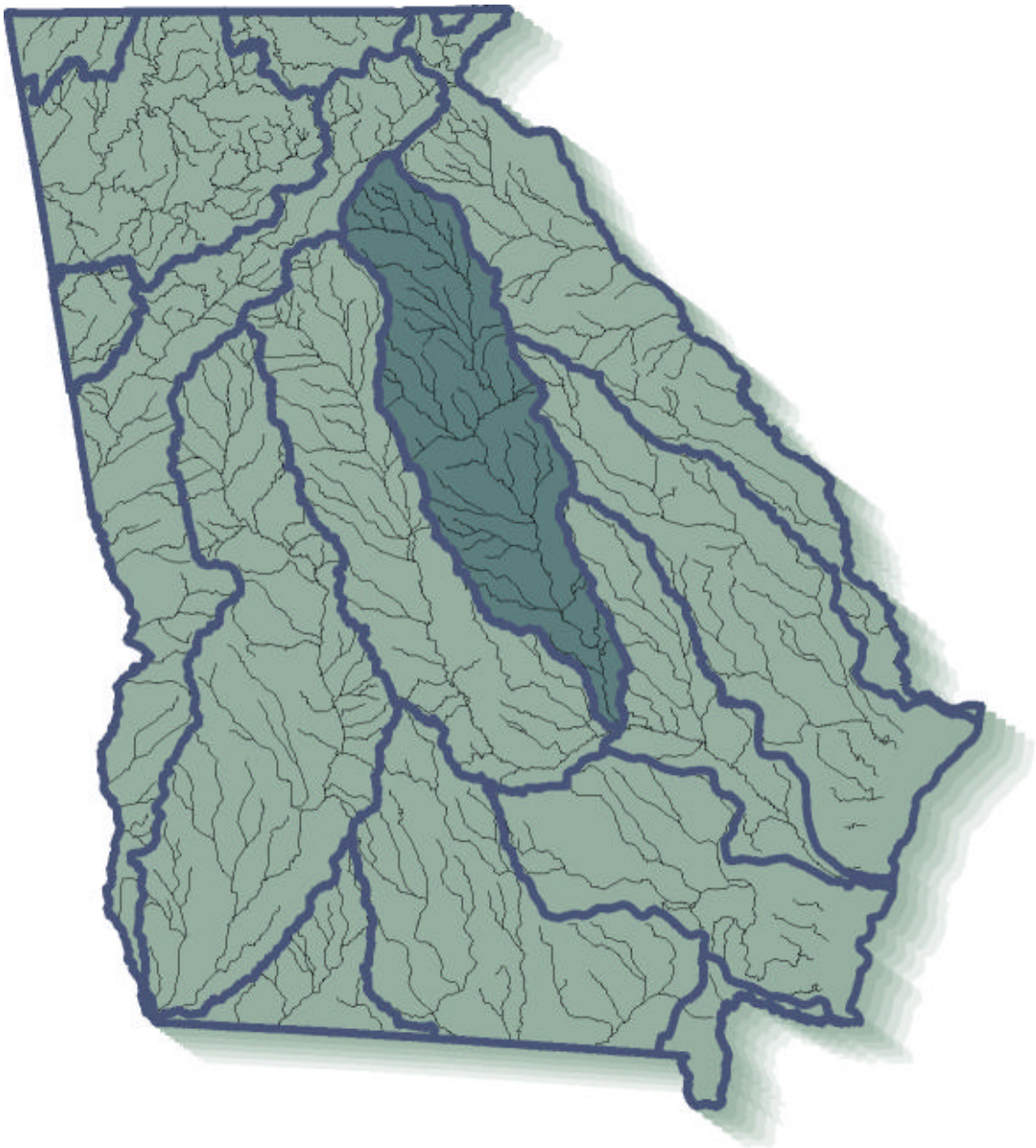
Oconee River Basin Management Plan 1998



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?

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.

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

Oconee River Basin Management Plan 1998

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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List of Acronyms and Abbreviations

Ac	acre
Ac-ft	acre-feet
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
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
GPC	Georgia Power Company
GPD	gallons per day
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
MOU	memorandum of understanding
MPN	most probable number (for quantification of fecal coliform bacteria)
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
NURE	National Uranium Resource Evaluation
NWI	National Wetlands Inventory (USF&WS)
Pb	lead
PCB	polychlorinated biphenyl
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)
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
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 Oconee 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, 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 Oconee River basin, describe the status of water quality and quantity in the Oconee 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 Oconee River Basin Management Plan includes strategies to address a number of different basinwide objectives. These include:

- Protecting water quality in lakes, rivers and streams 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 Oconee River basin over the next five years. It contains useful information on the health of the Oconee River basin and recommended strategies to protect the basin now and into the future.

Oconee River Basin Characteristics

The Oconee River basin extends from central northern Georgia, northeast of Atlanta, to central southern Georgia, occupying an area of 5,330 square miles. The Oconee River basin contains parts of the Piedmont and Coastal Plain physiographic provinces, which extend throughout the southeastern United States. The Oconee River joins the Ocmulgee River to form the Altamaha River, which drains to the Atlantic Ocean.

Water Resources

The surface water resources of the basin include several major rivers, including the North Oconee and Middle Oconee Rivers, the Oconee River mainstem, and the Apalachee River. There are also two major reservoirs: Lake Sinclair and Lake Oconee.

Biological Resources

The basin encompasses parts of three major land resource areas (Southern Piedmont, Southern Coastal Plain, and Carolina and Georgia Sand Hills), providing different ecosystem types. These ecosystems provide habitat for diverse species of aquatic and terrestrial wildlife including at least 74 species of fish, 37 species of amphibians, and 19 species of reptiles strongly associated with freshwater habitats. Several of these species are currently threatened or endangered.

Population and Land Use Characteristics

More than 400,000 people live in the Oconee basin. The major population centers include bedroom communities of Atlanta, as well as Athens, Milledgeville, and Dublin. The heaviest concentration of the population resides in the upper end of the basin in Clarke, Barrow, Jackson, and portions of Hall and Walton counties (approximately 50 percent of the total basin population). The number of basin residents is expected to grow to a population of about 500,000 by the year 2020, growing to more than 700,000 by the year 2050.

More than 65 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. Although the total farmland in the basin is declining, livestock and poultry production is strong.

Local Governments and Planning Authorities

The local governments in the basin consist of counties and incorporated municipalities. The Oconee basin includes part or all of 27 Georgia counties. These counties are members of six different Regional Development Centers. There are also 105 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, while within the Coastal Plain province, aquifer yields are higher and ground water withdrawals are an important part of the total water budget. The Oconee River basin provides drinking water for over 280,000 people in the state of Georgia by municipal or privately owned public water systems. Georgia's Drinking Water Program oversees 285 active and permitted public water systems in the Oconee River basin.

The primary demands for water supply in the basin include municipal and industrial use, agricultural use, power generation, and recreation. Drinking water demands for surface and ground water located in the basin are expected to increase due to the growth in the Athens, Lake Oconee, and Lake Sinclair area. A regional drinking water reservoir on Bear Creek for Clarke, Oconee, Jackson, and Barrow Counties is being built and expected to be finished in the year 2000. Water supplies in the basin are expected to be adequate to meet demands.

Water Quality Conditions

The major environmental stressors that impair or threaten water quality in the Oconee 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 1996-1997 water quality assessment report, urban runoff and rural nonpoint sources are now the major sources of failure to support designated uses of water bodies in the Oconee 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 6 permitted major municipal wastewater discharges with flows greater than 1 MGD in the Oconee River basin. There are also 28 minor public discharges. EPD monitors compliance of these permits and takes appropriate enforcement action for violations. As of the 1996-1997 water quality assessment, 10 stream segments (totaling 53 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 4 major facilities. EPD identified 1 stream segment (3 miles) where permitted industrial discharges contributed to a failure to support designated uses. This segment is currently being addressed through the NPDES permitting process.

Permitted storm water discharges. Urban storm water runoff in the Oconee basin has been identified as a major source of water quality impairment. Urban runoff which is collected by storm sewers is now subject to NPDES permitting and control. EPD has issued 2 municipal separate storm system (MS4) permits in the Oconee basin.

