wastewater facilities (i.e., those with design flows greater than or equal to 1.0 million

gallons per day [MGD]) are required to meet a chronic toxicity-based chlorine limitation when the permit comes up for routine reissuance. The limitation is calculated based on a maximum instream concentration of 0.011 mg/l, the facility's design flow, and the 7Q10 low flow of the receiving stream. No facilities are given a limitation higher than 0.5 mg/l as this is deemed to be an operationally achievable number even if a facility does not have dechlorination equipment installed. Facilities which are given a limitation more stringent than 0.5 mg/l which do not already have dechlorination equipment installed, are given up to a two year schedule in which to meet the limitation. All discharging facilities which are upgrading are required to meet a chlorine limitation as part of the upgrade, based on the same criteria noted above.

Ammonia

Ammonia in effluents poses a problem both as a source of toxicity to aquatic life and as an oxygen-demanding waste. New facilities and facilities proposed for upgrade are required to meet ammonia limits for toxicity if those limits are more stringent than instream dissolved oxygen based limits. Existing facilities are not be required to meet ammonia limits based on calculated toxicity unless instream toxicity has been identified through toxicity testing.

Metals/Priority Pollutants

Major municipal and industrial facilities are required to submit periodic priority pollutant scans to EPD as part of their permit monitoring requirements or upon submittal of a permit application for permit reissuance. The priority pollutant data is assessed in accordance with the Georgia Rules and Regulations for Water Quality Control. The results of the assessment can be used to trigger either additional priority pollutant monitoring, a toxicity reduction evaluation or permit limits for certain parameters.

Color

The State's narrative water quality standard for color requires that all waters shall be free from material related to discharges which produce color which interferes with legitimate water uses. EPD's color strategy will address this standard for industrial and municipal discharges by implementing permit limits and/or color removal requirements. EPD requires new facilities or discharges to prevent any noticeable color effect on the receiving stream. EPD requires existing facilities with color in their effluent to collect upstream and downstream color samples when their NPDES permit is reissued. The facility must conduct an assessment of the sources of color. Also, a color removal evaluation may be required at permit reissuance. EPD will also target facilities for color removal requirements based on significant citizen complaints of discoloration in streams.

Phosphorus

EPD establishes phosphorus control strategies where needed to address water bodies where water quality is limited by excess phosphorus loading. At the present time, there are no data to suggest phosphorus loading problems in the Ogeechee River basin.

Temperature

Permits issued for facilities which discharge to primary trout streams are required to have no elevation of natural stream temperatures. Permits issued for facilities which discharge to secondary trout streams are required to not elevate the receiving stream more than 2 degrees Fahrenheit.

Storm Water Permitting

The 1987 Amendments to the federal Clean Water Act require permits to be issued for certain types of discharges, with primary focus on runoff from industrial operations and large urban areas. The EPA promulgated Storm Water Regulations on November 16, 1990. EPD subsequently received delegation from the EPA in January 1991 to issue General Permits and regulate storm water in Georgia. EPD has developed and implemented a strategy which assures compliance with the federal regulations.

The "Phase I" Federal Regulations set specific application submittal requirements for large (population 250,000 or more) and medium (population 100,000 to 250,000) municipal separate storm sewer systems. Accordingly, Georgia has issued individual area-wide NPDES municipal separate storm sewer system (MS4) permits to 58 cities and counties in municipal areas with populations greater than 100,000 persons. These permits authorize the municipalities to discharge storm water from the MS4s which they own or operate, and incorporate detailed storm water management programs. These programs may include such measures as structural and non-structural controls, best management practices, inspections, enforcement and public education efforts. Storm water management ordinances, erosion and sediment control ordinances, development regulations and other local regulations provide the necessary legal authority to implement the storm water management programs. Illicit discharge detection and long-term wet weather sampling plans are also included in the management programs. The permit requires the submission of Annual Reports to EPD, describing the implementation of the storm water management program. Among other things, the Annual Report includes a detailed description of the municipality's implementation of its Storm Water Management Plan.

EPA's Phase I Rule addresses only municipalities with populations greater than 100,000 people and construction sites larger than five acres. EPA is proposing a Phase II Rule for municipalities with populations less than 100,000 people and construction sites smaller than five acres. This rule is not expected to be finalized until at least March, 1999. The Phase II Rule will eventually impact some of the municipalities within the basin.

EPD has issued one general permit regulating storm water discharges for 10 of 11 federally regulated industrial subcategories defined in the Phase I Federal regulations. The eleventh subcategory, construction activities, will be covered under a separate general permit, which is not yet finalized. The general permit for industrial activities requires the submission a Notice of Intent (NOI) for coverage under the general permit, the preparation and implementation of a storm water pollution prevention plan, and in some cases, the monitoring of storm water discharges from the facility. As with the municipal storm water permits, implementation of site-specific best management practices is the preferred method for controlling storm water runoff.

7.2.3 Nonpoint Source Management

The strategies in this section address sources of environmental stressors which are not subject to NPDES permitting and typically originate from diffuse or nonpoint sources associated with land uses. Most strategies that address nonpoint source concerns are not regulatory in nature, but involve a variety of approaches such as technical assistance and education to prevent and reduce nonpoint source pollution in the basin. Strong stakeholder involvement will be essential to effectively implement many of these strategies.

Georgia Nonpoint Source Management Program

The Georgia Environmental Protection Division (EPD) has produced the *Georgia Nonpoint Source Management Program* (PFY98-02), which provides an overview of the State's nonpoint source water quality management activities as well as a summary of what the State intends to accomplish in the next five federal fiscal years. The Georgia Nonpoint Source Management Plan addresses the following categories of nonpoint source pollution loading: Agriculture (crops, pasture, animal operations, aquaculture), Silviculture, Construction, Urban Runoff, Resource Extraction/Exploration/ Development, Land Disposal (Runoff/Leachate from Permitted Areas), Hydrologic/Habitat Modification, and Other.

Agricultural Nonpoint Source Control Strategies

Agricultural nonpoint source pollution continues to be managed and controlled with a statewide non-regulatory approach. This approach uses cooperative partnerships with various agencies and a variety of programs. A brief description of these agencies and outline of their functions and programs is provided below.

Soil and Water Conservation Districts (SWCDs)

Georgia's SWCDs were formed by Act No. 339 of the Georgia General Assembly on March 26, 1937. Their role is to provide leadership in the protection, conservation, and improvement of Georgia's soil, water, and related resources. This is accomplished through promotion efforts related to the voluntary adoption of agricultural best management practices (BMPs).

Georgia Soil and Water Conservation Commission (GSWCC)

Georgia's SWCDs receive no annual appropriations and are not regulatory or enforcement agencies. Therefore, the GSWCC was also formed in 1937 to support the SWCDs. GSWCC has been designated as the administering or lead agency for agricultural nonpoint source (NPS) pollution prevention in the state. The GSWCC develops NPS water quality programs and conducts educational activities to promote conservation and protection of land and water resources devoted to agricultural uses. Primary functions of the GSWCC are to provide guidance and assistance to the Soil and Water Conservation Districts and provide education and oversight for the Georgia Erosion and Sedimentation Act.

There are a number of other agricultural agencies administering programs to address water quality and natural resource management issues. Resource Conservation and Development (RC&D) Councils are organized groups of local citizens supported by USDA involved in a program to encourage economic development, as well as the wise conservation of natural and human resources. The University of Georgia College of Agricultural and Environmental Sciences (CAES) conducts an education and outreach campaign that encourages producers to increase productivity using environmentally sound techniques. This is accomplished through a number of programs like Farm*A*Syst, Well Water Testing, Nutrient Management, Soil and Water Laboratory Analysis, and informational material on a wide range of subjects. Georgia's Department of Agriculture (GDA) administers a wide variety of insect and plant disease control programs to help regulate the use of pesticides. GDA also inspects irrigation system requirements, such as check valves and back flow prevention devices, for protection of groundwater. The Agricultural Research Service (ARS) conducts research designed to improve the effectiveness of agricultural conservation techniques and promote sustainability. The Natural Resources Conservation Service (NRCS), along with the Farm Services Agency (FSA) and through local Soil and Water Conservation Districts,

administers Farm Bill Programs that provide technical and financial incentives to producers to implement agricultural BMPs. The Agricultural Water Use Coordinating Committee, through it's individual members regularly applies for, and receives, funds under section 319(h) of the Clean Water Act to best management practices and demonstration projects throughout the state. The Georgia Soil and Water Conservation Commission has provided state leadership with many of these efforts.

Collectively, these programs will serve to address resource concerns related to agricultural land uses in a coordinated fashion over the next five years until the second iteration of the River Basin Management Planning Cycle. Much of the information regarding opportunities to participate under this voluntary approach to complying with water quality standards is disseminated through commodity commissions and organizations such as the Farm Bureau Federation, Agribusiness Council, Cattlemen's Association, Milk Producers Association, Pork Producers Association, Poultry Federation, and other agricultural support industries.

Prioritization Activities under the Farm Bill

The 1996 Farm Bill provides a number of programs, and processes, designed to address those environmental stressors related to nonpoint sources from Agriculture which were identified in section 4.1.2. A new flagship conservation program, the Environmental Quality Incentives Program (EQIP), will provide the lion's share of funding for technical, educational, and financial assistance. The USDA Natural Resources Conservation Service (NRCS) has leadership for EQIP and works with the USDA Farm Service Agency (FSA) to set policies, priorities, and guidelines. These two agencies take recommendations from local work groups and a State Technical Committee, comprised of resource professionals from a variety of disciplines, when addressing actual, and potential, resource impairments associated with agricultural land uses.

EQIP provides incentive payments and cost-sharing for conservation practices through 5 to10 year contracts. Producers may receive federal cost-sharing up to 75 percent of the average cost of certain conservation practices such as terraces, grassed waterways, filter strips, buffer strips, manure management facilities, animal waste utilization, and 46 other conservation practices important to improving and maintaining the health of natural resources in an area. An individual producer can receive as much a $50,000 in EQIP funds to implement needed conservation practices.

A majority of funds allocated to Georgia (65 percent) will be spent in priority areas where there are serious and critical environmental needs and concerns. High priority is given to areas where state and local governments offer financial and technical assistance, and where agricultural improvements will help meet water quality and other environmental objectives.

The remaining 35 percent of funds allocated to Georgia can be extended outside priority areas to other parts of the state. Eligibility is limited to persons who are engaged in agricultural productions. Eligible land includes cropland, pastureland, forestland, and other farm lands.

In addition to EQIP there are three major conservation programs from USDA that will be available to producers, and rural landowners. The first is the Conservation Reserve Program (CRP), which protects highly erodible and environmentally sensitive land with grass, trees, and other long-term cover. The Wetland Reserve Program (WRP) is a voluntary program designed to protect, restore, and enhance wetlands with cost-share incentives. Also, the Wildlife Habitat Incentives Program (WHIP) will help landowners develop and improve habitats for upland wildlife, wetland wildlife, endangered species, fisheries, and other wildlife.

Forestry Nonpoint Source Control Strategies

In 1977, the Governor's Silviculture Task Force prepared a report which recommended a voluntary approach to the implementation of best management practices (BMPs) and the designation of the Georgia Forestry Commission (GFC) as the lead agency for implementing the Silviculture portion of the State Section 208 Water Quality Management Plan. The GFC was designated as the lead agency for silvicultural nonpoint source pollution prevention in the state in November, 1979. The Forestry Nonpoint Source Control Program is managed and implemented by the GFC, with the support of the forest industry, for the voluntary implementation of best management practices.

The Forestry Nonpoint Source Control Program is managed by a Statewide Coordinator and appointed foresters serving as District Coordinators from each of the 12 GFC districts. The Statewide and District Coordinators conduct educational workshops, training programs and field demonstrations for the forest community (i.e., landowners, land management and procurement foresters, consulting foresters, timber buyers, loggers, site preparation contractors). The GFC investigates and mediates complaints involving forestry operations. In addition, the GFC conducts BMP compliance surveys to assess the effectiveness of BMP in the forest community. The GFC has established procedures for installing water control structures in firebreaks to reduce soil erosion and sedimentation.

Recently, the State Board of Registration for Foresters adopted procedures to sanction or revoke the licenses of professional foresters involved in unresolved complaints where the lack of BMP implementation has resulted in state water quality or federal wetlands requirement violations.

Additional requirements are imposed within the National Forest areas of Georgia. Each National Forest produces and regularly updates and Land and Resource Management Plan to guide timber harvest and other activities. These plans establish long range goals and objectives; specific management prescriptions and the vicinity in which they will occur; standards and guidelines on how management prescriptions will be applied; and monitoring procedures to assure the Plan is followed.

Urban Nonpoint Source Control Strategies

The 1990 report of the Community Stream Management Task Force, *We All Live Downstream*, established a road map for urban nonpoint source management in Georgia. The Task Force recognized two major impediments to effectively managing the quality of urban water bodies. The first is the division between 1) statutory responsibilities for management of water quality, granted to EPD, and 2) local government's Constitutional responsibility for management of the land activities which affect urban water bodies. The second impediment is the widespread nature of the nonpoint sources and the variety of activities which may contribute to impacts from urban runoff. They concluded that management of urban nonpoint source pollution would require ". . . a cooperative partnership between layers of government, the private sector, and the general public. The development of such a partnership will require a strong impetus to accept new institutional roles and make the structural changes necessary to support and sustain the stream management process."

EPD has a primary role in facilitating the management of urban runoff, and is responsible for administering and enforcing a variety of permit programs, including permitting of discharges. In addition to these regulatory activities, EPD seeks to assist in development of local solutions to water quality problems; provides technical information on the water resources of the state; and administers grant programs, with funds from various sources to support non-point source planning and assessment, implementation of

BMPs, and regional or local watershed management initiatives. EPD also conducts a variety of outreach and educational activities addressing urban runoff in general, regulatory requirements, and cooperative or non-regulatory approaches.

For urban runoff, activities of the Nonpoint Source Management Program interact strongly with point source controls for combined sewers and storm sewers, both of which discharge urban runoff through point conveyances. While the state continues to have an important regulatory role, aspects of the cooperative intergovernmental partnerships envisioned by the Task Force have emerged and are being strengthened. EPD is implementing programs which go beyond traditional regulation, providing the regulated community with greater flexibility and responsibility for determining management practices. Current activities for urban surface runoff control include the following:

- Implement local nonpoint source (NPS) management programs, streambank and stream restoration activities, and community Adopt-A-Stream programs.
- Develop and disseminate local watershed planning and management procedures.
- Implement state and local Erosion and Sedimentation Control Programs.
- Prepare and disseminate technical information on best management practices and nonpoint source monitoring and assessment.
- Implement NPS education programs for grades K through 12 through Project WET (Water Education for Teachers), as described in Section 7.3.6.
- Implement the Georgia Adopt-A-Stream Program, as described below in Section 7.3.6.
- Identify and evaluate resources to support urban watershed planning and management.

7.2.4 Floodplain Management

Floodplain Management Strategies

Floodplain Management in the State of Georgia is administered under federal regulations and local ordinances. The federal statues are found in Title 44 of the Code of Federal Regulations Parts 59-79. As a condition of participation in the National Flood Insurance Program (NFIP), local political jurisdictions voluntarily adopt Flood Damage Prevention Ordinances, which are based on federal regulations, to enforce and administer floodplain development. Georgia's Floodplain Management Office does not issue permits for floodplain development.

Georgia's Floodplain Management Office, located within the Department of Natural Resources, Environmental Protection Division, serves as liaison between the Federal Emergency Management Agency (FEMA) and local communities participating in the NFIP. However, Georgia's Floodplain Management Office has no regulatory authority. Participation by the local communities in the NFIP is a requirement for the Federal Government to make flood insurance available to all property owners. Through workshops, newsletters, technical assistance and community visits, the Floodplain Management Office assists local governments to maintain compliance with NFIP requirements. The Floodplain Management Office also provides technical data, floodplain maps, and training workshops to various public and private entities involved in floodplain management and floodplain determinations. In addition, the Floodplain Management Office reviews all state-funded and federal-funded projects for development in designated Special Flood Hazard Areas. A major thrust of the Floodplain Management

Office is to increase the number of political jurisdictions participating in the NFIP, thereby increasing the number of flood insured structures in Georgia.

River Care 2000 Program

Georgia also has strategies to protect and manage riparian floodplain areas. Of particular relevance is River Care 2000, a conservation program which Governor Miller established in September 1995. One key objective of this program is acquisition of river-corridor lands for purposes of protection and to forestall unwise development in flood-prone areas. The Coordinating Committee has approved procedures for three types of projects: Riverway Demonstration Projects, which improve public access to a river with scenic and recreation uses, and protects natural and historic resources by acquiring and managing land in the river corridor; Significant Sites, which are tracts of land which DNR will acquire and operate as a traditional state public-use facility: wildlife management or public fishing area, park or historic site, natural area, or greenway; and Restoration Sites, which are tracts of land which the state will identify, acquire, and manage to reduce nonpoint-source water pollution.

The River Care 2000 program is also charged with assessing important river resources throughout the state and identifying more effective management tools for river corridors. The program recently released a state-wide assessment of resources associated with rivers throughout the state (GA DNR, 1998).

7.2.5 Wetland Management Strategies

The loss of wetlands, because of the associated adverse impacts to flood control, water quality, aquatic wildlife habitat, rare and endangered species habitat, aesthetics, and recreational benefits, has become an issue of increasing concern to the general public as they become better informed of the values and functions of wetlands. We still suffer from the lack of accurate assessments for current and historic wetland acreage, but, regardless of the method used to measure total acreage or wetland losses, Georgia still retains the highest percentage of precolonial wetland acreage of any southeastern state.

Efforts to Track No Net Loss of Wetlands

While the 1993 Federal Administration Wetlands Plan calls for a concerted effort by EPA and other federal agencies to work cooperatively toward achieving a no overall net loss of wetlands in the short term and a net increase in the quantity of the nation's wetlands in the long run, there have been no statutory or executive level directives to carry out this policy. Achievement of the goal of no net loss is dependent upon limited changes to regulations, memoranda of understanding, cooperative agreements, and other partnerships between federal, state, and local governments, conservation organizations, and private citizens.

All dredge and fill activities in freshwater wetlands are regulated in Georgia by the U.S. Army Corps of Engineers (COE) under Section 404 of the Clean Water Act. The majority of wetland alterations occur under nationwide or general permits, which include permits for bridge building, minor road crossing fills, and fills of less than ten acres above the “headwaters” point of non-tidal streams where the annual average flow is less than 5 cubic feet per second. Enforcement is carried out by the COE and EPA in freshwater wetlands. Normal agricultural and silvicultural operations are exempted under Section 404 regulations.

The COE may require wetland mitigation activities in association were permitting, including creation, restoration, and protection of wetlands. COE may also require

wetland restoration in case of violations. In the settlement of violations, restorations occurred on 16.8 acres in 1994, and 17.8 acres in 1995.

Land Acquisition

The Department of Natural Resources (DNR), Wildlife Resources Division (WRD), began a land acquisition program in 1987 to acquire 60,000 acres of additional lands for Wildlife Management Areas (WMAs) and Public Fishing Areas (PFAs). This initiative was funded by $30 million of 20-year obligation bonds to be paid off by hunting and fishing license increases and WMA permit fees.

Beginning in 1990 Governor Zell Miller initiated Preservation 2000, a $60 million program to acquire 100,000 acres of lands to be used for wildlife and fisheries management, parks and recreation, natural area preservation, and general conservation. Additional wetlands acquisition occurs as part of the River Care 2000 initiative, discussed above.

7.2.6 Stakeholder Involvement/Stewardship Strategies

Effective nonpoint source management must address the numerous activities of individuals, businesses, industries, and governments which can adversely affect urban and rural waters. In many cases, these groups are unaware of the potential impacts of their activities or corrective actions which may be taken. Stakeholder involvement and stewardship are essential to address these major challenges.

Georgia has chosen a two-pronged approach to encourage stewardship via education and citizen monitoring. EPD is the lead agency in these education and citizen monitoring programs, but, like other aspects of the state's nonpoint source management effort, cooperative efforts with local governments and community-based groups are critical to their implementation. Outreach and education, including citizen monitoring, lays the groundwork for behavior change and is often an important pre-requisite for effective implementation of BMPs and comprehensive watershed management programs.

General goals for stakeholder involvement and stewardship strategies are:

- Generate local support for nonpoint source management through public involvement and monitoring of streams and other water bodies and of results of management actions.
- Increase individual's awareness of how they contribute to nonpoint source pollution problems and implement appropriate strategies to motivate behavior change and actions to address those problems.
- Provide the educational tools, assistance, and support for addressing NPS problems to target audiences across the state.

Georgia Adopt-A-Stream

The Georgia Adopt-A-Stream Program is designed to promote citizen monitoring and stream protection. Currently, more than 5,000 volunteers participate in individual and community sponsored Adopt-A-Stream Programs. Volunteers conduct clean-ups, stabilize streambanks, monitor streams using biological and chemical methods, and evaluate habitats and watersheds. These activities lead to a greater awareness of water quality and nonpoint source pollution, active cooperation between the public and local governments in protecting water resources, and the collection of basic water quality data. The Georgia Adopt-A-Stream Program focuses on what individuals and communities can do to protect Georgia's water resources from nonpoint source pollution. The Program

offers training and support in the following activities—watershed surveys, visual surveys, biological monitoring, chemical testing and clean ups.

The Georgia Adopt-A-Stream Program addresses nonpoint source pollution from agriculture, silviculture, construction and urban runoff. The focus of the Adopt-A-Stream Programs in middle and southern Georgia is often agricultural NPS pollution (especially, where land use is largely agricultural crop production). Examples of agricultural NPS pollution are presented in workshops, videos and manuals (e.g., excess fertilizer and animal waste). In north Georgia, the focus is generally silvicultural NPS pollution (especially, in areas adjacent to the Chattahoochee and Oconee National Forests). Adopt-A-Stream Programs in urban areas address construction and urban runoff NPS pollution. Workshops and training sessions emphasize the connection between land use, runoff and water resources. Erosion and sedimentation control at construction sites is always a major concern with volunteers.

Volunteers are offered three levels of involvement. Each level involves an education and action component on a local stream. Volunteers commit for a minimum of one year on a half-mile stream segment. Level I consists of setting up a project (i.e., identifying a stream segment, identifying partners, registering with the Georgia Adopt-A-Stream Program), evaluating land use and stream conditions during a "watershed walk", conducting quarterly visual evaluations and clean-ups, and one public outreach activity. Volunteers create a "Who to Call for Questions or Problems" list so that if something unusual is noted, immediate professional attention can be obtained. Level II builds on Level I by adding either biological monitoring, chemical monitoring or a habitat improvement project. Level III includes two or more Level II activities.

Approximately 500 volunteers participate in the various workshops each year. An "Introduction to Adopt-A-Stream Program" and "Watershed Walk" videos have been produced, duplicated and distributed on loan. The Georgia Adopt-A-Stream Program Manuals have been printed and distributed to approximately 1,000 volunteers. In addition, a bi-monthly newsletter is published and distributed to over 1,000 volunteers. The Annual Georgia Adopt-A-Stream Conference and Awards Ceremony is held each fall. The Georgia Adopt-A-Stream Program assists EPD in organizing the Annual Georgia River Clean-Up Week each fall, with over 1000 volunteers cleaning up river segments in over 50 locations. In addition, the Georgia Adopt-A-Stream Program conducts numerous presentations around the State.

Georgia Project WET (Water Education for Teachers) Program

A report outlining a plan for nonpoint source education in Georgia was completed in 1994. The "Georgia Urban Waterbody Education Plan and Program", laid out nonpoint education strategies for seven target audiences: general public, environmental interest organizations, civic associations, educators, business associations, local government officials, and state government officials. Given limited resources and the scope of effort required to target each of these audiences concurrently, EPD decided to initially target nonpoint source education efforts toward educators both formal and non-formal educators.

In October 1996, EPD selected Project WET (Water Education for Teachers) Curriculum as the most appropriate water science and education curriculum for the State. The Project WET Curriculum is an interdisciplinary curriculum of school, museum, university pre-service class, or a community organization. The goals of the Georgia Project WET Program are facilitate and to promote awareness, appreciation, knowledge and stewardship of water resources through the development and dissemination of classroom (K-12) ready teaching aids.

Since 1997, several Project WET Facilitator Training Workshops have been successfully completed in Athens, Atlanta, Dahlonega, Macon, Savannah, Valdosta, and Warner Robbins with a total of 141 Project WET Facilitators trained in Georgia. In addition, over 115 Project WET Educator Workshops have been successfully completed in Georgia with more than 2,000 educators implementing the Project WET Curriculum statewide.

Currently in the Ogeechee River Basin, there are 19 Project WET Facilitators with over 250 educators having received certified Project WET training. In addition, Oatland Island Environmental Education Center educators are certified Project WET Facilitators and conduct Project WET workshops for educators in the lower portions of the Ogeechee River Basin. The pre-service program for education students at Georgia Southern University has certified over 100 early childhood and middle school education students as Project WET educators.

Georgia Project WET provides facilitators and educators the use of additional water resources such as the Enviroscape Module and the Ground Water Module, demonstration tools used to emphasize the impact of nonpoint source pollution to surface and ground waters pollution. In addition, the newsletter, "The Dragonfly Gazette," is published and distributed quarterly to over 2500 teachers and environmental educators.

The Georgia Project WET Program has been nationally recognized for its training strengths and techniques – specifically the use of arts in environmental education. The Georgia Project WET Program in conjunction with International Rivers Network offers educators in Georgia the opportunity to participate in the "River of Words," an international poetry and art contest for student (K-12). This contest provides students with the opportunity to explore their own watersheds and to learn their 'ecological" addresses through poetry and art. National winners are selected by the former U.S. Poet Laureate, Rob Hass, and the International Children's Art Museum. Annually, only eight students are selected as the National Grand Prize winners to be honored at the Library of Congress in Washington, DC and treated to many V.I.P. tours of the nation's capital. Since 1997, five students from Georgia have been recognized as National Grand Prize Winners and an additional 20 students from Georgia have been as National Finalists.

The Georgia Project WET Program provides educators with 'River of Words – Teacher's Guide" along with resource information specific to Georgia. Annually, selected poetry and art are on display throughout Georgia for the year following the contest.

7.2.7 Ground Water Protection Strategies

In 1984, EPD developed its first management plan to guide the management and protection of Georgia's ground water quantity and quality. The current version, Georgia Geologic Survey Circular 11, published in 1996, is the basis of Georgia's application to be certified by U.S. EPA for a Comprehensive State Ground Water Protection Plan (CSGWPP). The goal of Georgia's ground water management plan is:

> . . . to protect human health and environmental health by preventing and mitigating significant ground water pollution. To do this, Georgia will assess, protect, and, where practical, enhance the quality of ground waters to levels necessary for current and projected future uses for public health and significant ecological systems.

The goal recognizes that not all ground water is of the same value. The Division's goal is primarily preventive, rather than curative; but it recognizes that nearly all ground water in the state is usable for drinking water purposes and should remain so. EPD pursues this goal through a policy of anti-degradation by which ground water resources

are prevented from deteriorating significantly, preserving them for present and future generations. Selection of this goal means that aquifers are protected to varying degrees according to their value and vulnerability, as well as their existing quality, current use, and potential for future use.

EPD has adequate legal authority to prevent ground water from being significantly polluted and to clean-up ground water in the unlikely event pollution were to occur. Extensive monitoring has shown that incidents of ground water pollution or contamination are uncommon in Georgia; no part of the population is known to be at risk.

In general, the prevention of ground water pollution includes—(1) the proper siting, construction, and operation of environmental facilities and activities through a permitting system; (2) implementation of environmental planning criteria by incorporation in land-use planning by local government; (3) implementation of a Wellhead Protection Program for municipal drinking water wells; (4) detection and mitigation of existing problems; (5) development of other protective standards, as appropriate, where permits are not required; and (6) education of the public to the consequences of ground water contamination and the need for ground water protection.

Ground water pollution is prevented in Georgia through various regulatory programs (administered by the State's Department of Natural Resources) which regulate the proper siting, construction, and operation of the following:

- Public water supply wells, large irrigation wells and industrial wells withdrawing more than 100,000 gallons per day.
- Injection wells of all types.
- Oil and gas wells (including oil and gas production).
- Solid waste handling facilities.
- Hazardous waste treatment/storage/disposal facilities.
- Municipal and industrial land treatment facilities for waste and wastewater sludge.
- Municipal and industrial discharges to rivers and streams.
- Storage/concentration/burial of radioactive wastes.
- Underground storage tanks.

EPD prevents the contamination of ground water used for municipal drinking water through an EPA-approved Wellhead Protection Program. As a result of this program, certain new potentially polluting facilities or operations are restricted from wellhead protection areas, or are subject to higher standards of operation and/or construction. EPD also encourages local governments to adhere to the *Criteria for the Protection of Groundwater Recharge Areas* (a section of the Rules for Environmental Planning Criteria), which define higher standards for facility siting, operation, and clean-up in significant ground water recharge areas. The most stringent guidelines of these criteria pertain to those recharge areas with above average ground water pollution susceptibility indexes.

Additionally, EPD has legal authority under the Georgia Water Quality Control Act to clean up ground water pollution incidents. Additional clean up authority occurs as special trust funds established to clean up leaking underground storage tanks, abandoned hazardous waste sites, and scrap tire dumps.

Most laws providing for protection and management of ground water are administered by EPD. Laws regulating pesticides are administered by the Department of Agriculture, environmental planning by the Department of Community Affairs; and on-site sewage

disposal, by the Department of Human Resources. EPD has established formal Memoranda of Understanding (MOU) with these agencies. The Georgia Groundwater Protection Coordinating Committee was established in 1992 to coordinate groundwater management activities between the various departments of state government and the several branches of EPD.

7.3 Targeted Management Strategies

This section describes specific management strategies that are targeted to address concerns and priority issues for the Ogeechee River Basin which were described in Section 6. Strategies are presented for each issue of concern, with divisions by geographic area and/or HUC Unit as appropriate. For each of the identified concerns, the management strategy consists of five components: a problem statement (identical to that given in Section 6), general goals, ongoing efforts, identified gaps and needs, and strategies for action. The purpose of these statements is to provide a starting point for key participants in the subbasin to work together and implement strategies to address each priority concern. In some cases, a strategy may simply consist of increased monitoring; in other situations, the stakeholders in the subbasin will need to develop innovative solutions to these water quality issues. While EPD will continue to provide technical oversight, conduct monitoring surveys as needed, and evaluate data on a basin-wide scale, locally-led efforts in the subbasins will be required to help to monitor, assess, restore, and maintain water quality throughout the Ogeechee River Basin.

7.3.1 Metals

Ogeechee Coastal (Hydrologic Unit 03060204)

Problem Statement

The water use classification of fishing was not fully supported in one segment of the Newport River due to an exceedance of the water quality standard for selenium due to nonpoint sources.

General Goals

Meet water quality standards to support designated stream classification of fishing.

Ongoing Efforts

Encouraging local watershed planning and management to ensure that designated water uses are supported.

Identified Gaps and needs

EPD needs to conduct additional ambient metals sampling in South Newport River. Future investigation of atmospheric selenium sources is needed (e.g. Coal burning power plant emissions). In addition, local governments should be encouraged to address potential non-point sources (e.g.; stormwater run-off, etc.) of selenium.

General Strategies for Action

EPD needs to conduct additional sampling in the Newport River in order to determine its current water quality status.

Specific Management Objectives

Monitor ambient selenium concentrations in the Newport River to assess current water quality status. Determine if the problem is a matter of sample contamination, and if

it is not, conduct further investigations to identify sources. If exceedance were due to sample contamination, take steps to remove segment from the Georgia 303(d) List.

Action Plan

Additional sampling of South Newport River will be conducted in calender years 2002 to document selenium concentrations. These efforts will be coordinated with EPDs Air Protection Branch in order to evaluate potential airborne sources.

7.3.2 Fecal Coliform Bacteria

Problem Statement

The water use classification of fishing was not fully supported in several water body segments due to exceedences of the water quality standards for fecal coliform bacteria. These water quality exceedences are found in a number of stream segments in the Ogeechee River basin and are primarily attributed to urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources, and/or animal wastes. A common strategy is proposed for addressing fecal coliform bacteria throughout the basin. However, achieving standards in individual stream segments will depend on the development of site specific local management plans.