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 alteration of habitat and the channelization of streams also are considered forms of nonpoint source pollution. The 1996-1997 water quality assessment results for the Oconee 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. Most of the water bodies assessed in the Oconee River basin support or partially support their designated uses. EPD assessed the streams and major lakes in the Oconee basin and reported the results in *Water Quality in Georgia, 1996-1997*. This assessment indicated that 71 out of 160 stream segments (369 miles) fully supported uses, and 54 out of 160 (326 miles) partially supported uses, while 35 out of 160 (198 miles) did not support designated uses. Lake Sinclair and Lake Oconee were found to be partially supporting designated uses.

Key Environmental Stressors

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

Fecal coliform bacteria. The 1996-1997 water quality assessments indicate that violations of water quality standards for fecal coliform bacteria were the most commonly listed cause of failure to support designated uses. Fecal coliform bacteria concentrations contributed to lack of full support on 345 miles, constituting 51 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, nonpoint sources have become increasingly important as potential sources of fecal coliform bacteria.

Metals. The 1996-1997 water quality assessments indicate that violations of water quality standards for metals (e.g., lead, copper, zinc, cadmium, mercury) were a commonly listed cause of failure to support designated uses. Metals concentrations contributed to lack of full support on 66 miles, constituting 19 stream segments. In most cases, these metals are attributed to nonpoint urban runoff and storm water.

Nutrient loading. Nutrient loading is an important issue for Lake Oconee and Lake Sinclair. Excess nutrient loads can promote undesirable growth of algae and degradation of water quality. A lake receives nutrients from the entire watershed upstream. The major sources of nutrient loading in the Oconee 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 2 stream segments (25 miles). Guidelines for reduced consumption are also in place for largemouth bass on Lake Oconee and Lake Bennett (in the Charlie Elliott Wildlife Center). All of these consumption guidelines are due to elevated levels of mercury found in tissues of individual fish species in these stream and lake segments. Most of the mercury load is believed to be of natural and atmospheric origin.

Sediment Loading and Habitat Degradation. A healthy aquatic ecosystem requires a healthy physical habitat. The major cause of disturbance to stream habitats is erosion and sedimentation. As sediment is carried into the stream, it changes the stream bottom, and smothers sensitive organisms. Turbidity associated with sediment loading also impairs 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 demand from all current uses within the Oconee basin. However, one of the major water quantity concerns in the Oconee River basin is the fairly rapid growth being experienced in the counties in the headwater region on the basin (i.e., Hall, Barrow, Clarke, and Oconee counties), and the additional storage or additional conservation and reuse efforts that will be needed to cope with this growth. This growth is expected to accelerate somewhat as the metropolitan Athens and metropolitan Atlanta regions begin to have more of a synergistic effect on each other.

As a result of anticipated growth in this area, a 52 million gallon per day water supply reservoir project is being cooperatively developed by Jackson, Barrow, Clarke, and Oconee counties. This project, named the Bear Creek Reservoir, will begin supplying

water in 2001 and is expected to satisfy water needs for the four-county region through 2050. This joint project is a model of the sort of regional cooperation which is effective in addressing water supply concerns in water-limited areas. Another project currently under investigation is a regional project being lead by Walton County which would conceivably supply some quantity of water to Walton, Gwinnett, and Oconee counties.

Water resources within the political boundaries of individual counties in the region may not be sufficient to meet longer-term "in-county" needs; therefore, regional cooperation to develop water supply options will become ever more important to support growth in the region. Interbasin diversion of water to meet the growing needs in the region is another option that will likely get more attention.

Growth in agricultural production (including turf production) in the central and southern regions of the basin are expected to increase the demand for both surface water and groundwater supplies during the growing season of each year. During normal years this should not present a concern, but the impact on stream flows during dryer years could become an issue of some concern. As more information becomes available on the impact of such withdrawals on stream flows, decisions will have to be made regarding limiting such future withdrawals.

In cases where there is competition for water across water use categories (i.e., water held in lakes for recreation vs. withdrawal for potable uses), Georgia law requires that priority be given to water for human consumption. However, it is far more likely that the competition will not be across water use categories as much as there will be competition for scarce water between adjoining jurisdictions. In such instances, EPD presently does (and will continue to) encourage cooperative efforts to develop and effectively utilize limited water resources. While cooperative intergovernmental approaches are much preferred in addressing such competition, the fact that the Director of EPD has the statutory authority to make final decisions regarding water withdrawal applications means that EPD will assist in resolving such matters if other efforts fail.

Strategies for Water Quality

Water quality in the Oconee 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 Oconee 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 Oconee 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 Oconee 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 Oconee 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 standards, 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 Oconee 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 Oconee River basin is a mixture of livestock and poultry operations and commodity production. About 21 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 Oconee basin and commercial forest lands represent about 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 Oconee River Basin

This basin plan represents one step in managing the water resources in the Oconee 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 Oconee River basin team and local advisory committee will both be reorganized in July to September of 1998 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 Oconee River basin plan is planned for mid-summer 2002.

In This Section

Section 1

Introduction

What Is the Purpose of This Plan?

This document presents Georgia's river basin management plan for the Oconee 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 Oconee River basin characteristics, describe the status of water quality and quantity in the Oconee 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 (Appendix A). 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 Oconee 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 Oconee River (Figure 1-1). Under the RBMP approach, the Oconee 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 Oconee 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 Oconee 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.

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.

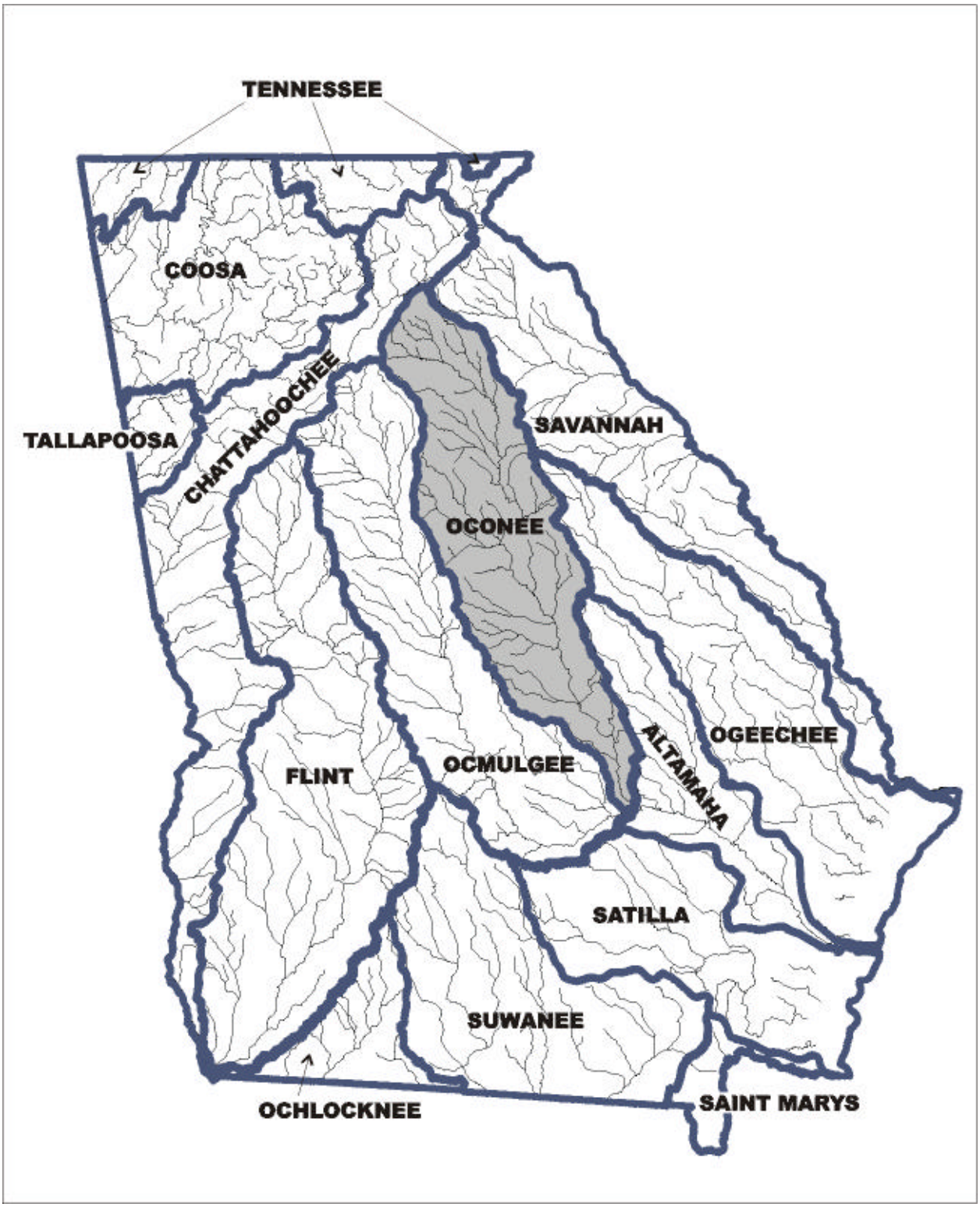

Figure I-1. The Oconee River Basin

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 Oconee River basin. It contains useful information on the health of the Oconee River basin and recommended strategies to protect the basin now and into 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 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 Oconee basin.