Upper Ogeechee River Subbasin (Hydrologic Unit 03060201)

The water use classification of fishing was not fully supported in one Ogeechee River mainstem segment and six tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Lower Ogeechee River Subbasin (Hydrologic Unit 03060202)

The water use classification of fishing was not fully supported in five tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Canoochee River Subbasin (Hydrologic Unit 03060203)

The water use classification of fishing was not fully supported in one Canoochee River mainstem segment and three tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Ogeechee Coastal Subbasin (Hydrologic Unit 03060204)

The water use classification of fishing was not fully supported in six tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

General Goals

Meet water quality standards to support designated water uses. Increase public awareness of fecal coliform bacteria pollution through coordinated education and outreach efforts.

Ongoing Efforts

EPD administers and enforces a variety of permit programs designed to facilitate the management of urban runoff, including both point and nonpoint source controls. EPD's Nonpoint Source Program regulates municipal and industrial storm water discharges through the National Pollutant Discharge Elimination System (NPDES) permitting process. Sanitary sewer overflows are managed through EPD's Permitting Compliance and Enforcement Program. Animal wastes in Georgia are addressed through the Memorandum of Agreement (MOA) with NRCS and SWCC and through recently adopted rules designed to regulate Concentrated Animal Feeding Operations (CAFOs) for swine. This includes a requirement for certain operations to obtain individual NPDES permits.

In addition to regulatory activities, EPD assists in the development of local solutions to water quality problems by administering grant programs and providing technical assistance to various regional and local watershed management initiatives. EPD also conducts a variety of outreach and public education programs addressing urban runoff in general, point and Nonpoint source pollution, BMP implementation, regulatory requirements, and cooperative or non-regulatory approaches.

The Georgia Department of Human Resources (DHR) Division of Public Health - Environmental Services has promulgated new rules (O.C.G.A Chapter 290.5.26) developed to regulate the design, operation, and maintenance of on-site sewage management systems. DHR subsequently formed the Onsite Sewage Management Systems Technical Review Committee in 1999. The Committee's function will be to make recommendations to the department regarding the approval of new systems, assist the Department with the development and revision of standards and guidelines for new technology, assist with the adoption of periodic updates to the Manual for On-Site Sewage Management Systems, and serve as the final authority in contested interpretation issues regarding the Rules and the Manual for On-site Sewage Management Systems.

Agriculture is making progress in controlling bacterial loads. Considerable effort has been directed toward animal confinement areas. Georgia universities and agricultural agencies or groups are conducting several agricultural efforts with statewide implementations. Sustainable Agriculture and Farm-A-Syst Training will be scheduled within the basin. The University of Georgia and ARS have proposals for assessing nutrient and fecal coliform bacteria reducing BMPs on 10 farms that will have statewide implications. Soil and Water Conservation Districts annually convene Local Work Groups (LWGs), which are comprised of resource professionals from a variety of disciplines and interested stakeholders at the local level, to identify resource concerns in their areas. The LWGs develop proposals for USDA or other funding to address identified resource concerns.

The University of Georgia College of Agriculture and Environmental Sciences' Animal Waste Awareness in Research & Extension (AWARE) program conducts research on animal waste management and provides public education through Southeast Sustainable Animal Waste Workshops and a variety of Internet publications. The University of Georgia is also testing agricultural uses of municipal biosolids in the Upper Ogeechee River subbasin.

Local Soil and Water Conservation Districts (SWCDs) and Resource Conservation and Development (RC&D) Councils are working with producers to utilize animal waste according to Nutrient Management Plans through their Lagoon Pumpout Program in the Upper and Lower Ogeechee and Canoochee subbasins, as well as in the Newport River basin.

The Newport River area is a Priority Area for USDA Cost-Share funds to implement agricultural BMPs through NRCS' EQIP Program.

Identified Gaps and Needs

Sources of fecal coliform bacteria in many stream segments are not clearly defined. In some cases, fecal bacterial loads may be attributable to natural sources (e.g. wildlife); alternative bacteriological sampling methods may be useful to distinguish between human, other mammalian, and avian fecal coliform bacteria sources. Sanitary sewer leaks and overflows may be a source of fecal coliform bacteria as well. Previous sampling was not conducted at a sufficient frequency to determine whether the monthly geometric mean criterion specified in the standard has actually been violated. Thus, an initial effort in the next RBMP cycle may be to continue to collect an adequate number of samples (four over a 30-day period) to support geometric mean calculations to determine if water quality standards are actually being exceeded.

Many fecal coliform bacteria reducing practices are relatively expensive and the percentage of reduction is often unknown. Many landowners are reluctant to spend today's dollars for long term amortization in uncertain future markets. Agricultural BMPs and cost share dollars (Farm Bill), grants (Section 319) and should be concentrated in priority watersheds with sufficient technical workforce to implement BMPs through long term agreements or contracts to reduce sediment loading.

Additional efforts should be directed toward increasing public awareness of fecal coliform bacteria pollution, with an emphasis on potential sources and BMPs. State and basin-wide coordination between agencies and organizations providing public education and technical assistance may help to extend outreach efforts.

Strategies for Action

Separate strategies are needed to address Nonpoint fecal coliform bacteria loadings for urban and rural sources.

A. General Strategies for Urban Sources

Addressing urban runoff will be a complex task, and will require implementation of watershed pollution control programs by local governments. Management of urban runoff is needed to address a variety of water quality problems, including metals, fecal coliform bacteria, nutrients, and habitat degradation. For this five-year phase of the basin management cycle, management will concentrate on source control and planning. Evaluation of the efficacy of this approach will be made during the basin strategy reevaluation scheduled for 2005 in accordance with the statewide RBMP management cycle. In addition, the EPA has developed a number of TMDLs for 303(d) listed streams in the Ogeechee River Basin. EPD will , along with partner agencies such as local governments, NRCS, GSWCC, GFC, be implementing the TMDLs.

Specific Management Objectives

Stakeholders should work together to encourage and facilitate local watershed planning and management to ensure that designated water uses are supported.

Agricultural agencies will provide technical and educational assistance to producers for the purpose of facilitating agricultural BMP implementation.

Management Option Evaluation

Integrated management options will be proposed, implemented, and evaluated by local governments.

Action Plan

EPD will monitor and assess use support in listed stream segments and encourage local efforts to address Nonpoint source pollution. EPD will complete reassessment of fecal coliform bacteria monitoring protocols and will propose a plan for resampling of streams identified as not supporting or partially supporting designated uses and complete sampling by December, 2002 in accordance with the statewide RBMP cycle.

EPD will continue to ensure that all permitted sources remain in compliance with permitted effluent limitations for fecal coliform bacteria. EPD will also request a comprehensive watershed assessment, focusing on both point and nonpoint sources, from localities applying for new or expanded NPDES point source discharge permits. The intent is to direct localities' attention toward current and future Nonpoint source issues in their watersheds and to have them consider ways to prevent or control water quality impacts due to growth. Approved watershed management steps will be included as a condition for expansion of existing water pollution control plants or construction of new plants.

EPD will continue to administer the NPDES and Permitting and Compliance and Enforcement (PCEP) Programs and encourage local planning to address management on a basin-wide scale. EPD will implement approved TMDLs.

Local governments will continue to operate and maintain their sewer systems and wastewater treatment plants, monitor land application systems, develop and implement regulations, zoning and land use planning, and implement local watershed initiatives and monitoring programs. EPD will encourage local authorities to institute programs to identify and address illicit sewage discharges, leaks and overflows of sanitary sewers, and failing septic tanks within their jurisdiction.

DHR will continue to regulate on-site sewage management systems and will work to educate local governments and citizen groups about the need for proper design, construction, and maintenance of septic systems to protect water quality. DHR will also utilize the criteria presented in the Growth Planning Act for septic system setbacks from high value waters. Local municipalities should work with the local health departments to identify locations of septic systems and educate owners about the proper care and maintenance of septic systems.

EPD will encourage citizen involvement through Adopt-A-Stream groups to address restoration of urban streams. Citizen groups will implement Adopt-A-Stream programs, and work with local governments in implementing watershed initiatives.

Method for Tracking Performance

EPD tracks point source discharges through inspections and evaluations of self-monitoring data. An evaluation of the status of listed water bodies will be made coincident with the next iteration of the RBMP cycle for the Ogeechee River basin in 2005.

B. General Strategies for Rural Sources

Agricultural cost share dollars (Farm Bill), grants (Section 319), and loans (Clean Water Act State Revolving Fund) need to be concentrated in priority watersheds with sufficient technical workforce to implement BMPs through long term agreements or contracts.

Specific Management Objectives

Stakeholders should work together to encourage and facilitate local watershed planning and management to ensure that designated water uses are supported.

Agricultural agencies will provide technical and educational assistance to producers for the purpose of facilitating agricultural BMP implementation.

Management Option Evaluation

Evaluation will be on a site-by-site basis. For agricultural BMP support, existing prioritization methods will be used.

Action Plan

EPD will monitor and assess use support in listed streams, encourage local planning efforts, and regulate point sources under the NPDES program. EPD will continue to ensure that all permitted sources remain in compliance with fecal coliform bacteria limits. EPD will also continue monitoring and assessment of Land Application Systems. EPD will implement approved TMDLs.

GSWCC and local SWCDs and RC&D councils, with assistance from NRCS, will continue to support adoption of BMPs for animal waste handling and will follow up on complaints related to fecal coliform bacteria associated with agriculture. Methods for prioritization and implementation of cost-share incentives under the 1996 Farm Bill will be targeted to areas of apparent water quality impact, including rural streams which may contain excessive fecal coliform loads from animal and cropland operations.

Local SWCDs will convene Local Work Groups to identify local resource concerns and develop proposals for funding to address these concerns.

The DHR will continue to regulate on-site sewage management systems and will work to educate local governments and citizen groups about the need for need for proper design, construction, and maintenance of septic systems to protect water quality. The DHR will also utilize the criteria presented in the Growth Planning Act for septic system setbacks from high value waters. Local municipalities should work with the local health departments to identify locations of septic systems and educate owners about the proper care and maintenance of septic systems.

The University of Georgia will provide on-farm assistance to local producers through their Farm-A-Syst Program.

EPD will encourage citizen involvement through Adopt-A-Stream groups to address restoration of urban streams. Citizen groups will implement Adopt-A-Stream programs and work with local governments in implementing watershed initiatives.

Method for Tracking Performance

Agricultural agencies will track rates of BMP implementation for cropland and animal operations. An evaluation of the status of listed water bodies will be made coincident with the next iteration of the RBMP cycle for the Ogeechee River basin in 2001-2005.

7.3.3 Erosion and Sedimentation

Problem Statement

Water use classifications for fishing and/or recreation are potentially threatened in many water body segments by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, stream erosion (including head cutting, bank erosion, and shifting of the bedload), forestry practices, and agriculture. Potential threats from sediment loading are possible throughout the Ogeechee River Basin, although there are no stream segments listed at this time in the basin as not fully supporting designated water uses due to poor fish communities or sedimentation. A common strategy is proposed for addressing erosion and sedimentation throughout the basin. However, achieving standards in individual stream segments will depend on the development of site-specific local management plans.

Upper Ogeechee River Subbasin (Hydrologic Unit 03060201)

The 1992 Georgia Forestry Commission (GFC) compliance survey examined eight sites involving 1,583 acres in this sub-basin. Four sites each were evaluated on private lands and forest industry lands. Overall, 86 percent of harvested acres and 82 percent of main haul road miles were in compliance with BMPs. No site-prepared acres or regenerated acres were evaluated. By ownership, compliance for roads and harvesting on private lands was 75 percent and 84 percent, respectively. Compliance on forest industry land for roads and harvesting was 93 percent and 92 percent, respectively. Another BMP survey was conducted during 1998, but the results are not complete.

Lower Ogeechee River Subbasin (Hydrologic Unit 03060202)

The 1992 Georgia Forestry Commission (GFC) compliance survey examined nine sites involving 1,087 acres in this sub-basin. Four sites were evaluated on private land and five were on forest industry lands. Overall, 96 percent of harvested acres and 94 percent of main haul road miles were in compliance with BMPs. No site preparation or regenerated acres were evaluated. By ownership, compliance for roads and harvesting on private lands was 81 percent and 95 percent, respectively. Compliance on forest industry land for roads and harvesting was 100 percent and 97 percent respectively. Another BMP survey was conducted during 1998, but the results are not complete.

Ogeechee Coastal Subbasin (Hydrologic Unit 03060204)

The 1992 Georgia Forestry Commission (GFC) compliance survey examined seven sites involving 430 acres in this subbasin. Three sites were evaluated on private lands and four on forest industry lands. Overall, 99 percent of harvested acres and 100 percent of main haul road miles were in compliance with BMPs. No sites were evaluated for site preparation or regeneration. By ownership, compliance for roads and harvesting on private lands was 100 percent and 100 percent respectively. Compliance on forest industry lands for roads and harvesting was 100 percent and 99 percent respectively. Another BMP survey was conducted during 1998, but the results are not complete.

Canoochee River Subbasin (Hydrologic Unit 03060203)

The 1992 Georgia Forestry Commission (GFC) compliance survey examined seven sites involving 357 acres in this sub-basin. Six sites were evaluated on private lands and one on forest industry lands. Overall, 92 percent of harvested acres and 100 percent of main haul road miles were in compliance with BMPs. No site prepared or regenerated acres were evaluated. By ownership, compliance for roads and harvesting on private lands was 100 percent and 91 percent, respectively. Compliance on forest industry lands for roads and harvesting was 100 percent and 98 percent, respectively. Another BMP survey was conducted during 1998, but the results are not complete.

General Goals

Control erosion and sedimentation from land disturbing activities in order to meet narrative turbidity water quality standards and support designated uses. Increase public awareness of erosion and sedimentation through coordinated education and outreach efforts.

The GFC will encourage implementation of the newly revised 1999 forestry BMPs through workshops and demonstrations.

Ongoing Efforts

Forestry and Agriculture both have voluntary E&SC programs built around implementation of BMPs and water complaint resolution procedures in place. GSWCC recently updated and is distributing the Manual for Erosion and Sediment Control in Georgia and the Field Manual for Erosion and Sediment Control in Georgia. The GSWCC, with its agricultural partners, has produced and distributed three E&SC pamphlets; "Guidelines for Streambank Restoration", "A Guide to Controlling Erosion with Vegetation", and "Agricultural Management Practices". These, along with a number E&SC related pamphlets and other informational materials are available in agricultural offices throughout the State. Soil and Water Conservation Districts annually convene Local Work Groups (LWGs) which are comprised of resource professionals from a variety of disciplines and interested stakeholders at the local level to identify resource concerns in their areas. These LWGs develop proposals for USDA or other funding to address identified resource concerns.

Forestry has made significant E&SC progress. GFC has been and is specifically targeting those landowner groups and regions with low compliance for increased BMP education throughout local talks, workshops, etc. The Georgia Forestry Association and the American Forest and Paper Association (AF&PA) sponsor Master Timber Harvesters Workshops with the goal of training every logger in the State on BMPs. In addition, the Georgia State Board of Registration for Foresters requires every licensed forester to implement BMPs as a minimum standard of practice. As they become standard within the industry, the new Forestry BMP Guidelines, printed in January, 1999, will result in additional sedimentation reductions with more riparian tree cover left over perennial and intermittent streams.

EPD serves as the "Issuing Authority" providing permitting, inspection, and compliance enforcement services in those localities across the State where local Erosion and Sedimentation Control Ordinances or Programs are not yet established. EPD is also continuing its efforts to develop a NPDES General Permit (No. GAR100000) for storm water discharges associated with construction activity. The permit will provide guidelines and regulations for effective control of silt, sediment and other pollutants which are carried by storm water runoff from construction sites. The General Permit has been

issued, appealed, and overturned four times between 1992 and 1998, but was approved in 2000.

An Erosion and Sedimentation Control (E&SC) Advisory Committee developed an Erosion and Sediment Control Complaint Resolution Procedure by which concerned citizens or other parties may register E&SC complaints. The procedure is a three-step process with Local Issuing Authorities serving as the primary contact, followed by the local Soil and Water Conservation District, and finally EPD in some cases. The purpose of the procedure is to provide timely and workable solutions to E&SC control complaints through local Soil and Water Conservation Districts.

There are several erosion educational initiatives underway which have an urban focus. Each year GSWCC and EPD conduct five formal E&SC courses to provide training to the regulated community, regulators, consultants, and interested citizens. GSWCC also provides detailed E&SC training for 8 to 11 units of government each year. A task force established by the Lieutenant Governor and the Erosion and Sediment Control Technical Study Committee, known as DIRT II, is assessing the economic and environmental impacts of erosion prevention and sediment control BMPs for urban construction sites. Another urban initiative is the U.S. Forest Service's Planting Along Stream Sides (PASS) which deals with vegetative plantings to reduce erosion from stream banks.

In 1997, EPD, in cooperation with the University of Georgia, prepared and distributed the Land Development Provisions to Protect Georgia Water Quality report. The report describes provisions which may be modified or added to local development programs to better protect water quality. Portions of the report address water quality impacts from storm water runoff and its relationship to urban development.

Local Soil and Water Conservation Districts and Resource Conservation and Development (RC&D) Councils are working with crop producers to reduce erosion and sedimentation through their No-Till Drill Program in the Upper and Lower Ogeechee and Canoochee River subbasins as well as in the Newport River basin.

The Lower Ogeechee River sub-basin and Newport River basin are Priority Areas for USDA Cost-Share funds to implement agricultural BMPs through NRCS' EQIP Program.

The Georgia Soil and Water Conservation Commission (GSWCC) is demonstrating agricultural BMPs related to animal operations in the Canoochee River subbasin.

Forestry BMP Education

From 1996 through 1999, the GFC offered a 3-day Master Timber Harvester Workshop. During the 3-year period, the workshop was attended by the following number of personnel affiliated with timber buyers and loggers in the four subbasins:

- Upper Ogeechee River Subbasin (Hydrologic Unit 03060201) – 115 personnel
- Lower Ogeechee River Subbasin (Hydrologic Unit 03060202) – 88 personnel
- Ogeechee Coastal Subbasin (Hydrologic Unit 03060204) – 55 personnel
- Canoochee River Subbasin (Hydrologic Unit 03060203) – 93 personnel

Identified Gaps and Needs

A key for addressing erosion, sedimentation, and habitat issues on highly impacted streams is the definition of appropriate management goals. Many highly impacted streams cannot be returned to "natural" conditions. An appropriate restoration goal needs to be established in consultation between EPD partners and other stakeholders.

Many privately owned sawmills are not members of the AF&PA. These mills and their producers are not required to attend the Master Timber Harvesters Workshops at this time. The GFC, UGA, GFA, and the Southeastern Wood Producers Association are working on a solution. A need still exists for education of private landowners who are selling timber for the last time prior to land development. Many such landowners attempt to maximize return on timber, sometimes at the expense of BMPs.

Much of the sediment being produced and adversely impacting streams and lakes is associated with development and maintenance of unpaved rural roads. In many instances E&SC plans, implementation, inspection, and enforcement are not adequate on unpaved rural road projects. Without aggressive inspection and enforcement, contractors sometimes tend to allow erosion to occur and attempt mitigation after the fact. Georgia DOT and other agencies charged with E&SC need to work with county road departments in identifying road segments that are high sediment producers and recommend abatement measures. Additional monitoring may be needed to quantify the impact of unpaved rural roads as a source of sedimentation into streams.

Additional efforts should be directed toward increasing public awareness of erosion and sedimentation, with an emphasis on potential sources and controls. State and basin-wide coordination between agencies and organizations providing public education and technical assistance may help extend outreach efforts.

Adverse impacts of excess sediment loading include degradation of habitat and reduction of species diversity. These types of impacts are best evaluated through biological monitoring, for which improved capabilities are needed. EPD is developing increased capability for biomonitoring using Rapid Bioassessment Protocols (RBPs) for benthic macroinvertebrates. The EPD protocols also include habitat assessment. The WRD is working with the IBI (Index of Biologic Integrity) to assess fish communities. These tools will provide methods to detect and quantify impairment of aquatic life resulting from habitat-modifying stressors such as sediment, as well as impacts from other stressors.

General Strategies for Action

Many agricultural sediment reduction practices are relatively expensive and landowners are reluctant to spend today's dollars for long term BMP amortization in uncertain future markets. Agricultural cost share dollars (Farm Bill) and perhaps low interest loans (Clean Water State Revolving Fund) should be concentrated in priority watersheds with sufficient technical workforce to implement BMPs through long term agreements or contracts to reduce sediment loading. An understanding of the role of erosion and sedimentation in urban streams is incomplete at this time. Most of these streams are impacted by a variety of stressors. An incremental or phased approach is needed to address these issues.

Key Participants and Roles

GFC: encourage implementation of the newly revised 1999 forestry BMPs through workshops and demonstrations.

American Forest and Paper Association (AF&PA): The forest products industry has a strong record of stewardship on the land it owns and manages. Member companies have agreed to a Sustainable Forestry Initiative (SFI) program. The goal of the program is to improve the performance of member companies and licensees, and set new standards for the entire forest industry as well as for other forest landowners through implementation of the following twelve objectives:

1. Broaden the practice of sustainable forestry by employing an array of scientifically, environmentally, and economically sound forest practices in the growth, harvest, and use of forests.
2. Promptly reforest harvested acres to ensure long-term forest productivity and conservation of forest resources.
3. Protect the water quality in streams, lakes, and other water bodies by establishing riparian protection measures based on soil type, terrain, vegetation, and other applicable factors, and by using EPA approved Best Management Practices in all forest management operations.
4. Enhance the quality of wildlife habitat by developing and implementing measures that promote habitat diversity and the conservation of plant and animal populations found in forest communities.
5. Minimize the visual impact by designing harvests to blend into the terrain by restricting clear-cut size (120 acres average) and/or by using harvest methods, age classes, and judicious placement of harvest units to promote diversity in forest cover.
6. Manage company lands of ecologic, geologic, or historic significance in a manner that accounts for their special qualities.
7. Contribute to bio-diversity by enhancing landscape diversity and providing an array of habitats.
8. Continue to improve forest utilization to help ensure the most efficient use of forest resources.
9. Continue the prudent use of forest chemicals to improve forest health and growth while protecting employees, neighbors, the public, and sensitive lands.
10. Broaden the practice of sustainable forestry by further involving non-industrial landowners, loggers, consulting foresters, and company employees who are active in wood procurement and landowner assistance programs.
11. Publicly report Program Participants' progress in fulfilling their commitment to sustainable forestry.
12. Provide opportunities for the public and the forestry community to participate in the commitment to sustainable forestry.

From a water quality perspective, Objectives 3 and 10 are extremely important. Performance measures for Objective 3 state:

- Participants will meet or exceed all established BMPs, all applicable state water quality laws and regulations, and the requirements of the Clean Water Act for forestland.
- Participants will establish and implement riparian protection measures for all perennial streams and lakes and involve a panel of experts at the state level to help identify goals and objectives for riparian protection.
- Participants will individually, through cooperative efforts or through AF&PA, provide funding for water quality research.

Performance measures for Objective 10 state:

- Participants will encourage landowners that sell timber to reforest, following harvest, and to use BMPs by providing these landowners with information on the environmental and economic advantages of these practices.

- Participants will work closely with the Southeastern Wood Producers Association, the Georgia Forestry Association, the University of Georgia School of Forest Resources, the GFC, the Georgia Wildlife Resources Division, and others in the forestry community to further improve the professionalism of loggers through the Master Timber Harvesters program by establishing and/or cooperating with existing state groups to promote the training and education of loggers in:

  i. BMPs, including road construction and retirement, site preparation, streamside management, etc.
  ii. Awareness of responsibilities under the Endangered Species Act and other wildlife consideration.
  iii. Regeneration and forest resource conservation.
  iv. Logging safety.
  v. OSHA and wage and hour rules.
  vi. Transportation.
  vii. Business management including employee training, public relations, etc.

Specific Management Objectives

Control erosion and sedimentation from land disturbing activities in order to meet narrative water quality standards.

Management Option Evaluation

During this iteration of the basin cycle, management will focus on source control BMPs.

Action Plan

EPD and WRD will continue to develop biological monitoring capabilities designed to assess aquatic life. EPD will work with local governments with the issuing authority for erosion and sedimentation controls, first through education and second through enforcement, to control erosion at construction sites, and will encourage local governments to implement land use planning.

GSWCC and local SWCDs and RC&D Councils with assistance from NRCS will provide technical and educational assistance to producers to encourage the implementation of BMPs to control erosion of agricultural lands. Local SWCDs will convene local workgroups to identify resource concerns and develop proposals for funding to address these concerns. The University of Georgia will provide on-farm assessments to local producers through their Farm-A-Syst Program.

The GFC will encourage implementation of the newly revised 1999 forestry BMPs through workshops and demonstrations. GFC will continue to monitor BMP implementation rates through biennial surveys and determine effectiveness of BMPs through habitat assessments and rapid bioassessments of the aquatic organisms above and below forestry operations. GFC will target landowner and user groups with low implementation rates for BMP education to encourage compliance with forestry BMP guidelines. GFC will work with AF&PA and forestry community to provide BMP training.

American Forest and Paper Association (AF&PA): Member companies will document performance measures for each objective through annual reports to AF&PA as required for Objective 11. AF&PA will issue an annual report to the public.

EPD will encourage citizen involvement through Adopt-A-Stream groups to address restoration of streams. Citizen groups will implement Adopt-A-Stream programs and

work with local governments in implementing watershed initiatives. EPD and WRD will continue to develop biological monitoring capabilities designed to assess aquatic communities.

Method for Tracking Performance

GSWCC, GFC, EPD, and issuing authorities will track BMP implementation: GSWCC by the number of E&SC plans reviewed and DAT evaluations and recommendations; GFC through its biennial surveys, and EPD through routine inspections of permitted projects, surveillance for any incidences of noncompliance, and enforcement activities. NRCS will track BMP implementation through its NIMS reporting system.

7.3.4 Fish Consumption Guidelines

Problem Statement

The water use classifications were not fully supported in several water body segments due to fish consumption guidelines for mercury and in one segment due to dieldrin. There are no known point source discharges or other identifiable anthropogenic sources of mercury or dieldrin in these watersheds. Mercury may be present in fish due to mercury content in the natural soils, from municipal or industrial sources, or from fossil fuel use. It is also possible that the elevated mercury level is related to global atmospheric transport and deposition.

Upper Ogeechee River Basin (Hydrologic Unit 03060201)

The water use classification of fishing was not fully supported in one segment of the Ogeechee River mainstem due to fish consumption guidelines recommended because of mercury residues. The guidelines are for largemouth bass, spotted sucker and redbreast sunfish. The water use classifications was not fully supported in Short Creek, a tributary to the Ogeechee River, due to fish consumption guidelines recommended because of mercury residue in sunfish.

Lower Ogeechee River Basin (Hydrologic Unit 03060202)

The water use classification of fishing was not fully supported in two Ogeechee River mainstem segments based on fish consumption guidelines due to mercury. The guidelines are for largemouth bass in one river segment and largemouth bass and redbreast sunfish in the second river segment.

Canoochee River Basin (Hydrologic Unit 0306023)

The water use classification of fishing was not fully supported in the Canoochee River mainstem and the Evans County Public Fishing Area (PFA) due to fish consumption guidelines recommended because of mercury residues. The guidelines are for largemouth bass, redbreast sunfish, and channel catfish in the river and largemouth bass in the PFA.

Ogeechee Coastal Subbasin (HUC 03060204)

The water use classification of fishing was not fully supported in Casey Canal due to fish consumption conditions recommended because of dieldrin residues in striped mullet.

General Goals

Work to protect human health by providing guidelines for consumption of fish.

Ongoing Efforts

DNR has monitored fish and issued fish consumption guidelines. There are no known point source discharges or other identifiable anthropogenic sources of either mercury or dieldrin in the Ogeechee River Basin watersheds. Ongoing efforts will focus on continued monitoring of residue levels and issuance of updated consumption guidelines.

The Ogeechee and Canoochee Rivers are coastal plain blackwater swamp systems. These systems are characterized by a high content of organic carbon (organic ligand humic substances), low alkalinity and pH, and naturally lower dissolved oxygen content. Blackwater systems have been found to have physico-chemical characteristics that provide both a sink for the accumulation of mercury from atmospheric deposition or other sources, and to provide an environment conducive to the methylation of mercury. As a result, baseline mercury residues found in fish tissues are higher than that found in other waterbodies having a different chemistry.

There is no known source of the dieldrin in the Casey Canal watershed, but it is thought that it may be due to historical use in termite control. This pesticide has been restricted from use and residues are expected to decrease over time due to chemical decay processes.

Identified Gaps and Needs

The source of mercury in the basin is not well quantified. Mercury within these watersheds is likely derived from natural sources or from atmospheric deposition.

The source of the dieldrin in Casey Canal is not well quantified. It is likely that the origin was from historical use in termite control. As this pesticide has been restricted from use, residue levels are expected to decrease over time.

General Strategies for Action

Because mercury and dieldrin are not originating from any known point or other identifiable anthropogenic sources, the strategy is to keep the fishing public notified of risks associated with fish consumption.

EPD and WRD will work to protect public human health by issuing fish consumption guidelines as needed, indicating the recommended rates of consumption of fish from specific waters. The guidelines are based on conservative assumptions and provide the public with factual information for use in making rational decisions regarding fish consumption.

Action Plan

- WRD and EPD will continue to sample and analyze fish tissue and issue fish consumption guidelines as needed. The next round of fish tissue sampling for this watershed will be considered in fiscal year 2002 in accordance with the river basin monitoring cycle.
- EPD will evaluate the need for additional sampling of different media (fish tissue, water and/or sediment), if localized anthropogenic sources are indicated.

Method of Tracking Performance

Trends in fish tissue concentration; number of Fish Consumption Guidelines.

7.3.5 Nutrients

Problem Statement

Excess nutrient loads are a potential concern for all surface waters, as they promote undesirable growths of floating and attached algae which can degrade habitat, deplete dissolved oxygen, and result in filter clogging and taste and odor problems for public water supply systems. Impacts are typically greatest in lakes and reservoirs; however, nutrients may also stimulate undesirable growths of attached algae in small rivers and streams. Protection of water quality will require basin-wide strategies to control nutrient loads.

Canoochee River Subbasin (Hydrologic Unit 03060203)

The water use classifications of fishing; potentially threatened due to input of nutrients from agricultural runoff.

General Goals

Meet water quality standards and maintain nutrient loading at levels sufficient to support designated uses. Increase public awareness of stream nutrient loading through coordinated education and outreach efforts.

Ongoing Efforts

A key goal of the Clean Water Action Plan is the development of water quality criteria for nutrients by the year 2000. EPA has formulated a national strategy outlining the process and approach for the development of numeric criteria for nutrients and adoption of nutrient provisions in state water quality standards. Under the approach described in the new nutrient strategy, EPA will develop nutrient guidance documents for various types of waterbodies (e.g. rivers, lakes, coastal waters, and wetlands) over the next several years. States will be able to use these guidance documents and target ranges as they develop numeric criteria for nutrients as part of state water quality standards. EPA has formed a National Nutrient Team to guide the nutrient criteria development process and Regional Nutrient Teams will be formed in each EPA region.

EPD administers and enforces a variety of permit programs designed to facilitate the management of urban runoff, including both point and Nonpoint source controls. EPD's Nonpoint Source Program regulates municipal and industrial storm water discharges through the National Pollutant Discharge Elimination System (NPDES) permitting process. Water pollution control plant discharges and sanitary sewer overflows are managed through EPD's Permitting Compliance and Enforcement Program (PCEP). Animal wastes in Georgia are addressed through recently adopted rules designed to regulate Concentrated Animal Feeding Operations (CAFOs) for swine. This includes a requirement for certain operations to obtain individual NPDES permits.

In addition to regulatory activities, EPD assists in the development of local solutions to water quality problems by administering grant programs and providing technical assistance to various regional and local watershed management initiatives. EPD also conducts a variety of outreach and public education programs addressing urban runoff in general, point and Nonpoint source pollution, BMP implementation, regulatory requirements, and cooperative or non-regulatory approaches.

The University of Georgia College of Agriculture and Environmental Sciences' Animal Waste Awareness in Research & Extension (AWARE) program conducts research on animal waste management and provides public education through Southeast

Sustainable Animal Waste Workshops and a variety of Internet publications. The University of Georgia is also testing agricultural uses of municipal biosolids in the Upper Ogeechee sub-basin.

Local Soil and Water Conservation Districts and RC&D Councils are working with producers to utilize animal waste according to Nutrient Management Plans through their Lagoon Pumpout Program in the Upper and Lower Ogeechee and Canoochee subbasins as well as in the Newport River basin.