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

The schedule of activities for the first two Oconee River basin cycles , i.e., 1993-1999 and 1998-2003, is 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 Oconee basin, this has meant that there was not as much time available in the first cycle (1994-1998) to prioritize watersheds and develop management strategies (steps 7 and 8) as there will be once the program converges into a long-term rotating cycle (after 2000). Also, the implementation stage of the first cycle (step 12 in Figure 1-2) is shortened in order to bring the basin cycle into phase with the long-term rotating cycle, which has the Oconee basin planning cycle joining that of the Ocmulgee and Altamaha beginning in April of 1998 (and every five years thereafter).

Having just completed the first RBMP-generated basin plan in the Oconee, EPD and its partners will have a stronger foundation of information to share with stakeholders in discussing management needs and information gaps. Stakeholder input will be sought prior to development of the information collection plan. However, EPD considers stakeholder involvement as a continuous process, not limited to scheduled meetings, and encourages stakeholders to provide input and assistance at any time.

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 Oconee River basin team will be reorganizing itself in the July to September quarter of 1998. Support and provide input to the agency that represents your interests.

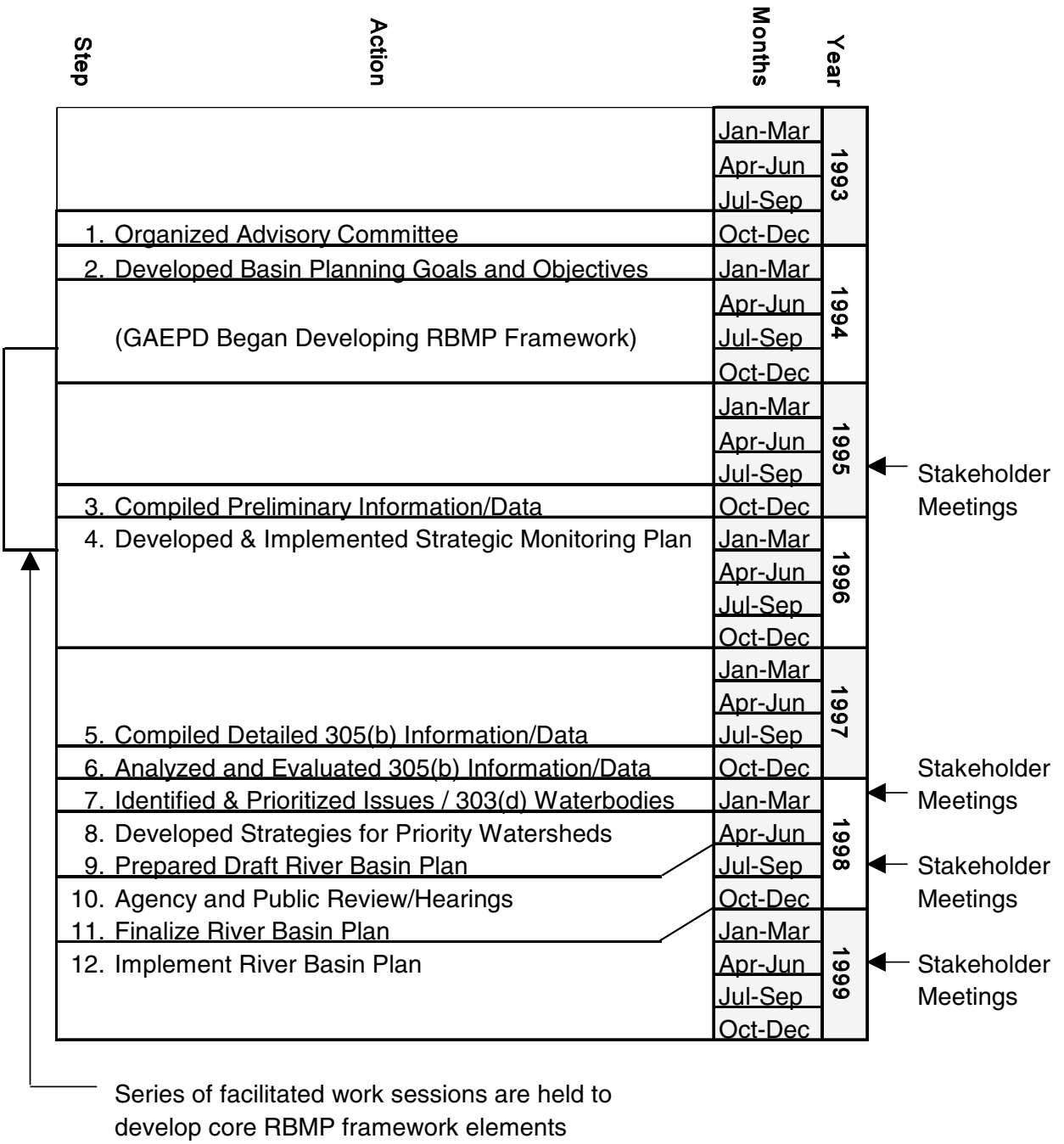

Figure I-2. Oconee River Basin Schedule, Ist Cycle, 1993-1999

Members of the basin team are selected 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.

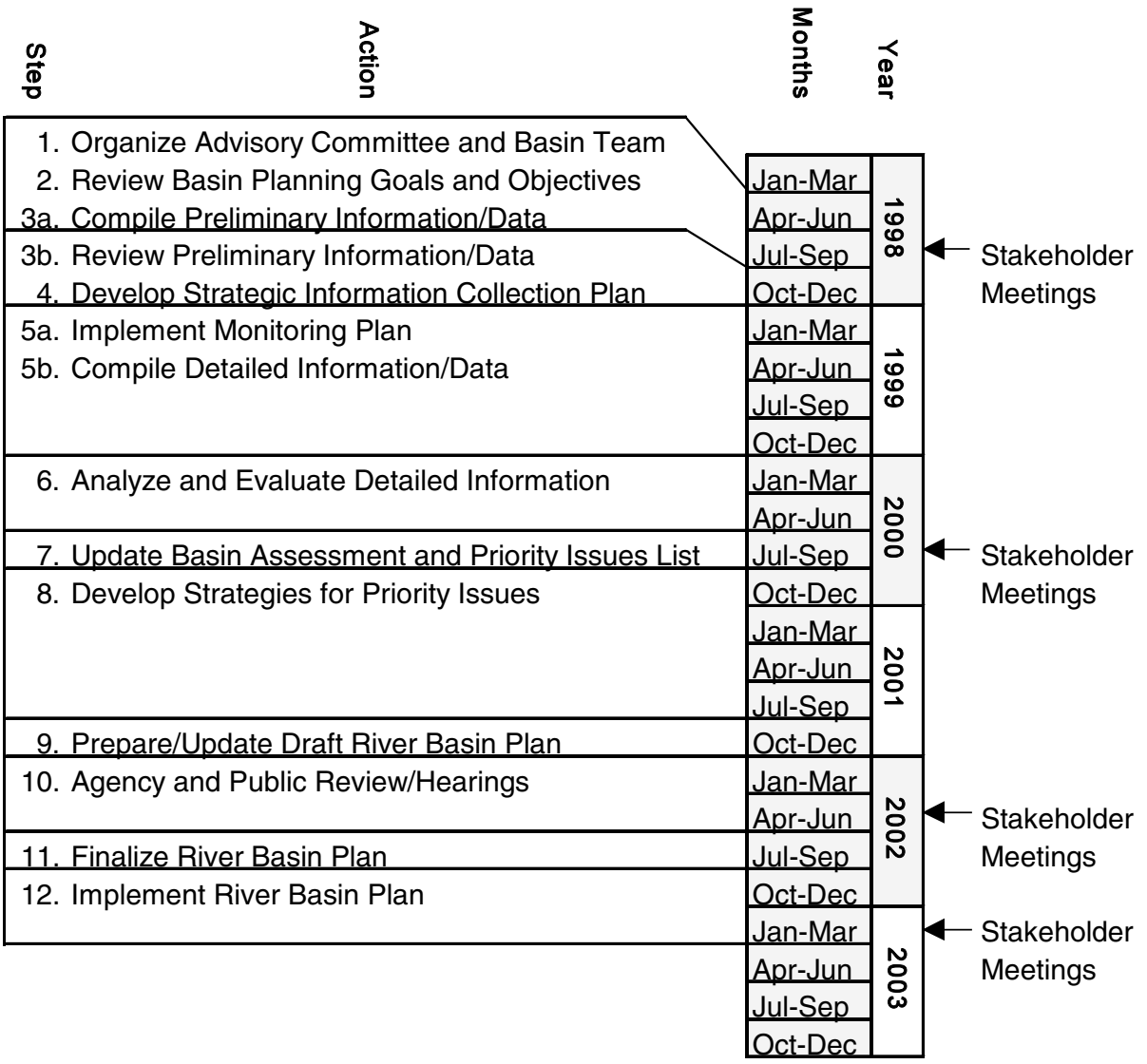

Figure I-3. Oconee River Basin Schedule, 2nd Cycle, 1998-2003

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. These 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 Oconee River Basin Local Advisory

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

Mr. Al Crace
County Manager
Clarke County
Post Office Box 1868
Athens, Georgia 30613-4199

Mr. Bill Evans
Environmental Affairs
Georgia Power Company
333 Piedmont Avenue
Post Office Box 4545
Atlanta, Georgia 30302

Mr. Albert Ike, Chairman
Oconee Rivers Greenway Commission
300 Old College
University of Georgia Athens, Georgia 30602

Ms. Mary Kay Lynde-Maas
Project Engineer
Southeast Paper Manufacturing
Post Office Box 1169
Dublin, Georgia 31040

Mr. Drew Marczak
Georgia Pacific Corporation
Post Office Box 990
Watkinsville, Georgia 30677-2524

Mr. Chuck Moody
Oconee Environmental Coalition
351 Milledge Avenue
Milledgeville, Georgia 31061

Mr. William Segars
Cooperative Extension Service
University of Georgia Cooperative Extension Service
Cooperative Extension Service
Athens, Georgia 30602

Ms. Danna Smith
Georgia Environmental Organization
334 Bil Rutledge Road
Winder, Georgia 30680

Mr. Steve Tomlin
Union Camp
Route 1, Box 223
Ailey, Georgia 30410

Committee serving for the first planning cycle (1995-1999). Support and provide input to the committee member who represents your interests.

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.

Figures 1-2 and 1-3 show the timing of stakeholder meetings that have been and will be held as part of the Oconee basin RBMP cycles. The first two groups of stakeholder meetings have already been held for the current planning cycle. EPD hosted initial stakeholder meetings at Athens and Dublin in July, 1995 to invite and encourage stakeholder input early in the planning process for the Oconee River basin. Second

stakeholder meetings were held at Athens and Dublin in February, 1998 to discuss water quality assessment results, problem areas, and prioritization of actions to address problem areas. A third group of stakeholder meetings—to give stakeholders the opportunity to review this river basin management plan—is planned for the fall of 1998. This meeting will also be used to provide stakeholders an opportunity to be involved in the planning for the next cycle of focused water quality monitoring in the Oconee basin. A fourth group of meetings in 1999 will give stakeholders a chance to discuss implementation of management strategies. The dates of ensuing stakeholder meetings are indicated in Figure 1-3.

What's Next?

This plan was reviewed by governmental partners, the Oconee River Basin Advisory Committee, and the public. Public meetings were held to solicit comments and recommendations regarding the river basin management plan. Following this review, appropriate modifications were made to the plan, and the final plan was submitted for review and acceptance by the Board of the Georgia Department of Natural Resources. The RBMP cycle for the Oconee will become synchronized with the schedule for the Ocmulgee and Altamaha basins, and partners and stakeholders will continue with the next 5-year cycle iteration to evaluate and update the plan as necessary.

In This Section

Section 2

River Basin Characteristics

This section describes the major characteristics of the Oconee River basin including the following:

- *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 best uses 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 Oconee River basin.

The physical characteristics of the Oconee 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 headwaters of the Oconee River are in Hall County, where the Middle Oconee and North Oconee Rivers rise. These two rivers run for 55 to 65 miles before joining below Athens to form the Oconee River. The Oconee River flows in a generally southerly direction for another 220 miles to its confluence with the Ocmulgee River to form the Altamaha River. The Oconee River basin, comprising all land areas draining

into the Oconee River, is located entirely within the state of Georgia and extends from central northern Georgia, northeast of Atlanta, to central southern Georgia (Figure 2-1). The basin drains a total of 5,330 square miles.

The U.S. Geological Survey (USGS) has divided the Oconee basin into two 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 Oconee 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 Oconee River Basin in Georgia

03070101	Oconee River Above Lake Sinclair Dam
03070102	Oconee River Below Lake Sinclair Dam

2.I.2 Climate

The Oconee River basin is characterized by a warm and humid, temperate climate. Major factors affecting the climate in the basin are latitude, altitude, and proximity to the Blue Ridge Mountains.

Average annual temperature ranges from about 60 °F in the north to 65 °F in the south. Average daily temperatures in the basin for the month of January range from about 40 °F to 45 °F, and for July from 75 °F to 80 °F. In the winter, cold winds from the northwest cause the minimum temperature to dip below freezing for only short periods. Summer temperatures commonly range from the 70s to the 90s (Southeast Regional Climate Center, 1997).

Precipitation is greatest at the north end of the basin, as a result of proximity to the mountainous region of northeast Georgia. Average annual precipitation in the basin, primarily as rainfall, is about 50 inches (in.), but ranges from a low of 47 in. in the southern part of the basin to a high of about 56 in. in the northern region of the basin (U.S. Geological Survey, 1986).

Evapotranspiration generally increases from north to south and ranges from about 26 in. to 35 in. per year. Average annual runoff ranges from 12 in. to almost 30 in. Areal distribution of average annual runoff from 1951 to 1980 reflects basinwide patterns in precipitation and soil-runoff potential. Runoff is greatest at the northern end of the basin, where precipitation is highest, and drops off as one moves southward through the basin (Gebert et al., 1987).

2.I.3 Physiography, Geology, and Soils

The Oconee 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 Piedmont province is underlain by mostly Precambrian and older Paleozoic crystalline rocks that include mica schist, felsic gneiss and schist, and granite gneiss. Less extensive outcrops of quartzites 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 Fall Line is the boundary between the Piedmont and Coastal Plain provinces. This boundary approximately follows the contact between older crystalline metamorphic