The Lower Ogeechee subbasin and Newport River basin are Priority Areas for USDA Cost-Share funds to implement agricultural BMPs through NRCS' EQIP Program.

The Georgia Soil and Water Conservation Commission (GSWCC) is demonstrating agricultural BMPs related to animal operations in the Canoochee River subbasin.

The U.S. EPA has developed a Nutrient Management Measure intended to be applied by the States to activities associated with the application of nutrients to agricultural lands. The goal of the measure is to minimize edge-of-field delivery of nutrients and leaching of nutrients from the root zone, as well as promote more efficient use of all nutrient sources that are available to agricultural operations.

Identified Gaps and Needs

The national response to the nutrient problem has been limited primarily because of concerns over the scale of the problem, and because of the tremendous variability of nutrient conditions, both natural and cultural, throughout the nation. Additional efforts should be directed toward increasing public awareness of stream nutrient loading, with an emphasis on potential sources and controls. State and basin-wide coordination between agencies and organizations providing public education and technical assistance may help to extend outreach efforts.

General Strategies for Action

Additional point and Nonpoint source controls such as agricultural best management practices may be implemented to minimize nutrient inputs and comply with future water quality standards. Landowners and managers of agricultural operations should be encouraged to adopt and implement Nutrient Management Plans.

Specific Management Objectives

Stakeholders should work together to encourage and facilitate local watershed planning and management, as well as the implementation of Nutrient Management Plans for agricultural operations, to ensure that designated water uses are supported.

Agricultural agencies will provide technical and educational assistance to producers for the purpose of facilitating agricultural BMP implementation.

Management Option Evaluation

GSWCC, NRCS, and the UGA will encourage the adoption of BMPs on agricultural lands. EPD will continue to encourage local government planning efforts, regulate point sources and encourage outreach through Adopt-A-Stream programs.

Action Plan

GSWCC and local agricultural agencies will continue to support adoption of BMPs for animal waste handling and cropland operations. Methods for prioritization and

implementation of cost-share incentives under the 1996 Farm Bill will be targeted to areas of apparent water quality impact, including rural streams which may sustain excessive nutrient loads from animal and cropland operations.

EPD will continue monitoring and assessment of Land Application Systems and assist local government agencies and other organizations in public education and outreach efforts. EPD will monitor and assess use support in listed streams, encourage local planning efforts and regulate point sources under the NPDES program.

EPD will encourage citizen involvement through Adopt-A-Stream groups to address restoration of streams. Citizen groups will implement Adopt-A-Stream programs, and work with local governments in implementing watershed initiatives.

The University of Georgia will provide on-farm assessments to local producers through the Farm-A-Syst program.

Method for Tracking Performance

Agricultural agencies will track rates of BMP implementation for cropland and animal operations. An evaluation of the status of listed water bodies will be made coincident with the next iteration of the RBMP cycle for the Ogeechee River basin in 2001-2005.

7.3.6 Low Dissolved Oxygen

Problem Statement

Water use classification for fishing were not fully supported in several water body segments due to excursions of the water quality standards for dissolved oxygen. These excursions are primarily attributed to Nonpoint sources and to natural conditions.

Lower Ogeechee River Subbasin (HUC 03060202)

The water use classification of fishing was not fully supported in five tributaries due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the tributaries was due to nonpoint sources. Dissolved oxygen may be lower in these areas due to natural conditions.

Canoochee River Subbasin (HUC 03060203)

The water use classification of fishing was not fully supported in one Canoochee River mainstem segment and seven tributaries due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the mainstream segment was due to urban runoff and low dissolved oxygen in the tributaries was due to nonpoint sources, urban runoff, and a water pollution control plant discharge. Dissolved oxygen may also be lower in these areas due to natural conditions.

Ogeechee Coastal Subbasin (HUC 03060204)

The water use classification of fishing was not fully supported four tributary stream segments (Peacock Creek and Casey Canal) due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the tributaries was due to nonpoint sources. Dissolved oxygen may be lower in these areas due to natural conditions.

General Goals

Meet water quality standards to support designated water uses.

Ongoing Efforts

The Lower Ogeechee is a Priority Area for USDA Cost-Share funds to implement agricultural BMPs through NRCS's EQIP Program. Local Soil and Water Conservation Districts and RC&D Councils are working with producers to utilize animal waste according to Nutrient Management Plans through their Lagoon Pumpout Program.

The Georgia Soil and Water Conservation Commission (GSWCC) is demonstrating agricultural BMPs related to animal operations in the Canoochee River Sub-Basin. Local Soil and Water Conservation Districts and RC&D Councils are working with producers to utilize animal waste according to Nutrient Management Plans through their Lagoon Pumpout Program.

Identified Gaps and Needs

Low dissolved oxygen concentrations in this part of the state are often due to natural environmental conditions. Work is needed to identify and characterize natural background dissolved oxygen concentrations in this area.

General Strategies for Action

Low dissolved oxygen concentrations in the various streams in the Ogeechee River Basin were due to nonpoint sources and/or natural environmental conditions. EPD will address Nonpoint sources through a watershed protection strategy for the basin.

Specific Management Objectives

Maintain dissolved oxygen concentrations adequate to support aquatic life and meet water quality standards.

Action Plan

- EPD: monitor and assess use support in the listed waters and develop a watershed strategy for addressing Nonpoint sources.
- Local governments will implement storm water management strategies and manage operations of water pollution control plants.
- WRD will continue work to study habitat requirements for fish populations.
- NRCS will continue BMP implementation.
- Local S&WC Districts and RC&D Councils will continue Lagoon Pumpout Program.

Methods for Tracking Performance

A reevaluation of the status of the listed waterbodies will be made coincident with the next iteration of the RBMP management cycle for the Ogeechee River basin in 2001-2005.

7.3.7 Groundwater Quality and Quantity

Lower Ogeechee River Subbasin (HUC 03060202)

Issue A. Suburban water supply

Problem Statement

Water needs for residential and commercial development growth is a concern for Southeast Bryan County. The defined limit on availability of Floridan aquifer groundwater is having an impact on continued development in the county. This is apparent with pressures to reduce usage of the Floridan aquifer in the area and in southern Bryan County, without any other convenient source of water.

The general regional use of groundwater throughout coastal Georgia is leading to declining water levels in the Floridan aquifer. Such declining groundwater levels are reducing pressures in the aquifer sufficiently to allow seawater to enter the aquifer in Port Royal Sound north of Hilton Head Island, South Carolina and potentially elsewhere in that area and then begin to slowly moving towards Savannah, Georgia. All municipal, industrial, and agricultural users withdrawing water from the Floridan aquifer throughout this basin contribute to this salt-water intrusion problem.

General Goals

Stop the intrusion of salt-water before the municipal supply wells on Hilton Head Island, South Carolina and in Savannah, Georgia are contaminated.

Ongoing Efforts

After several years of working with the stakeholders throughout the coastal area, EPD developed the *"Interim Strategy for Managing Salt Water Intrusion in the Upper Floridan Aquifer of Southeast Georgia"* (dated April 23, 1997). This defines the EPD roles and requirements for studies and stakeholder efforts through December 31, 2005. The legislature has funded an extensive Sound Science initiative to provide some of the necessary information to determine what is happening in the aquifer and what can be done to minimize any problems. This shall all be discussed with stakeholders and used in developing the Final Strategy for water withdrawals in January, 2006. To meet these objectives, EPD will do the following:

(1) Conduct expanded scientific (Sound Science effort) and feasibility studies to determine with certainty how to permanently stop the salt-water intrusion moving towards Hilton Head Island, South Carolina and Savannah, Georgia

(2) Require the development of comprehensive local water supply plans in a 24 county area of southeast Georgia.

(3) Create one or more technical advisory committees (TAC). With their input, the additional scientific information and the local water supply plans, develop a long-term ground water management plan for southeast Georgia by the end of the year 2005, which will protect the Upper Floridan aquifer from further salt-water intrusion.

(4) Impose caps on ground water use in the Capped areas of Glynn County, Chatham County, and southern portions of Bryan and Effingham counties, to avoid worsening the rate of salt water intrusion at Hilton Head - Savannah and at Brunswick.

(5) Reduce ground water use in Chatham County by at least 10 million gallons per day by December 31, 2005 through conservation and substitution of surface

water for ground water. Union Camp will provide at least 6.5 mgd of the total 10 Mgd of ground water reduction in Chatham County. This will be affirmed through reductions in ground water use permits.

(6) Allow, on an interim basis, increases in groundwater withdrawals in the areas of southeast Georgia that have little impact on salt-water intrusion problem.

(7) Encourage and promote water conservation and reduced ground water usage wherever feasible, throughout southeast Georgia.

Identified Gaps and Needs

EPD needs an expanded compliance effort to better account for actual amounts of groundwater withdrawals from the Floridan aquifer.

EPD, USGS and several consulting firms are working on creating improved computer modeling efforts to provide better and more complete information than was previously available regarding the impacts of all withdrawals on the aquifer.

EPD in conjunction with the USGS and contracted consulting firms is trying to identify alternative water sources to allow additional water from sources outside of the Floridan aquifer.

Strategies for Action

EPD and the coastal stakeholders need to implement the policies recommended in the Interim Strategy, be prepared to analyze any new information developed under the Sound Science initiative and eventually create the recommendations of policy measures for the final strategy policy.

EPD is currently investigating the potential water production from the Miocene aquifers above the Floridan aquifer. Test wells will be drilled and a determination made of general water potentials.

Key Participants and Roles

Georgia EPD: Monitor strategy efforts and inform stakeholders of progress.

South Carolina DHEC: Because of the contamination moving under Hilton Head Island, SC DHEC will be closely watching any recommendations Georgia will make on this matter and noting any progress Georgia may make to address the issue.

County and Local Municipal Governments: Each City in the area has it's own interest in economic development and residential growth. How will limited water impact it's own development? Can water conservation efforts allow more growth?

Public Citizen groups: Public participation is essential to insure public buy-in on any proposed interim measures and in the development of the final strategy.

Specific Management Objectives

EPD and others will encourage water conservation by all parties. EPD needs to insure that Chatham County will reduce their groundwater usage by 10 mgd by December 31, 2005. EPD will prevent any withdrawal increases within the rest of the Capped area, if not associated with any nearby withdrawal reductions to offset the increase. And lastly, limit new or increased Floridan aquifer groundwater withdrawals from elsewhere.

Management Option Evaluation

Apply the Interim Strategy to permitting actions in coastal Georgia.

Develop the Final strategy.

Action Plan

Implement the Coastal Interim Strategy through December 31, 2005

Develop the Final Management Strategy for action in January, 2006.

Extensive stakeholder involvement in all these matters is sought and encouraged.

Public meetings to update stakeholders shall be held regularly in the coastal area.

Methods for Tracking Performance

Account for accurate water withdrawals throughout the area, looking for the necessary mandated reductions.

Determine the velocity of the salt-water intrusion and see if the contaminant wedge is accelerating or decelerating in its movement towards Hilton Head Island, SC and Savannah, GA.

Issue B: Groundwater Surface water interactions

Problem Statement

Groundwater levels are also threatened due to high rates of pumpage of groundwater for agricultural irrigation. USGS presented evidence that agricultural groundwater usage may be responsible for a lower groundwater table and less recharge to streams. The data points suggest that pre-agricultural irrigation 7Q10s in the lower Ogeechee River were higher than 7Q10s since irrigation pressures began.

General Goal

Define whether agricultural withdrawals in the mid and upper basins are lowering aquifer levels sufficient to reduce groundwater flow into the streams, thereby reducing stream flow levels in the basin as a whole.

Ongoing Efforts

Problem has been noted and some initial investigatory steps have been taken by EPD. As manpower and funds become available in the future, EPD will try to determine whether this is an actual problem or not.

Identified Gaps and Needs

Additional data will be needed to illustrate if this actually is occurring. Future computer modeling will need to be done to determine if groundwater withdrawals are the potential reason for any surface water reductions in flow.

Action Plan

Gather more data and watch to see if this actually is a problem.

Methods for Tracking Performance

Continue to assess data as it is collected.

References

Georgia Environmental Protection Division. 1987. Water Availability and Use Report, Coastal Plain River Basins.

DRI/McGraw Hill. 1996. The Regional Economic Forecast of Population and Employment Comprehensive Study, Volume 1. Prepared for: Georgia Department of Natural Resources Environmental Protection Division. DRI/McGraw-Hill, Lexington, MA.

In This Section

- Where Do We Go From Here?
- Working to Strengthen Planning and Implementation Capabilities
- Addressing the Impacts from Continued Population Growth and Land Development
- The Next Iteration of the Basin Cycle
- Priorities for Additional Data Collection

Section 8

Future Issues and Challenges

8.1 Where Do We Go From Here?

The Dynamic Process of Basin Management

This plan represents another step in managing the water resources in the Ogeechee River basin, but not the final step. It is important to recognize that effective basin management is ongoing and dynamic because changes in resource use and conditions occur continually, as do changes in management resources and perspectives. Therefore, management planning and implementation must remain flexible and adapt to changing needs and capabilities.

Building on Past Improvements

As discussed above in Section 7.3, there is more work to do to adequately restore and protect all of Georgia's water resources. After focusing on the implementation of this plan, the Ogeechee River basin will enter into its second iteration of the basin management cycle (scheduled for April 2000). The next cycle will provide an opportunity to review issues that were not fully addressed during the first cycle and to reassesses or identify any new priority issues. In other words, future management efforts can and should build on the foundation created by previous, ongoing, and already planned management actions.

Participation by Many Different Stakeholders

Partners will not have to start from scratch during the next iteration of the basin planning cycle. The information in this document provides an historical account of what is known and planned to date. Stakeholders in the Ogeechee basin will know what was accomplished in the first iteration, and can therefore focus on enhancing ongoing efforts or filling gaps. Data collection and public discussion activities scheduled early in the next

cycle can draw on information in the plan to identify areas in need of additional monitoring, assessment, and strategy development.

Blending Regulatory and Voluntary Approaches

Although the regulatory authorities of agencies such as EPD are important for protection and restoration of Georgia's waters, RBMP partners will continue to emphasize voluntary and cooperative approaches to watershed management. This will take time and be very challenging. Long-term protection means that the people, local governments, and businesses must learn collectively what is needed for protection and adapt their lifestyle and operations accordingly. Experience indicates that we are much more likely to buy into proposed management solutions in which we have a say and control over how we spend our time and money. The challenge in the future, therefore, is to continue to "build bridges" between regulatory and voluntary efforts, using each where they best serve the people and natural resource of Georgia.

8.2 Working to Strengthen Planning and Implementation Capabilities

Understanding One Another's Roles

Increasing awareness and understanding of the roles and capabilities of local, state, and federal partners is one of the keys to future success in basin management for the Ogeechee River. Lack of understanding can lead to finger pointing and frustration on the part of all involved. Increasing opportunities for stakeholders to develop this awareness and understanding should result in more effective management actions.

This basin plan provides one opportunity for stakeholders to increase their awareness of conditions in the basin and to learn about ongoing and proposed new management strategies. Within this context, stakeholders can develop a better understanding of certain roles and responsibilities. For example, this basin plan points out several areas where EPD has regulatory authority and corresponding duties, including

- Establishing water quality use classifications and standards.
- Assessing and reporting on water quality conditions.
- Facilitating development of River Basin Management Plans.
- Developing TMDLs.
- Issuing permits for point source discharges of treated wastewater, municipal storm water discharges as required, and land application systems.
- Issuing water supply permits.
- Enforcing compliance with permit conditions.

In many areas, however, organizations or entities other than EPD are responsible; for example,

- Septic tank permitting and inspection (County Health Departments) and maintenance (individual landowners).
- Land development (land use) and zoning ordinances (local governments).
- Sanitary sewer and storm water ordinances (local governments).
- Water supply source water protection ordinances (local governments).

- Urban storm water and drainage (local governments).
- Erosion and sediment control (local governments).
- Siting of industrial parks, landfills, and wastewater treatment facilities (local governments).
- Floodplain management (FEMA, local governments).
- Implementation of forestry best management practices (Georgia Forestry Commission with support from the American Forest and Paper Association, the Georgia Forestry Association, the University of Georgia School of Forest Resources, Southeastern Wood Producers Association, and the American Pulpwood Association).
- Implementation of agricultural best management practices (landowners with support from state and federal agricultural agencies).
- Proper use, handling, storage, and disposal of chemicals (businesses, landowners, municipalities, counties, etc.).