Figure 2-I. Location of the Oconee River Basin

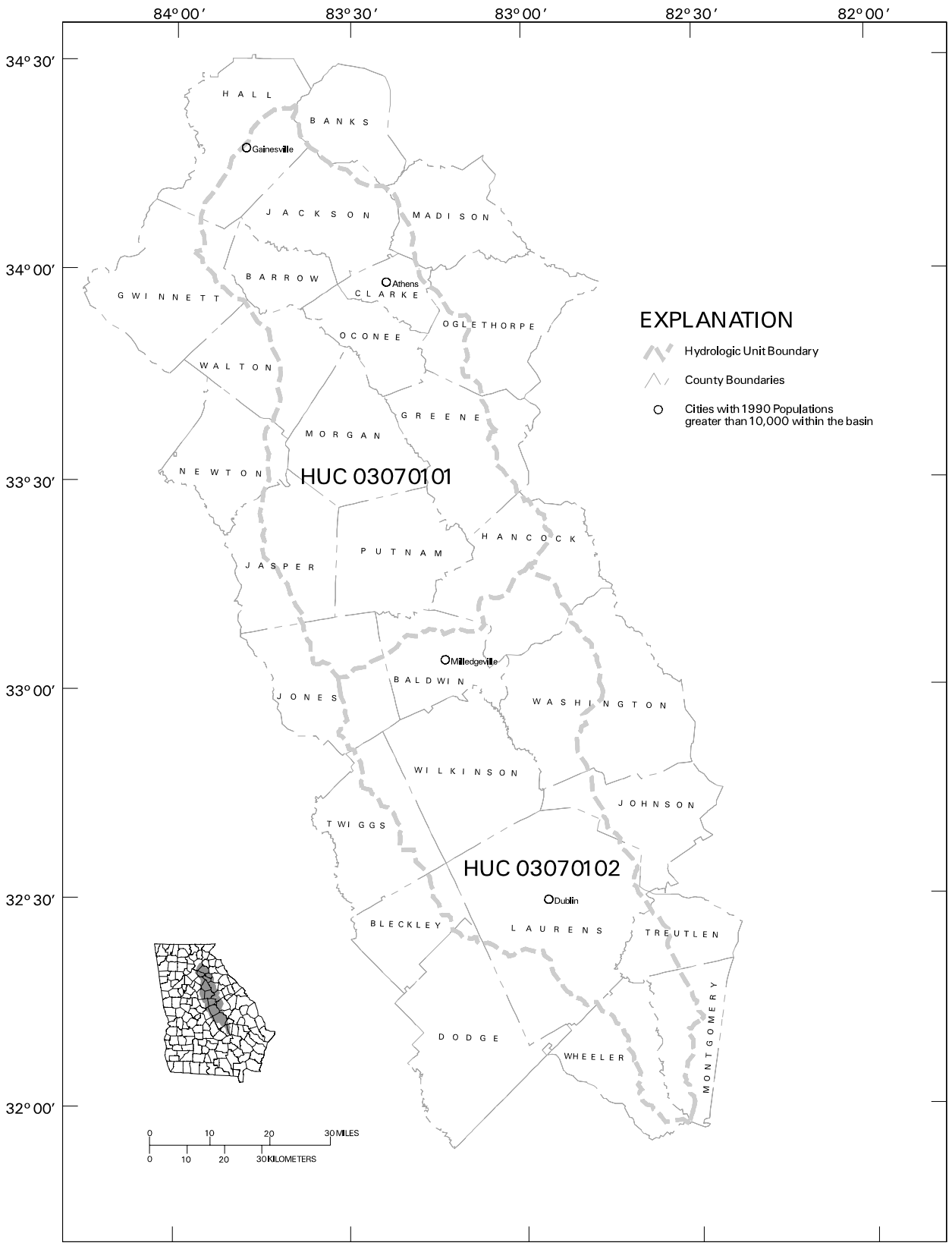

Figure 2-2. Hydrologic Units and Counties of the Oconee River Basin

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 shoals common to streams in the Piedmont and exhibit greater floodplain development and increased sinuosity.

Geology

The following is a summary of the general geologic factors that appear to influence the background stream sediment geochemistry and stream hydrogeochemistry. Further details are provided by Cocker (1996).

The Oconee River Basin is located within two physiographic provinces: the Piedmont and the Coastal Plain provinces. The Piedmont province, which constitutes approximately 60 percent of the Oconee River Basin, is underlain by crystalline metamorphic and igneous rocks. The majority (57 percent) of the exposed rocks of the Oconee River Basin consist of several types of gneiss. Biotite gneisses cover 29 percent; granite gneisses cover 14 percent; and amphibolite gneisses cover 5 percent of the Oconee River Basin. Granites occupy 4 percent of the basin. Metasedimentary rocks such as metagraywackes, quartzite, and schists cover 4 percent of the Oconee River Basin. Less than 0.1 percent of the Oconee River Basin is occupied by ultramafic and mafic rock units. Coastal Plain sediments are present over 40 percent of the Oconee River basin. Approximately 85 percent of the Coastal Plain sediments in the basin are sands and clays. The rest include calcareous sediments and Quaternary alluvium. Because of significant differences in chemical composition, porosity, permeability, and origin of the different rock units within the Piedmont and Coastal Plain, these rock units and the stream sediments derived from these rock units significantly influence differences in the stream hydrogeochemistry.

Although each rock unit may exert an effect on stream sediment geochemistry and stream hydrogeochemistry, of greater importance is the regional geologic grouping of rocks of similar compositions, porosity, permeability, and origin. In the Piedmont, two major tectonic terranes: the Inner Piedmont terrane and the Carolina terrane, are separated by a major fault—the Towaliga Fault Zone. On the north side of this fault, the Inner Piedmont terrane consists mainly of granitic and biotitic gneisses with smaller volumes of schists, amphibolites, and ultramafic bodies. Source rocks for these Inner Piedmont rocks were primarily sedimentary and perhaps felsic to intermediate igneous rocks. On the south side of the Towaliga Fault Zone, the Carolina terrane includes predominantly intermediate to mafic metavolcanic or metasedimentary rocks derived from intermediate to mafic volcanic rocks. In addition to their compositional differences, the Inner Piedmont rocks have generally been metamorphosed to a higher grade or intensity than rocks in the Carolina terrane. Rocks in the Carolina terrane appear to be more porous and more reactive with surface and ground waters than rocks in the Inner Piedmont perhaps because of differences in composition and metamorphic grade. Small masses of ultramafic rocks are aligned parallel to the main tectonic fabric of the Piedmont and appear to be local sources for chromium, nickel, iron, and magnesium.

Coastal Plain sediments overlap the southern edge of the Carolina terrane 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, clay casts, and pebbly sand. These sediments host the major kaolin deposits in Georgia with many of these deposits found within the Oconee River Basin. The high porosity and relatively non-reactive quartz sands and clays of these sediments appear to have a limited effect on the surface and ground waters. Younger

Eocene and Oligocene sediments are calcareous and have a greater effect on surface and ground waters. These sediments are located further to the south of the older Cretaceous and older Eocene sandy sediments. In the southern part of the basin are poorly sorted, pebbly, argillaceous, micaceous sands, and sandy clays that are Miocene in age. These sediments appear to have little effect on surface and ground waters.

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. Predominant soil types in the Piedmont are sandy loam clay to fine sandy loam. South of the Fall Line, soils are loamy sand, sandy loam, and sand. Sandy loam and clay to sand soils cover the rest of the Coastal Plain sediments within the Oconee River Basin. 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.

Geochemistry

Documentation of the background geochemistry of the Oconee River Basin was based primarily on stream sediment and stream geochemical data obtained as part of the U.S. Department of Energy's National Uranium Resource Evaluation (NURE) Program during the period 1976 to 1978. These databases provide the most extensive geochemical sample coverage for the state. A total of 792 NURE stream sediment sample sites are within the Oconee River Basin and represent a ratio of one stream sediment sample site per 17 km^2. All analyses were done by automated neutron activation techniques (NAA). Details on the collection and analyses of the samples are provided by Cocker (1996). Metals in stream sediments that were examined by Cocker (1996) include aluminum, beryllium, chromium, cobalt, copper, lead, nickel, zinc, iron, magnesium, manganese, titanium, and vanadium. Stream pH, conductivity, and alkalinity were also examined. Data were spatially analyzed by a Geographic Information System (GIS) and by statistical methods.

The Oconee River Basin cuts across five regions that differ in pH, conductivity, and alkalinity. Two regions of higher pH (>7), higher conductivity (>50 micromhos/cm), and higher alkalinity (>0.3 meq/L) are coincident with each other and separate regions of lower pH, lower conductivity, and lower alkalinity. These regions are generally correlative with regional geologic and related geochemical trends. Regions of higher pH, conductivity, and alkalinity include the Carolina terrane and the calcareous rocks of the Coastal Plain. Regions of lower pH, conductivity, and alkalinity include the Inner Piedmont terrane, the older (Cretaceous to Eocene) sediments in the northern part of the Coastal Plain, and the younger Miocene sandy sediments in the southern part of the Coastal Plain. These stream measurements appear related to the reactivity of the rocks and sediments which is controlled mainly by their composition and porosity.