These are but a few of the areas involved, but they illustrate how responsibilities are spread across many stakeholders in each basin. Additionally, other agencies and organizations—regional development centers; federal, state, and local technical assistance programs; citizens groups; and business associations—assist in planning and implementation in many of these areas. As stakeholders become more familiar with one another's responsibilities and capabilities, they will become increasingly aware of appropriate partners to work with in addressing their issues of concern.

Using the RBMP Framework to Improve Communication

Raising awareness frequently involves two-way communication. The RBMP framework's interactive planning and outreach sessions provide additional opportunities for two-way communication. For example, Basin Technical Planning Team meetings provide opportunities for partners to share information on their responsibilities and capabilities with each other. Similarly, River Basin Advisory Committee meetings and Stakeholder meetings provide opportunities for citizens, businesses, government agencies, associations, and others. to share information and learn from each other. Although these interactions often require considerable time, they are critical to the future of management in the basin because they build the working relationships and trust that are essential to carrying out effective, integrated actions.

Continuing to Streamline Our Efforts

Increased coordination will also result if partners in this approach continue to streamline their efforts. There are many laws and requirements with related and complementary goals, e.g., Georgia's Growth Strategies Act, Planning Act, River Corridor Protection Act, Comprehensive Ground Water Management Plan, and River Basin Management Planning requirements, in addition to federal Clean Water Act water quality regulations and Safe Drinking Water Act source water protection requirements. Partners should continue to find ways to make actions under these laws consistent and complementary by eliminating redundancy and leveraging efforts. Again, partners can use the forums in the RBMP framework (e.g., river basin team and advisory committees) to discuss and implement ideas to streamline roles and make the best use of their funds and staff resources.

8.3 Addressing the Impacts from Continued Population Growth and Land Development

Supporting Consistent Implementation of Protection Measures

In addressing the impacts from anticipated population growth and increased land development in the basin, future managers will need to increase their understanding of roles and use forums to coordinate and develop more specific action plans. Historically, mitigating impacts from newly developed areas has been approached mostly on a case-by-case basis. Unfortunately, this approach has resulted in inconsistent planning and implementation of water resource protection measures. River basin planning offers an opportunity for a more consistent approach by making it easier for landowners, local governments, and businesses to work together at the watershed and basin levels.

One way that Georgia EPD will address this issue is by approving only new and expanding permits for water withdrawals and wastewater discharges that are consistent with the basin plan and that meet the intent of the Georgia Planning Act. Rather than waiting for the permit application process, however, local governments can work together and with EPD to work out some of these issues in advance. There are incentives for organizations such as the Georgia Water Pollution Control Association (WPCA), the Georgia Municipal Association (GMA), the Association of County Commissioners of Georgia (ACCG), and the Regional Development Centers (RDCs) to work out consistent methods to conduct watershed assessments in developing areas and to improve the implementation of protection measures as development occurs. EPD, DCA, and other partners can coordinate by facilitating discussion at RBMP meetings and supporting local initiatives aimed at this issue. An excellent example of this cooperative effort is the Georgia Water Management Campaign being facilitated by the Association of County Commissioners in cooperation with the Georgia EPD, the Georgia Municipal Association, and the Georgia Environmental Facilities Authority.

8.4 The Next Iteration of the Basin Cycle

Building on Previous, Ongoing, Planned Efforts

As discussed above and in Section 7.3, there is more work to do to adequately restore and protect all of Georgia's water resources. After focusing on the implementation of this plan, the Ogeechee River basin will enter into its second iteration of the basin management cycle (scheduled for 2001). The next cycle will provide an opportunity to review issues that were not fully addressed during the first cycle and to reassess or identify any new priority issues. In other words, future management efforts can and should build on the foundation created by previous, ongoing, and already planned management actions.

8.5 Priorities for Additional Data Collection

In 1997-1998 monitoring efforts were focused on the Savannah and Ogeechee River basin in accordance with the EPD basin planning schedule. Intensive monitoring will return to the Ogeechee basin in support of the next iteration of the basin planning cycle in 2001. Prior to this time, EPD and partners will develop a monitoring plan for the Ogeechee. The monitoring plan will have two major components: general assessment of water quality status within the basin, and targeted assessment to address priority issues and concerns.

River Basin Planning Act

(O.C.G.A. 12-5-520 to 525)

92 SB637/AP

Senate Bill 637

By: Senators Johnson of the 47th, Pollard of the 24th, Edge of the 28th and Egan of the 40th.

An Act

To amend Chapter 5 of Title 12 of the Official Code of Georgia Annotated, relating to water resources, so as to define certain terms; to provide for the development of river basin management plans for certain rivers; to provide for the contents of such plans; to provide for the appointment and duties of local advisory committees; to provide for notice and public hearings; to provide for submission to and approval of plans to the Board of Natural Resources; to make certain provisions relative to issuing certain permits; to provide for the application for and use of certain funds; to provide that this Act shall not enlarge the powers of the Department of Natural Resources; to repeal conflicting laws; and for other purposes.

Be It Enacted by the General Assembly of Georgia:

Section 1. Chapter 5 of Title 12 of the Official Code of Georgia Annotated, relating to water resources, is amended by inserting at the end thereof the following:

Article 8

12-5-520. As used in this article, the term:

(1) "Board" means the Board of Natural Resources.

(2) "Director" means the director of the Environmental Protection Division of the Department of Natural Resources.

12-5-521. The director shall develop river basin management plans for the following rivers: Alapaha, Altamaha, Canoochee, Chattahoochee, Coosa, Flint, Ochlocknee, Ocmulgee, Oconee, Ogeechee, St. Marys, Satilla, Savannah, Suwanee, Tallapoosa, and Tennessee. The director shall consult the chairmen of the local advisory committees on all aspects of developing the management plans. The director shall begin development of the management plan for the Chattahoochee and Flint river basins by December 31, 1992, and for the Coosa and Oconee river basins by December 31, 1993. Beginning in 1994, the director shall begin development of one management plan per calendar year until all required management plans have been begun. All management plans shall be completed not later than five years after they were begun and shall be made available to the public within 180 days after completion.

12-5-522. The management plans provided by Code Section 12-5-521 shall include, but not be limited to, the following:

(1) A description of the watershed, including the geographic boundaries, historical, current, and projected uses, hydrology, and a description of water quality, including the current water quality conditions;

(2) An identification of all governmental units that have jurisdiction over the watershed and its drainage basin;

(3) An inventory of land uses within the drainage basin and important tributaries including point and nonpoint sources of pollution;

(4) A description of the goals of the management plan, which may include educating the general public on matters involving the environmental and ecological concerns specific to the river basin, improving water quality and reducing pollution at the source, improving aquatic habitat and reestablishing native species of fish, restoring and protecting wildlife habitat, and providing recreational benefits; and

(5) A description of the strategies and measures necessary to accomplish the goals of the management plan.

12-5-523. As an initial action in the development of a management plan, the director shall appoint local advisory committees for each river basin to consist of at least seven citizens and a chairman appointed by the director. The local advisory committees shall provide advice and counsel to the director during the development of the management plan. Each committee shall meet at the call of the chairman but not less than once every four months. The chairman and members of the local advisory committees shall serve without compensation or reimbursement of expenses.

12-5-524.

(a) Upon completion of the penultimate draft of a management plan, the director shall conduct public hearings within the river basin. At least one public hearing shall be held in each river basin named in Code Section 12-5-521. The director shall publish notice of each such public hearing in a newspaper of general circulation in the area announcing the date, time, place, and purpose of the public hearing. A draft of the management plan shall be made available to the public at least 30 days prior to the public hearing. The director shall receive public comment at the public hearing and for a period of at least ten days after the public hearing.

(b) The division shall evaluate the comments received as a result of the public hearings and shall develop the final draft of the management plan for submission to the board for consideration within 60 days of the public hearing.

(c) The board shall consider the management plan within 60 days after submission by the director. The department shall publish the management plan adopted by the board and shall make copies available to all interested local governmental officials and citizens within the river basin covered by such management plan.

(d) Upon the board's adoption of a final river basin management plan, all permitting and other activities conducted by or under the control of the Department of Natural Resources shall be consistent with such plan.

(e) No provision of this article shall constitute an enlargement of the existing statutory powers of the department.

12-5-525. The director is directed to apply for the maximum amount of available funds pursuant to Sections 106, 314, 319, and 104(b)(2) of Public Law 95-217, the federal Clean Water Act, and any other available source for the development of river basin management plans."

Section 2. All laws and parts of laws in conflict with this Act are repealed.

Georgia Instream Water Quality Standards For All Waters: Toxic Substances

(Excerpt From Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6-.03 Water Use Classifications and Water Quality Standards)

I Instream concentrations of the following chemical constituents which are considered to be other toxic pollutants of concern in the State of Georgia shall not exceed the criteria indicated below under 7-day, 10-year minimum flow (7Q10) or higher stream flow conditions except within established mixing zones:

1. 2,4-Dichlorophenoxyacetic acid (2,4-D) 70 µg/l
2. Methoxychlor* 0.03 µg/l
3. 2,4,5-Trichlorophenoxy propionic acid (TP Silvex) 50 µg/l

II Instream concentrations of the following chemical constituents listed by the U.S. Environmental Protection Agency as toxic priority pollutants pursuant to Section 307(a)(1) of the Federal Clean Water Act (as amended) shall not exceed criteria indicated below under 7-day, 10-year minimum flow (7Q10) or higher stream flow conditions except within established mixing zones or in accordance with site specific effluent limitations developed in accordance with procedures presented in 391-3-6-.06.

1. Arsenic
   - (a) Freshwater 50 µg/l
   - (b) Coastal and Marine Estuarine Waters 36 µg/l
2. Cadmium
   - (a) Freshwater
     - (at hardness levels less than 100 mg/l) 0.7 µg/l*
     - (at hardness levels of 100 mg/l to 199 mg/l) 1.1 µg/l*
     - (at hardness levels greater than or equal to 200 mg/l) 2.0 µg/l*

     Note: Total hardness expressed as $CaCO_3$.
   - (b) Coastal and Marine Waters 9.3 µg/l
3. Chlordane*
   - (a) Freshwater 0.0043 µg/l
   - (b) Coastal and Marine Estuarine Waters 0.004 µg/l
4. Chromium (VI)
   - (a) Freshwater 11 µg/l
   - (b) Coastal and Marine Estuarine Waters 50 µg/l
5. Total Chromium

   (at hardness levels less than 100 mg/l) 120 µg/l

   (at hardness levels of 100 mg/l to 199 mg/l) 210 µg/l

   (at hardness levels greater than or equal to 200 mg/l) 370 µg/l

   Note: Total hardness expressed as $CaC0_3$.
6. Copper
   - (a) Freshwater
     - (at hardness levels less than 100 mg/l) 6.5 µg/l*
     - (at hardness levels of 100 mg/l to 199 mg/l) 12 µg/l
     - (at hardness levels greater than or equal to 200 mg/l) 21 µg/l

     Note: Total hardness expressed as $CaCO_3$.
   - (b) Coastal and Marine Estuarine Waters 2.9 µg/l*
7. Cyanide*
   - (a) Freshwater 5.2 µg/l
   - (b) Coastal and Marine Estuarine Waters 1.0 µg/l
8. Dieldrin* 0.0019 µg/l
9. 4,4'-DDT* 0.001 µg/l
10. a-Endosulfan*
    - (a) Freshwater 0.056 µg/l

(b) Coastal and Marine Estuarine Waters 0.0087 µg/l

11. b-Endosulfan*
    (a) Freshwater 0.056 µg/l
    (b) Coastal and Marine Estuarine Waters 0.0087 µg/l
12. Endrin* 0.002 µg/l
13. Heptachlor*
    (a) Freshwater 0.0038 µg/l
    (b) Coastal and Marine Estuarine Waters 0.0036 µg/l
14. Heptachlor Epoxide*
    (a) Freshwater 0.0038 µg/l
    (b) Coastal and Marine Estuarine Waters 0.0036 µg/l
15. Lead*
    (a) Freshwater
        (at hardness levels less than 100 mg/l) 1.3 µg/l
        (at hardness levels of 100 mg/l to 199 mg/l) 3.2 µg/l
        (at hardness levels greater than or equal to 200 mg/l) 7.7 µg/l
        Note: Total hardness expressed as $CaCO_3$.
    (b) Coastal and Marine Estuarine Waters 5.6 µg/l
16. Lindane [Hexachlorocyclohexane (g-BHC-Gamma)] 0.08 µg/l
17. Mercury*
    (a) Freshwater 0.012 µg/l
    (b) Coastal and Marine Estuarine Waters 0.025 µg/l
18. Nickel
    (a) Freshwater
        (at hardness levels less than 100 mg/l) 88 µg/l
        (at hardness levels of 100 mg/l to 199 mg/l) 160 µg/l
        (at hardness levels greater than or equal to 200 mg/) 280 µg/l
        Note: Total hardness expressed as $CaCO_3$.
    (b) Coastal and Marine Estuarine Waters 8.3 µg/l
19. Pentachlorophenol*
    (a) Freshwater 2.1 µg/l
    (b) Coastal and Marine Estuarine Waters 7.9 µg/l
20. PCB-1016 0.014 µg/l
21. PCB-1221 0.014 µg/l
22. PCB-1232 0.014 µg/l
23. PCB-1242 0.014 µg/l
24. PCB-1248 0.014 µg/l
25. PCB-1254 0.014 µg/l
26. PCB-1260 0.014 µg/l
27. Phenol 300 µg/l
28. Selenium
    (a) Freshwater 5.0 µg/l
    (b) Coastal and Marine Estuarine Waters 71 µg/l
29. Silver **
30. Toxaphene 0.0002 µg/l
31. Zinc
    (a) Freshwater
        (at hardness levels less than 100 mg/l) 60 µg/l
        (at hardness levels of 100 mg/l to 199 mg/l) 110 µg/l
        (at hardness levels greater than or equal to 200 mg/l) 190 µg/l
        Note: Total hardness expressed as $CaCO_3$.
    (b) Coastal and Marine Estuarine Waters 86 µg/l

Notes:

- The in-stream criterion is lower than the EPD laboratory detection limits.