Statistical analyses of basin-wide data suggests several elemental associations: (1) iron-manganese-titanium-vanadium-magnesium; (2) copper-nickel-cobalt-zinc-lead; (3) beryllium-potassium-aluminum; and (4) sodium-aluminum. The first group may be related to iron-magnesium mafic silicates and iron-titanium oxides and reflect the distribution of mafic metavolcanic and metaplutonic rocks in the Carolina terrane. The copper-nickel-cobalt-zinc-lead group may be related to base-metal sulfides and reflect their presence as disseminated or vein mineralization. The beryllium-potassium-aluminum group may be related to pegmatites or granitic plutons. Higher beryllium,

potassium, and aluminum concentrations are spatially related to granitic plutons. The sodium-aluminum relation appears to reflect the presence of sodic feldspars or sodic amphiboles in the metavolcanic rocks of the Carolina terrane. Correlation coefficients, as well as spatial distributions suggest that groups 1, 2, and 4 plus pH, alkalinity, and conductivity are related to each other and to rocks of the Carolina terrane. A spatial correlation between ultramafic rocks and the metals chromium, nickel, and magnesium probably indicates a genetic relationship.

Stream sediments spatially associated with the mafic metavolcanic and metaplutonic rocks of the Carolina terrane contain higher concentrations of chromium, cobalt, copper, nickel, zinc, iron, manganese, titanium, vanadium, and sodium than most other rock types within the Oconee River Basin. Base and precious metal mining has occurred in the past and is presently underway in the Carolina terrane of South Carolina. The association of certain toxic metals such as mercury, antimony, and arsenic with the mineral deposits in South Carolina suggests that those metals may also exist within the geologically similar rocks of the Carolina terrane in the Oconee River Basin.

Metal concentrations tend to be lowest in the stream sediments located in the Coastal Plain of the Oconee River Basin. This is related to intensive chemical weathering during formation of those Coastal Plain sediments and to subsequent (present) intensive chemical weathering. Highest metal values tend to be those for aluminum which may be related to the aluminous kaolin deposits in the Cretaceous to Eocene age sediments.

Some stream sediment samples and associated stream samples in the NURE database may be affected by nearby human activities. These activities may have increased concentrations of certain heavy metals and affected the pH, conductivity, and alkalinity of the streams. Activities which appear to have affected the geochemistry of the streams and stream sediments the most include: urban activities, waste disposal sites, and sewage.

Soils

Soils of the Oconee River basin are divided into three major land resource areas (MLRAs, formerly called soil provinces) as shown in Figure 2-3. About 60 percent of the area is located in the Southern Piedmont MLRA, about 30 percent in the Southern Coastal Plain MLRA, and 10 percent in the Carolina and Georgia Sand Hills MLRA.

The Southern Piedmont portion of the Oconee basin is underlain primarily by granite and gneiss. Dominant soils in the area have a fine sandy loam surface layer and a deep, red clayey subsoil.

Soils in the Southern Coastal Plain portion of the basin developed in sandy and loamy marine sediments. The dominant soils are very deep and have a loamy sand surface layer and a loamy subsoil.

The Carolina and Georgia Sand Hills portion of the basin lies along the Fall Line between the Piedmont and Coastal Plain. The parent materials in which the soils formed are primarily sandy and loam marine sediments, which occasionally overlay residual Piedmont materials. There are two major groups of soils in the area. One of these soils consists of very deep sands with very little soil profile development. The other soils have a sandy surface layer and a loamy subsoil. The subsoil varies in depth, but is generally not as deeply developed as in the Coastal Plain soils.

2.1.4 Surface Water Resources

The Oconee River basin contains several major rivers, as well as man-made reservoirs.

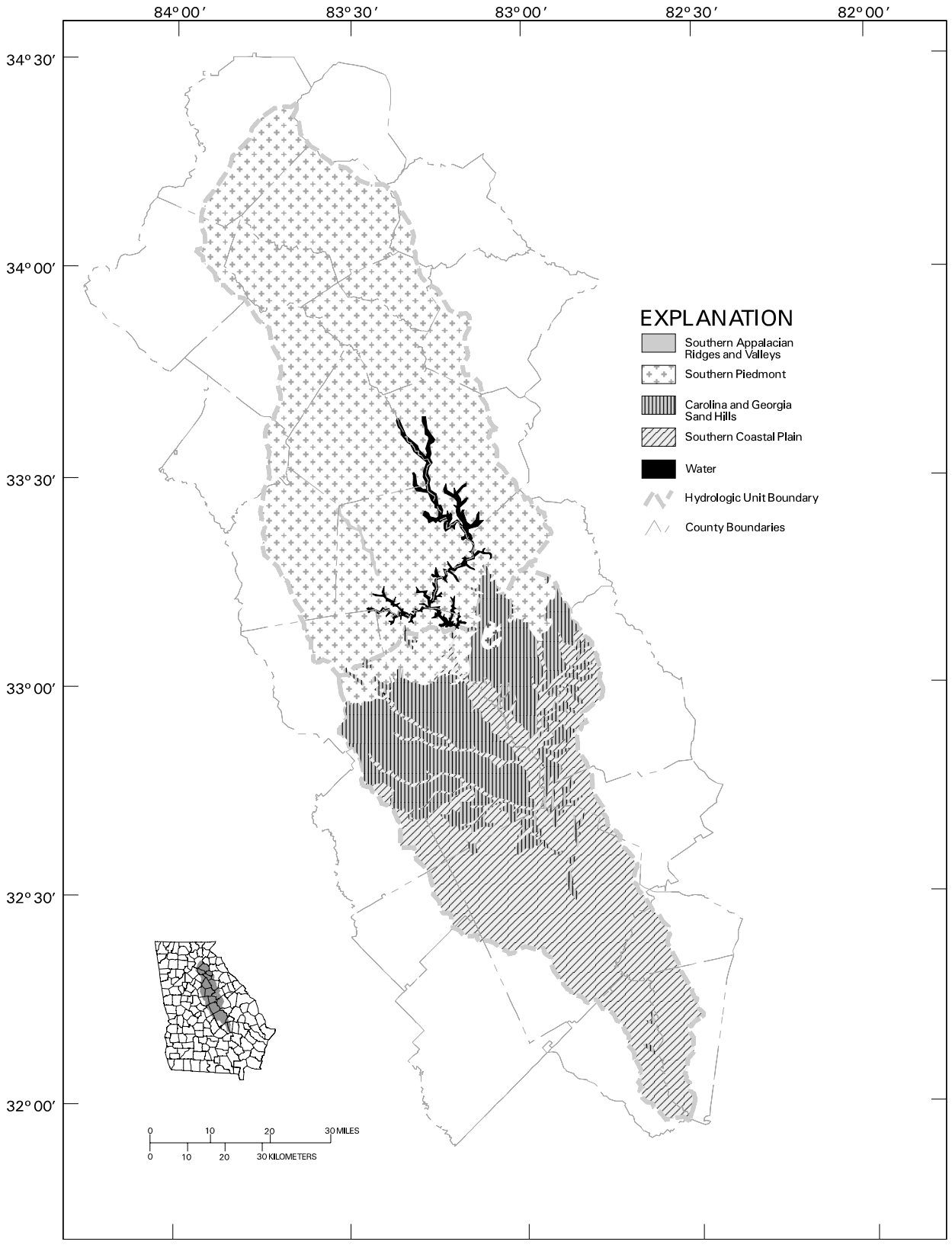

Figure 2-3. Major Land Resource Areas in the Oconee River Basin

North Oconee and Middle Oconee Rivers

Two headwater tributaries—the North Oconee River and the Middle Oconee River—originate at the northern end of the Oconee basin, in the Piedmont physiographic province, at an elevation of about 1,000 feet about mean sea level. These headwater streams are generally well entrenched, flow through narrow floodplains, and have steep gradients ranging from 4.5 to 7.4 feet per mile. These tributaries each flow for approximately 55 to 65 miles to a point just south of Athens, where they join to form the Oconee River.

Oconee River Above Sinclair Dam

From the junction of the North and Middle Oconee Rivers, the Oconee River flows freely for about 20 miles until it joins the northern end of Lake Oconee, a 21,000-acre reservoir formed by Wallace Dam. Immediately downstream of Lake Oconee is the 15,330-acre Lake Sinclair, also a man-made reservoir, formed behind Sinclair Dam (located about 5 miles upstream of Milledgeville). North of Sinclair Dam, the Oconee River flows through the Piedmont physiographic province, where the river is well entrenched, cutting through igneous and metamorphic rock.