** Numeric limits are not specified. This pollutant is addressed in 391-3-6-.06.

III Instream concentrations of the following chemical constituents listed by the U. S. Environmental Protection Agency as toxic priority pollutants pursuant to Section 307(a)(1) of the Federal Clean Water Act (as amended) shall not exceed criteria indicated below under annual average or higher stream flow conditions:

1. Acenaphthene **
2. Acenaphthylene **
3. Acrolein 780 µg/l
4. Acrylonitrile 0.665 µg/l
5. Aldrin 0.000136 µg/l
6. Anthracene 110000 µg/l
7. Antimony 4308 µg/l
8. Arsenic 0.14 µg/l
9. Benzidine 0.000535 µg/l
10. Benzo(a)Anthracene 0.0311 µg/l
11. Benzo(a)Pyrene 0.0311 µg/l

12.	3,4-Benzofluoranthene	0.0311 µg/l
13.	Benzene	71.28 µg/l
14.	Benzo(ghi)Perylene	**
15.	Benzo(k)Fluoranthene	0.0311 µg/l
16.	Beryllium	**
17.	a-BHC-Alpha	0.0131 µg/l
18.	b-BHC-Beta	0.046 µg/l
19.	Bis(2-Chloroethyl)Ether	1.42 µg/l
20.	Bis(2-Chloroisopropyl)Ether	170000 µg/l
21.	Bis(2-Ethylhexyl)Phthalate	5.92 µg/l
22.	Bromoform (Tribromomethane)	360 µg/l
23.	Carbon Tetrachloride	4.42 µg/l
24.	Chlorobenzene	21000 µg/l
25.	Chlorodibromomethane	34 µg/l
26.	2-Chloroethylvinyl Ether	**
27.	Chlordane	0.000588 µg/l
28.	Chloroform (Trichloromethane)	470.8 µg/l
29.	2-Chlorophenol	**
30.	Chrysene	0.0311 µg/l
31.	Dibenzo(a,h)Anthracene	0.0311 µg/l
32.	Dichlorobromomethane	22 µg/l
33.	1,2-Dichloroethane	98.6 µg/l
34.	1,1-Dichloroethylene	3.2 µg/l
35.	1,3-Dichloropropylene (Cis)	1700 µg/l
36.	1,3-Dichloropropylene (Trans)	1700 µg/l
37.	2,4-Dichlorophenol	790 µg/l
38.	1,2-Dichlorobenzene	17000 µg/l
39.	1,3-Dichlorobenzene	2600 µg/l
40.	1,4-Dichlorobenzene	2600 µg/l
41.	3,3'-Dichlorobenzidine	0.077 µg/l
42.	4,4'-DDT	0.00059 µg/l
43.	4,4'-DDD	0.00084 µg/l
44.	4,4'-DDE	0.00059 µg/l
45.	Dieldrin	0.000144 µg/l
46.	Diethyl Phthalate	120000 µg/l
47.	Dimethyl Phthalate	2900000 µg/l
48.	2,4-Dimethylphenol	**
49.	2,4-Dinitrophenol	14264 µg/l
50.	Di-n-Butyl Phthalate	12100 µg/l
51.	2,4-Dinitrotoluene	9.1 µg/l
52.	1,2-Diphenylhydrazine	0.54 µg/l
53.	Endrin Aldehyde	0.81 µg/l
54.	Endosulfan Sulfate	2.0 µg/l
55.	Ethylbenzene	28718 µg/l
56.	Fluoranthene	370 µg/l
57.	Fluorene	14000 µg/l
58.	Heptachlor	0.000214 µg/l
59.	Heptachlor Epoxide	0.00011 µg/l
60.	Hexachlorobenzene	0.00077 µg/l
61.	Hexachlorobutadiene	49.7 µg/l
62.	Hexachlorocyclopentadiene	17000 µg/l
63.	Hexachloroethane	8.85 µg/l
64.	Indeno(1,2,3-cd)Pyrene	0.0311 µg/l
65.	Isophorone	600 µg/l
66.	Lindane [Hexachlorocyclohexane (g-BHC-Gamma)]	0.0625 µg/l
67.	Methyl Bromide (Bromomethane)	4000 µg/l
68.	Methyl Chloride (Chloromethane)	**
69.	Methylene Chloride	†
70.	2-Methyl-4,6-Dinitrophenol	765 µg/l
71.	3-Methyl-4-Chlorophenol	**
72.	Nitrobenzene	1900 µg/l
73.	N-Nitrosodimethylamine	8.12 µg/l
74.	N-Nitrosodi-n-Propylamine	**
75.	N-Nitrosodiphenylamine	16.2 µg/l
76.	PCB-1016	0.00045 µg/l
77.	PCB-1221	0.00045 µg/l
78.	PCB-1232	0.00045 µg/l
79.	PCB-1242	0.00045 µg/l
80.	PCB-1248	0.00045 µg/l
81.	PCB-1254	0.00045 µg/l
82.	PCB-1260	0.00045 µg/l
83.	Phenanthrene	**
84.	Phenol	4,600,000 µg/l
84.	Pyrene	11,000 µg/l
85.	1,1,2,2-Tetrachloroethane	10.8 µg/l
85.	Tetrachloroethylene	8.85 µg/l
87.	Thallium	48 (6.3) µg/l ‡
88.	Toluene	200000 µg/l
89.	1,2-Trans-Dichloroethylene	**
90.	1,1,2-Trichloroethane	41.99 µg/l
91.	Trichloroethylene	80.7 µg/l
92.	2,4,6-Trichlorophenol	6.5 µg/l
93.	1,2,4-Trichlorobenzene	**
94.	Vinyl Chloride	525 µg/l

Notes:

** Numeric limits are not specified. These pollutants are addressed in 391-3-6-.06.

† EPD has proposed to the Board of Natural Resources changing numeric limits for methylene chloride from unspecified to 1600 µg/l consistent with EPA's National Toxics Rule.

‡ EPD has proposed to the Board of Natural Resources changing numeric limits for thallium from 48 to 6.3 µg/l consistent with EPA's National Toxics Rule.

IV Site specific criteria for the following chemical constituents will be developed on an as-needed basis through toxic pollutant monitoring efforts at new or existing discharges that are suspected to be a source of the pollutant at levels sufficient to interfere with designated uses:

1. Asbestos

V Instream concentrations of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) must not exceed 0.0000012 µg/l under long-term average stream flow conditions.

(e) Applicable State and Federal requirements and regulations for the discharge of radioactive substances shall be met at all times.

Point Source Control Efforts

Georgia DNR's management has promoted continuing improvement in the quality of return flows from permitted point sources in the basin. During the past twenty-five years, the majority of our municipal wastewater treatment plants were constructed or updated to meet state and/or federally mandated effluent standards. State and federal construction grants and the citizens of local municipalities funded these projects. This massive construction program has been so successful that over 90% of all these facilities in Georgia are currently meeting their effluent limits. We must protect our investments in these facilities and in the State's water quality.

The history of construction improvements for permitted dischargers within the Ogeechee basin is summarized in the following table:

HUC 03060201

1962	Forstmann & Company constructed two waste ponds for equalization.
1963	City of Louisville constructed a waste stabilization pond..
1964	City of Millen constructed a 14 acre oxidation pond #1 and a 2 acre oxidation pond #2.
1967	City of Union Point built an 11 acre stabilization pond.
1968	City of Louisville constructed Plant #2 a 3 acre lagoon system.
1969	Forstmann & Company constructed an aeration basin, $95,000.
1972	City of Gibson built a 4.5 acre waste stabilization pond and an aerated lagoon for seasonal cannery waste.
1974	City of Union Point upgraded their pond to an activated sludge process..
1974	City of Mayfield constructed a waste water treatment facility.
1976	City of Millen discontinued using oxidation pond #2.
1981	Forstmann & Company a 4.0 MGD activated sludge plant, $4,200,000.
1982	City of Louisville upgraded their stabilization pond to a 37 acre three cell pond.
1985	City of Union Point upgraded their activated sludge process with new influent structure, new pumps, new aerators, clarifier, aerobic digester, chlorine contact chambers and laboratory building, $675,000.
1987	City of Millen built the north side pump station and force main, $106,000.
1988	City of Millen installed diversion curtains, new aerators in pond #1 and a new influent force main, $386,000.

HUC 03060202

1969	Grinnell Manufacturing Division installed a contact stabilization treatment process package plant, $48,000.
1974	Bulloch County Schools William James Middle School (Northside) wastewater pond constructed.
1977	City of Richmond Hill built a 0.5 MGD activated sludge plant for $1,000,000.
1987	City of Richmond Hill expanded treatment capacity to 0.75 MGD for $500,000.

1990	City of Savannah Georgetown WPCP constructed for 2.45 MGD using extended aeration activated sludge process with filters and ultraviolet disinfection.
1996	City of Richmond Hill constructed a 1.5 MGD constructed wetlands treatment system for $4,000,000.

HUC 03060203

1960	Fort Stewart Wright Army Airfield Land Application System constructed for 0.008 MGD consisting of a settlement lagoon and irrigation system.
Mid 60s	Fort Stewart Evans Field Package Treatment Plant utilizing extended aeration process installed to treat 0.035 MGD.
Mid 60s	Fort Stewart NCO Academy Package Treatment Plant utilizing extended aeration process installed to treat 0.035 MGD.
1978	Fort Stewart Camp Oliver Land Application System consisting of settlement lagoons and irrigation system built to treat 0.06 MGD.
1978	Cooper Industries installed a physical/chemical metals precipitation with filtration treatment process.
Early 80s	Fort Stewart Industrial Wastewater Treatment Plant built to treat 1.5 MGD with: grit chamber, oil separation, equalization tank and sand filters.
1990	Cooper Industries closed their surface treatment ponds and connected to the City of Statesboro. This upgrade included an atmospheric evaporation system to complete a closed loop, eliminating wastewater discharge from their electroplating operation for $1,500,000.
1994	Cooper Industries built a larger clarifier and sludge press and eliminated their filtration system for $60,000.
1996	Cooper Industries announced that the Statesboro Plant will be closed second quarter of 2000 with operations moved to other existing Cooper facilities.

HUC 03060204

1968	Interstate Paper Riceboro Mill constructed with an anaerobic treatment process.
1969	Savannah Yacht Club built an activated sludge treatment system to treat 0.0033 MGD.
1970	Nassau Woods activated sludge package plant for 0.12 MGD constructed.
1972	Skidaway Island Utilities built a 1.25 MGD land application treatment system using an aerated lagoon for pretreatment. Static screen added for additional pretreatment.
1972	City of Savannah Georgetown WPCP spray irrigation system constructed to treat 0.35 MGD.
1990	City of Savannah Georgetown WPCP spray irrigation system discontinued. Facility expanded to 2.45 MGD and upgraded to extended aeration activated sludge process with sand filters and ultraviolet disinfection. Discharge now to main stem of Ogeechee River, HUC 03060202.
1992	Gateway WPCP closed. Flow diverted to Savannah Georgetown WPCP HUC 03060202.

NPDES Permits for Discharges in the Ogeechee River Basin

FACILITY NAME	NPDES #	PERMITTED FLOW (MGD)	MAJOR	COUNTY	RECEIVING STREAM
BRYAN FISHERMANS COOPERATIVE	GA0033014			BRYAN	KILKENNY CR
CHEMTALL INCORPORATED	GA0046582			LIBERTY	RICEBORO CR
COLLINS POND	GA0021091	0.060		TATTNALL	CYPRESS FLAT CR TRIB
COOPER HAND TOOLS	GA0035327			BULLOCH	FREER BRANCH
CRAWFORDVILLE WPCP	GA0020915	0.050		TALIAFERRO	HUBERT BR
DAVIDSON MINERAL PROP HANCOCK	GA0046493			HANCOCK	UNNAMED TRIB/LITTLE OGEECHEE RV
DAYS INN/CMA	GA0029874	0.030		MCINTOSH	BELLVILLE RV.
DNR A.H. STEPHENS STATE PARK	GA0048402	0.006		TALIAFERRO	BUNCOMBE CR TRIB TO LICK CR
DPS GA STATE PATROL #42	GA0035530	0.002		CHATHAM	SALT CR TRIB TO LITTLE OGEECHEE
FORSTMANN & COMPANY LOUISVILLE	GA0003778		Y	JEFFERSON	OGEECHEE RV
GARDEN ACRES ESTATES	GA0049506	0.050		CHATHAM	HARDIN CL-SALT CR
GIBSON WPCP	GA0021849	0.210		GLASCOCK	ROCKY COMFORT CR
GRINNELL	GA0003263			BULLOCH	WILSON BR
HANCOCK CO MAYFIELD	GA0021873	0.060		HANCOCK	FULSOME CR
HINESVILLE/FORT STEWART	GA0047180	7.150	Y	LIBERTY	CANOOCHEE CR TRIB
INTERSTATE PAPER CORP	GA0003590		Y	LIBERTY	RICEBORO CR

FACILITY NAME	NPDES #	PERMITTED FLOW (MGD)	MAJOR	COUNTY	RECEIVING STREAM
J M HUBER CORP WRENS	GA0002542			JEFFERSON	REEDY CR/BRIER CR
KING FINISHING COMPANY	GA0003280		Y	SCREVEN	JACKSON BR
LARCHMONT ESTATES	GA0034819	0.200		CHATHAM	HARDIN CANAL
LOUISVILLE POND #1	GA0021580	0.560		JEFFERSON	ROCKY COMFORT CR
LOUISVILLE POND #2	GA0032301	0.062		JEFFERSON	ROCKY COMFORT CR
MARTIN MARIETTA WARRENTON	GA0034576			WARREN	OGEECHEE RV
MIDVILLE	GA0020028	0.167		BURKE	OGEECHEE R
MIDWAY HEALTH CARE CENTER	GA0022381	0.035		LIBERTY	JONES CR
MILLEN	GA0031879	0.457		JENKINS	BUCKHEAD CR
NASSAU WOODS MHP	GA0030163	0.070		CHATHAM	HORSESHOE CANAL
NEWINGTON POND	GA0050202	0.045		SCREVEN	OGEECHEE CR
NORTHSIDE JR HIGH SCHOOL	GA0034061	0.019		BULLOCH	BELCHER BRANCH
PEMBROKE POND	GA0033588	0.150		BRYAN	UNNAMED TRIB TO MILL CR TRIB
PHILLIPS SEAFOOD	GA0037320	0.003		MCINTOSH	SAPELO RV
RICHMOND HILL ELBOW SWAMP	GA0037648	1.500	Y	BRYAN	ELBOW SWAMP TO STERLING CR
RICHMOND HILL WPCP	GA0024759	0.850		BRYAN	OGEECHEE RV
SAVANNAH GEORGETOWN	GA0046418	2.450	Y	CHATHAM	OGEECHEE RIVER
SAVANNAH PINES MHP	GA0022250	0.070		CHATHAM	HORSESHOE CANAL
STATESBORO WPCP	GA0023108	5.000	Y	BULLOCH	LITTLE LOTS CR
THIELE KAOLIN WRENS	GA0047317			GLASCOCK	REEDY CR
TWIN CITY WPCP	GA0048666	0.200		EMANUEL	THICK CR-CANOOCHEE CR
UNION POINT WPCP	GA0025429	0.450		GREENE	NORTH FORK OGEECHEE RV
UNION POINT WTP	GAWP10000			GREENE	NORTH FORK OGEECHEE RV
USA FT STEWART	GA0004308	5.000		LIBERTY	CANOOCHEE RV
VULCAN MAT SILOAM	GA0026743			GREENE	OGEECHEE RV

FACILITY NAME	NPDES #	PERMITTED FLOW (MGD)	MAJOR	COUNTY	RECEIVING STREAM
WADLEY POND	GA0021024	0.215		JEFFERSON	WILLIAMSON SWAMP CR
WARRENTON NORTH	GA0032778	0.045		WARREN	GOLDEN CR TRIB
WARRENTON SOUTH	GA0032786	0.295		WARREN	ROCKY COMFORT CR
WARRENTON WTP	GAWP10000			WARREN	POND TO GOLDEN CR

Support of Designated Uses for Rivers, Streams, and Lakes in the Ogeechee River Basin, 1998-1999

Rivers/Streams Supporting Designated Uses

BASIN/STREAM (Data Source)	LOCATION	WATER USE CLASSIFICATION	MILES
OGEECHEE RIVER BASIN			
HUC 03060201			
Big Creek (1)	Kelley's Pond to Ogeechee River, Louisville (Jefferson Co.)	Fishing	5
Ogeechee River (1)	Long Creek to Hwy. 102 near Jewell (Hancock/Washington Co.)	Fishing	12
Rocky Comfort Creek (1)	Duhart Creek to Ogeechee River, Louisville (Jefferson Co.)	Fishing	6
HUC 03060202			
Mill Creek (1)	Newsome Branch to Ogeechee River near Statesboro (Bulloch Co.)	Fishing	16
HUC 03060203			
Canoochee Creek (1)	Upstream SR 119, Ft. Stewart (Liberty Co.)	Fishing	7
Little Lotts Creek (1)	Downstream South Main Street, Statesboro (Bulloch Co.)	Fishing	1
Mill Creek (1)	Upstream Taylors Creek, Fort Stewart (Liberty Co.)	Fishing	2
Taylors Creek (1)	Upstream WPCP Drainage Canal, Fort Stewart (Liberty Co.)	Fishing	3
Tributary to Taylors Creek (1)	Drainage Canal to Taylors Creek, Fort Stewart (Liberty Co.)	Fishing	2
HUC 03060204			
North Newport River (1)	Lower Carrs Neck Creek to Timmons River (Liberty Co.)	Fishing	4