Oconee River Below Sinclair Dam

Below Sinclair Dam, the Oconee River flows freely, with the exception of one abandoned diversion dam near Milledgeville, for about 143 miles to its confluence with the Ocmulgee to form the Altamaha River. About 5 miles south of Sinclair Dam, the river enters the transition zone between the Piedmont and upper Coastal Plain known as the Fall Line Hills District, which represents the ancient shoreline of the Atlantic Ocean. This area is characterized by an increased gradient in the Oconee River: the average gradient of the river here is 1.23 feet/mile (0.233 m/km), as compared to 1.05 feet/mile (0.199 m/km) in the Coastal Plain portion of the river between Dublin and its confluence with the Ocmulgee. In the Coastal Plain province, channel substrates are more homogeneous, consisting almost entirely of sand. The channel itself is more sinuous, shifting, and unstable than in the Piedmont, with easily erodible banks.

From the headwaters of the North Oconee River to the confluence with the Ocmulgee River, the Oconee River flows for a total length of about 285 miles and drains a total of 5,330 square miles.

Flow Rates of the Oconee River

From 1897 to 1996, the median discharge of the Oconee River at Dublin, Georgia (USGS Station 02223500) was 2,980 cubic feet per second (ft^3/s). Dublin is the southernmost active USGS gaging station located on the Oconee mainstem, representing a drainage area of 4,400 square miles, or about 83 percent of the Oconee River basin. Over the past 100 years, mean daily discharge at Dublin ranged from a low of 350 ft^3/s on September 11, 1951, to a high of 94,900 ft^3/s on April 13, 1936. Both of these extremes occurred prior to regulation of the Oconee River by Sinclair Dam (completed in 1953) and Wallace Dam (completed in 1979). These impoundments have apparently altered the flow regime in the river, reducing the median flow somewhat and tempering the extremes. Before completion of Sinclair Dam, median flow in the Oconee River was 3,210 ft^3/s; after completion of Wallace Dam, the median flow in the Oconee River was 2,280 ft^3/s.

Figure 2-4 displays trends in discharge at the Dublin gaging station for the past 20 years as boxplots. Each entry on the plot summarizes daily average flow measurements for a water year. (The water year is defined as running from October of the previous

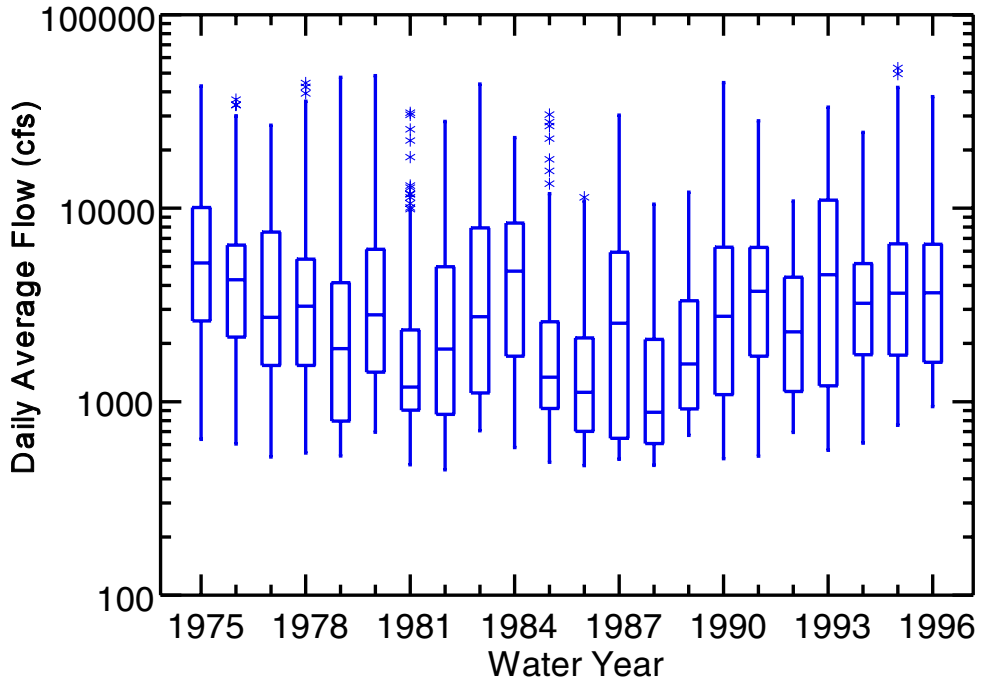

Figure 2-4. Summary of Oconee River Flows Measured at Dublin, 1975-1996

calendar year through September of the current year). The center horizontal line marks the median flow for the year, which is the 50th percentile or flow that is exceeded on half of the days in the year. The upper and lower edges of the box represent the 75th and 25th percentiles, respectively. The lines or "whiskers" extending from each box show the range of data, except that high values far above the median are shown as asterisks or circles.

As shown in Figure 2-4, from 1975 to 1996 the median discharge of the Oconee River at Dublin, Georgia, was 2,510 ft³/s. Over the past 20 years, mean daily discharge at Dublin ranged from a low of 445 ft³/s on October 1, 1981, to a high of 53,100 ft³/s on February 21, 1995 (Figure 2-4). Median yearly flows show significant variability over the same period, ranging from 883 ft³/s in 1988 to 5,220 ft³/s in 1990.

As discussed in Section 2.1.1, the Oconee River basin is subdivided into two Hydrologic Units (HUCs). Stream networks within the Georgia portions of each of these HUCs are shown in Figures 2-5 and 2-6.

Reservoirs

The Oconee River basin contains two major surface water reservoirs, Lake Sinclair and Lake Oconee (Figure 2-7 and Table 2-2). Both of these reservoirs are Georgia Power Company facilities designed and operated for the production of hydroelectric power. An additional reservoir—the Bear Creek Regional Reservoir—is under development and expected to be operational by the year 2001.

Lake Sinclair

Lake Sinclair drains an area of 2,910 square miles from the upper Oconee River basin above Baldwin County. The construction of Sinclair Dam began in 1929 but was suspended as a result of the Great Depression. Construction was resumed in 1949 and