Rivers/Streams Partially Supporting Designated Uses

BASIN/STREAM (Data Source)	LOCATION	WATER USE CLASSIFICATION	CRITERION VIOLATED	EVALUATED CAUSE(S)	ACTIONS TO ALLEVIATE	MILES	305(b)	303(d)	Priority
OGEECHEE RIVER BASIN									
HUC 03060201									
Little Ogeechee River (1)	Two Mile Creek to Hamburg Mill Pond near Culverton (Hancock/Washington Co.)	Fishing	FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	9	X	X	3
Ogeechee River (1)	Powell Creek to Beaverdam Creek near Powelton (Hancock Co.)	Fishing	FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	5	X	X	3
Ogeechee River (1)	Hwy 102 to US Hwy 301 (Washington, Jefferson, Jenkins, Emanuel, & Bulloch Co.)	Fishing	FCG	NP	EPD will address nonpoint sources through a watershed protection strategy. Note: Fish Consumption Guidelines due to mercury in fish tissue.	98	X	X	3
Rocky Comfort Creek (1)	Joes Creek to Ivey Branch near Edgehill (Glascock/Jefferson Co.)	Fishing	FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	10	X	X	3
Short Creek (1)	Headwaters to confluence with Long Creek (Warren Co.)	Fishing	FCG	NP	EPD will address nonpoint sources through a watershed protection strategy. Note: Fish Consumption Guidelines due to mercury in fish tissue.	4	X	X	3
HUC 03060202									
Black Creek (1)	Ash Branch to Mill Creek near Blitchton (Bulloch/Bryan Co.)	Fishing	DO,FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	11	X	X	2
Jackson Branch (1)	Upstream King Finishing Company from SR17 to Co. Rd. 39, Dover (Screven Co.)	Fishing	FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	2	X	3	3
Ogeechee Creek (1)	Rd. S2178 to Ogeechee River near Oliver (Screven Co.)	Fishing	DO	NP	EPD will address nonpoint sources through a watershed protection strategy.	7	X	X	2
Ogeechee River (10)	U.S. Hwy. 301 to Black Creek (Bulloch/Bryan Co.)	Fishing	FCG	NP	EPD will address nonpoint sources through a watershed protection strategy. Fish consumption guidance due in part to natural source of mercury.	59	X	X	3

BASIN/STREAM (Data Source)	LOCATION	WATER USE CLASSIFICATION	CRITERION VIOLATED	EVALUATED CAUSE(S)	ACTIONS TO ALLEVIATE	MILES	305(b)	303(d)	Priority
Ogeechee River (1)	Black Creek to Richmond Hill (Bryan/Effingham/Chatham Co.)	Fishing	FCG	NP	EPD will address nonpoint sources through a watershed protection strategy. Note: Fish Consumption Guidelines due to mercury in fish tissue.	21	X	X	3
HUC 03060203									
Bull Creek (1)	Strickland Pond to Canoochee River near Daisy (Evans Co.)	Fishing	DO	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy.	6	X	X	2
Canoochee Creek (1)	Taylors Creek to Canoochee River, Ft. Stewart (Liberty Co.)	Fishing	DO	M	City currently in compliance with permit limits. Plant upgrade completed 6/98.	4	X	X	2
Canoochee River (1)	Ga. Hwy. 192 to Fifteen Mile Creek near Metter (Emanuel/Candler Co.)	Fishing	DO,FC,FCG	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy. Note: Fish Consumption Guidelines due to mercury in fish tissue.	21	X	X	2
Canoochee River (1)	Fifteen Mile Creek to Cedar Cr. (Candler/Evans Co.)	Fishing	FCG	NP	EPD will address nonpoint sources through a watershed protection strategy. Note: Fish Consumption Guidelines due to mercury in fish tissue.	14	X	X	3
Canoochee River (1,10)	Cedar Creek to Lotts Creek (Evans Co.)	Fishing	FCG	NP	EPD will address nonpoint sources through a watershed protection strategy. Note: Fish Consumption Guidelines due to mercury in fish tissue.	13	X	X	3
Canoochee River (1)	Lotts Cr. to confluence with Ogeechee River (Liberty/Bryan Co.)	Fishing	FCG	NP	EPD will address nonpoint sources through a watershed protection strategy. Fish consumption guidance due in part to natural source of mercury.	56	X	X	3
Lotts Creek (1)	U.S. Hwy. 301 to Little Lotts Creek near Register (Bulloch Co.)	Fishing	DO	NP	EPD will address nonpoint sources through a watershed protection strategy.	8	X	X	2
Taylors Creek (1)	Downstream WPCP Discharge to Drainage Canal, Fort Stewart	Fishing	DO	M	City currently in compliance with permit limits. Plant upgrade completed 6/98.	4	X	3	2

BASIN/STREAM (Data Source)	LOCATION	WATER USE CLASSIFICATION	CRITERION VIOLATED	EVALUATED CAUSE(S)	ACTIONS TO ALLEVIATE	MILES	305(b)	303(d)	Priority
HUC 03060204									
Peacock Creek (1)	Hwy. 144 to North Newport River near McIntosh (Liberty Co.)	Fishing	DO,FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy.	17	X	X	2

*Indicates minimal data set.

Criterion Violated Codes (Column 4)

Bio	=	Biota Impacted
Cd	=	Cadmium
Cu	=	Copper
DO	=	Dissolved Oxygen
FC	=	Fecal Coliform Bacteria
FCG	=	Fish Consumption Guidelines
Hg	=	Mercury
Pb	=	Lead
Temp	=	Temperature
Tox	=	Toxicity Indicated
Zn	=	Zinc
*	=	Minimal Database

Evaluated Cause Codes (Column 5)

CSO	=	Combined Sewer Overflow
I1	=	Industrial Facility
M	=	Municipal Facility
NP	=	Nonpoint Sources/ Unknown Sources
UR	=	Urban Runoff/Urban Effects

Rivers/Streams Not Supporting Designated Uses

BASIN/STREAM (Data Source)	LOCATION	WATER USE CLASSIFICATION	CRITERION VIOLATED	POTENTIAL CAUSE(S)	ACTIONS TO ALLEVIATE	MILES	305(b)	303(d)	Priority
OGEECHEE RIVER BASIN									
HUC 03060201									
Buckhead Creek (1)	Downstream Spring Mill Branch to Ogeechee River, Millen (Jenkins Co.)	Fishing	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy.	4	X	X	3
N.Fork Ogeechee River (1)	Hwy. 77 to Ogeechee River near Crawfordville (Greene/Taliaferro Co.)	Fishing	FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	13	X	X	3
Williamson Swamp Creek (1)	Hwy. 24 to Limestone Creek, Davisboro (Washington/Jefferson Co.)	Fishing	FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	12	X	X	3
Williamson Swamp Creek (1)	Mill Creek to Ogeechee River, Wadley (Jefferson Co.)	Fishing	FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	9	X	X	3
HUC 03060202									
Horse Creek (1)	Little Horse Creek to Ogeechee River near Rocky Ford (Screven Co.)	Fishing	DO,FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	5	X	X	2
Jackson Branch (1)	Downstream King Finishing Company from SR17 to Ogeechee River, Dover (Screven Co.)	Fishing	FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	1	X	X	3
Nevills Creek (1)	Bay Gull Creek to Ogeechee River near Rocky Ford (Bulloch Co.)	Fishing	DO	NP	EPD will address nonpoint sources through a watershed protection strategy.	3	X	X	2
Sculls Creek (1)	Richardson Creek to Ogeechee River near Scarboro (Jenkins Co.)	Fishing	DO,FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	4	X	X	2
HUC 03060203									
Cedar Creek (1)	Water Hole Creek to Canoochee River, Claxton (Evans Co.)	Fishing	DO,FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy.	6	X	X	2

BASIN/STREAM (Data Source)	LOCATION	WATER USE CLASSIFICATION	CRITERION VIOLATED	POTENTIAL CAUSE(S)	ACTIONS TO ALLEVIATE	MILES	305(b)	303(d)	Priority
Fifteenmile Creek (1)	Stocking Head Branch to Canoochee River near Metter (Candler Co.)	Fishing	DO,FC	NP	EPD will address nonpoint sources through a watershed protection strategy.	6	X	X	2
Tenmile Creek (1)	Upstream Canoochee River, Excelsior (Candler Co.)	Fishing	DO,FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy.	3	X	X	2
HUC 03060204									
Casey Canal (1)	Head of Canal to DeRenne Ave., Savannah (Chatham Co.)	Fishing	DO,FC	UR	Urban runoff is being addressed in the EPD Stormwater Management Strategy. An areawide stormwater permit was issued to the City of Savannah on 4/20/95.	3	X	X	2
Casey Canal (1)	DeRenne Ave. to Montgomery Crossroad, Savannah (Chatham Co.)	Fishing	DO,FC,FCG	UR	Urban runoff is being addressed in the EPD Stormwater Management Strategy. An areawide stormwater permit was issued to the City of Savannah on 4/20/95. Note: FCG is a partial support and is due to levels of Dieldrin in the fish tissue of striped mullet. Dieldrin is a pesticide that has been restricted from use in the U.S.	3	X	X	2
Hayners Creek (known upstream as Casey Canal) (1)	Casey Canal (Montgomery Crossroad) to Vernon River (Chatham Co.)	Fishing	DO,FC,FCG	UR	Urban runoff is being addressed in the EPD Stormwater Management Strategy. An areawide stormwater permit was issued to Chatham County on 4/20/95. Note: FCG is a partial support and is due to levels of Dieldrin in the fish tissue of striped mullet. Dieldrin is a pesticide that has been restricted from use in the U.S..	2	X	X	2
Little Ogeechee River (1)	Little Ogeechee Pond to below US Hwy. 17 near Burroughs (Chatham Co.)	Fishing	FC	UR	Urban runoff is being addressed in the EPD Stormwater Management Strategy. An areawide stormwater permit was issued to Chatham County on 4/20/95.	6	X	X	3
S. Newport River (1)	Upstream US Hwy. 17, South Newport (Liberty/McIntosh Co.)	Fishing	FC,Se	NP	EPD will address nonpoint sources through a watershed protection strategy.	3	X	X	2

*Indicates minimal data set.

Criterion Violated Codes (Column 4)

Bio	=	Biota Impacted
Cd	=	Cadmium
Cu	=	Copper
DO	=	Dissolved Oxygen
FC	=	Fecal Coliform Bacteria
FCG	=	Fish Consumption Guidelines
Hg	=	Mercury
Pb	=	Lead
Se	=	Selenium
Temp	=	Temperature
Tox	=	Toxicity Indicated
Zn	=	Zinc

Potential Cause Codes (Column 5)

CSO	=	Combined Sewer Overflow
I1	=	Industrial Facility
M	=	Municipal Facility
NP	=	Nonpoint Sources/ Unknown Sources
UR	=	Urban Runoff/Urban Effects

Estuarine Waters Not Fully Supporting Designated Uses

ESTUARY NAME (Data Source)	LOCATION	WATER USE CLASSIFICATION	USE SUPPORT CATEGORY	CRITERION VIOLATED	POTENTIAL CAUSE(S)	SQUARE MILES AFFECTED	305(b)	303(d)	Priority
Doboy Sound (5)	Doboy Sound	Fishing	NS	SB	M,MA,NP	17	X	NA	NA
Medway River (5)	Sunbury	Fishing	NS	SB	NP	6	X	NA	NA
Ossabaw Estuary (5)	Ossabaw	Fishing	NS	SB	NP	45	X	NA	NA
Sapelo Sound (5)	Sapelo Sound	Fishing	NS	SB	MA,NP	24	X	NA	NA
St. Catherines Sound (5)	St. Catherines Sound	Fishing	NS	SB	MA,NP	25	X	NA	NA
Wassaw Sound (5)	Wassaw Sound	Fishing	NS	SB	NP,I1,UR	6	X	NA	NA

Use Support Status (Column 4)

S = Supporting
PS = Partially Supporting
NS = Not Supporting

Criterion Violated Codes (Column 5)

Bio = Biota Impacted
Cd = Cadmium
Cu = Copper
DO = Dissolved Oxygen
FC = Fecal Coliform Bacteria
FCG = Fish Consumption Guidelines
Hg = Mercury
Pb = Lead
SB = Shellfish Ban
Temp = Temperature
Tox = Toxicity Indicated
Zn = Zinc
* = Minimal Database

Potential Cause Codes (Column 6)

CSO = Combined Sewer Overflow
I1 = Industrial Facility
M = Municipal Facility
MA = Marina
NP = Nonpoint Sources/ Unknown Sources
UR = Urban Runoff/Urban Effects

Lakes/Reservoirs Not Fully Supporting Designated Uses

LAKE NAME	LOCATION	SUPPORT CATEGORY	WATER USE CLASSIFICATION	CRITERION VIOLATED	POTENTIAL CAUSE(S)	ACRES AFFECTED	305(b)	303(d)	Priority
Evans County PFA (1)	Evans County Public Fishing Area	PS	Fishing	FCG	NP	122	X	X	3

*Indicates minimal data set.

Use Support Status (Column 3)

S = Supporting
PS = Partially Supporting
NS = Not Supporting

Criterion Violated Codes (Column 5)

Bio = Biota Impacted
Cd = Cadmium
Cu = Copper
DO = Dissolved Oxygen
FC = Fecal Coliform Bacteria
FCG = Fish Consumption Guidelines
Hg = Mercury
Pb = Lead
Temp = Temperature
Tox = Toxicity Indicated
Zn = Zinc
* = Minimal Database

Potential Cause Codes (Column 6)

CSO = Combined Sewer Overflow
I1 = Industrial Facility
M = Municipal Facility
NP = Nonpoint Sources/ Unknown Sources
UR = Urban Runoff/Urban Effects

Ogeechee River Basin Contact Information

Department of Community Affairs 60 Executive Park South, N.E. Atlanta, GA 30329 Phone: 404.679.4940 www.dca.state.ga.us	Coastal Georgia RDC PO Box 1917 Brunswick, GA 31521 Phone: 912.264.7363 www.dca.state.ga.us/publications/cg.html
Georgia Mountains RDC PO Box 1720 Gainesville, GA 30503 Phone: 770.538.2626 www.dca.state.ga.us/publications/gm.html	Northeast Georgia RDC 305 Research Drive Athens, GA 30605-2795 Phone: 706.369.5650 www.dca.state.ga.us/publications/neg.html
Heart of Georgia Altamaha RDC PO Drawer 1260 Baxley, GA 31515 Phone: 912.367.3648 www.dca.state.ga.us/publications/hga.html	Central Savannah River RDC PO Box 2800 Augusta, GA 30914-2800 Phone: 706.210.2000 www.dca.state.ga.us/publications/csra.html
Georgia Soil and Water Conservation Commission Region 2 PO Box 8024 Athens, GA 30603 Phone: 706.542.9233 www.gaswcc.org	Georgia Forestry Commission 5645 Riggins Mill Road Dry Branch, GA 31020 Phone: 478.751.3500 www.GFC.State.Ga.US/
DNR Wildlife Resources Division 2070 U.S. Highway 278, S.E. Social Circle, GA 30279 www.dnr.state.ga.us/dnr/wild	DNR Coastal Resources Division One Conservation Way Brunswick, GA 31520-8687 Phone: 912.264.7218 www.dnr.state.ga.us/dnr/coastal
DNR-EPD Air Protection Branch 4244 International Parkway, Suite 120 Atlanta, GA 30354 Phone: 404.363.7000	DNR-EPD Geological Survey Branch 19 Martin Luther King Jr. Drive Atlanta, GA 30334 Phone: 404.656.3214
DNR-EPD Hazardous Waste Management Branch 205 Butler Street SE, Suite 1154 East Tower Atlanta, GA 30334 Phone: 404.656.7802	DNR-EPD Land Protection Branch 4244 International Parkway, Suite 104 Atlanta, GA 30354 Phone: 404.362.2537
DNR-EPD Program Coordination Branch 205 Butler Street, SE, Suite 1152 East Tower Atlanta, GA 30334 Phone: 404.656.4713	DNR-EPD Water Protection Branch 4220 International Parkway, Suite 101 Atlanta, GA 30354 Phone: 404.675.6232
DNR-EPD Water Resources Branch 205 Butler Street SE, Suite 1058 East Tower Atlanta, GA 30334 Phone: 404.656.6328	DNR-EPD Brunswick District Office One Conservation Way Brunswick, GA 31520-8687 Phone: 912.264.7283

United States Environmental Protection Agency (EPA) Region 4, Water Management Division Atlanta Federal Center 61 Forsyth Street, SW Atlanta, GA 30303-3104 Phone: 404.562.9345 www.epa.gov/region4/	US Army Corps of Engineers, Savannah District PO Box 889 Savannah, GA 31402-0889 Phone: 912.652.5279 www.sas.usace.army.mil
US Army Corps of Engineers, Mobile District PO Box 2288 Mobile, AL 36628-0001 Phone: 334.690.2505 www.sas.usace.army.mil	United States Geological Survey Water Resources Division Peachtree Business Center, Suite 130 3039 Amwiler Road Atlanta, GA 30360-2824 Phone: 770.903.9100 www.usgs.gov
United States Department of Agriculture Natural Resources Conservation Service Stephens Federal Building 355 East Hancock Avenue Athens, GA 30601-2769 Phone: 706.546.2272 www.ga.nrcs.usda.gov/ga/gaadm/dirso.htm	