Figure 2-5. Hydrography, Upper Oconee River Basin, HUC 03070101

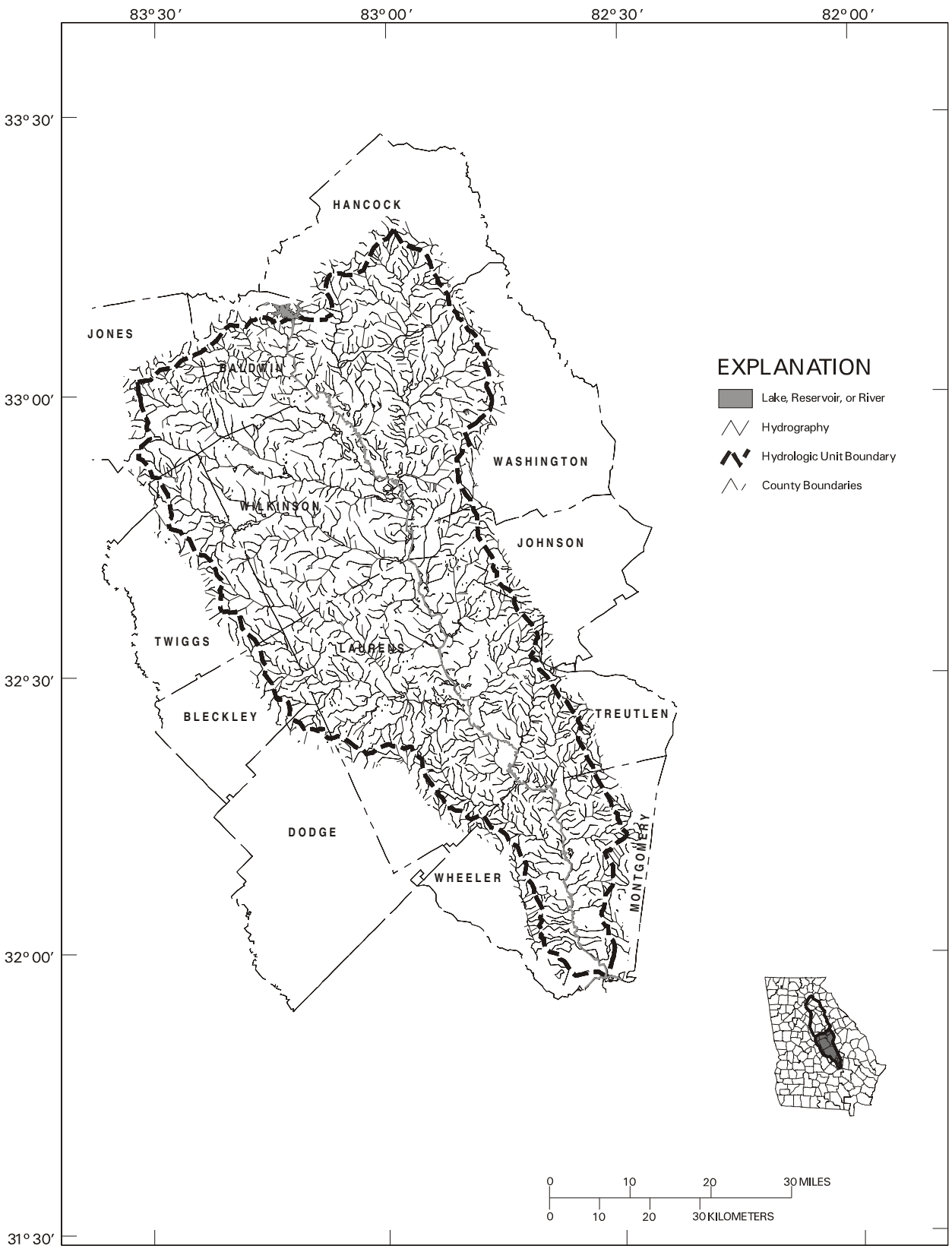

Figure 2-6. Hydrography, Lower Oconee River Basin, HUC 03070102

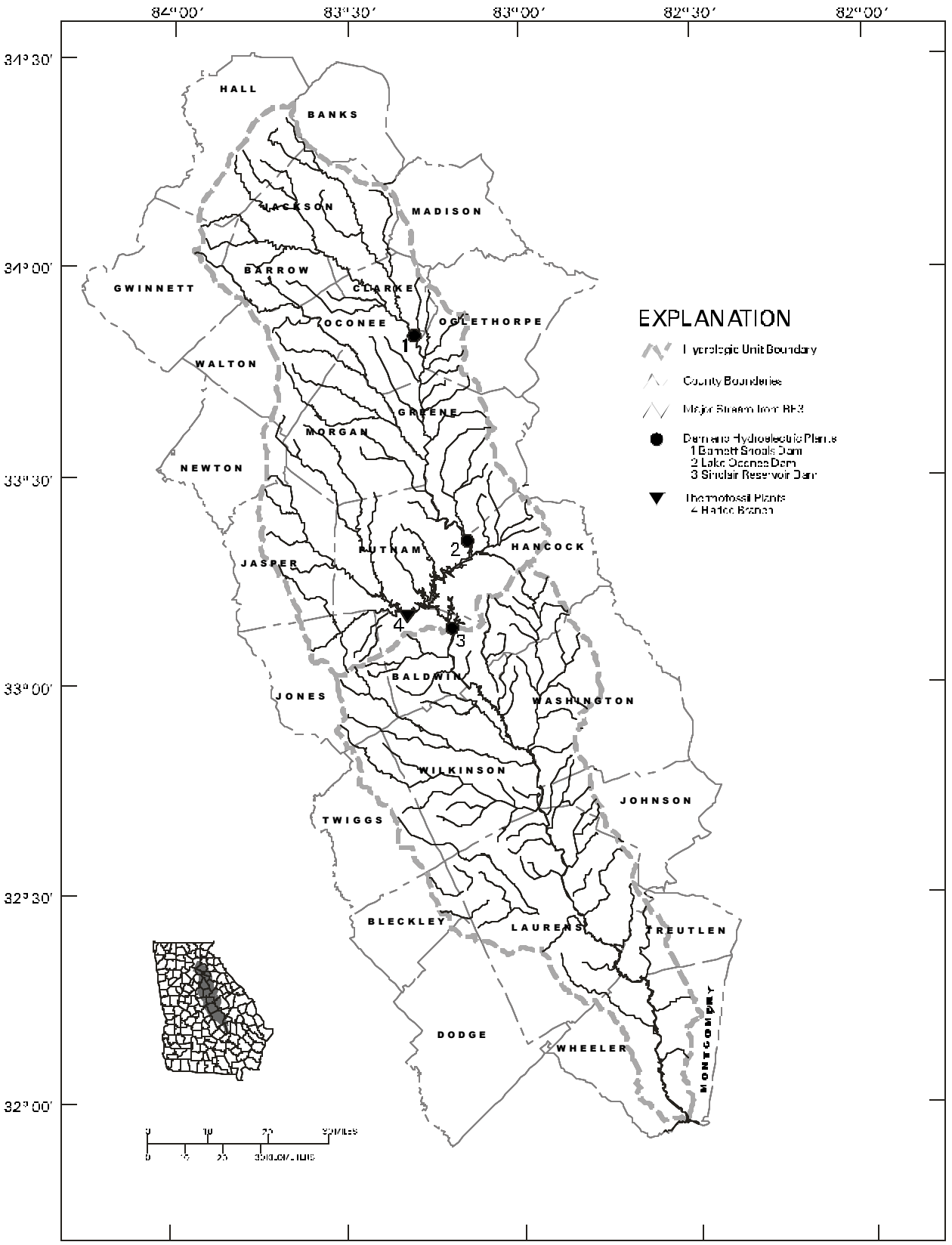

Figure 2-7. Location of Mainstem Dams and Power-Generating Plants in the Oconee River Basin

Table 2-2. Major Dams and Impoundments in the Oconee River Basin

Project Name	Owner/Yr Initially Completed	Drainage Area (mi^2)	Reservoir Size (ac)	Reservoir Storage Volume (ac-ft)	Total Power Capacity (kW)	Normal Lake Elevation (ft)
Lake Oconee	Georgia Power/1979	1,830	21,000	470,000	321,000	435.6
Lake Sinclair	Georgia Power/1953	2,910	15,330	330,000	45,000	340.6

completed in 1953. The dam consists of a concrete cavity structure 1,420 feet long with earth embankments on either side totaling 1,595 feet. Lake Sinclair spreads out over a 15,330-acre area at normal pool and has a shoreline that approaches 417 miles in Baldwin, Putnam, Hancock, and Jones counties in central Georgia. The first commercial operation of the facility was in 1953. There are two conventional turbines at Lake Sinclair with installed capacity of 45 megawatts. The project is operated as a hydroelectric peaking facility to meet peak demand in the Georgia Power Company system.

Lake Oconee

Lake Oconee, located immediately upstream of Lake Sinclair, drains some 1,830 square miles of land mass from the upper Oconee River basin above Morgan and Greene counties. Its 374 miles of shoreline lie in Hancock, Putnam, Morgan, and Greene counties in north-central Georgia. Georgia Power Company began commercial operation of Lake Oconee upon completion of Wallace Dam in 1979. There are two conventional turbines and four pumpback units at the powerhouse. In general, the pump turbines are operated in pumping mode to move water up from Lake Sinclair to Lake Oconee during periods of low demand for electricity, usually at night. This water is then used to drive the turbines to generate electricity during periods of peak demand, usually in the day. The installed capacity of the powerhouse is 321 megawatts. Pool elevation of Lake Oconee does not fluctuate seasonally but varies about 1½ feet daily as a result of the pumped storage operation.

Planned Reservoirs

In northeast Georgia, the counties of Jackson, Barrow, Clarke, and Oconee, under the umbrella of the Upper Oconee Basin Water Authority, successfully negotiated a contract that would allow the four counties to cooperatively develop the Bear Creek Regional Reservoir. The reservoir will cover 505 acres and hold 14,980 acre-feet of water at normal pool. It is expected to satisfy water needs for the four counties through the year 2050. This locally sponsored regional reservoir is under development and is expected to begin selling water by mid-2001.

2.1.5 Ground Water Resources

The Oconee River basin is a dynamic hydrological system containing interactions between aquifers, streams, reservoirs, floodplains, and estuaries. Many principal rivers receive a substantial contribution of water from ground water baseflow during dry periods. Three major aquifer systems, described below, underlie the Oconee River basin. Generalized outcrop areas of major aquifers in the Oconee River basin are shown in Figure 2-8. These aquifers are generally separated by confining units.

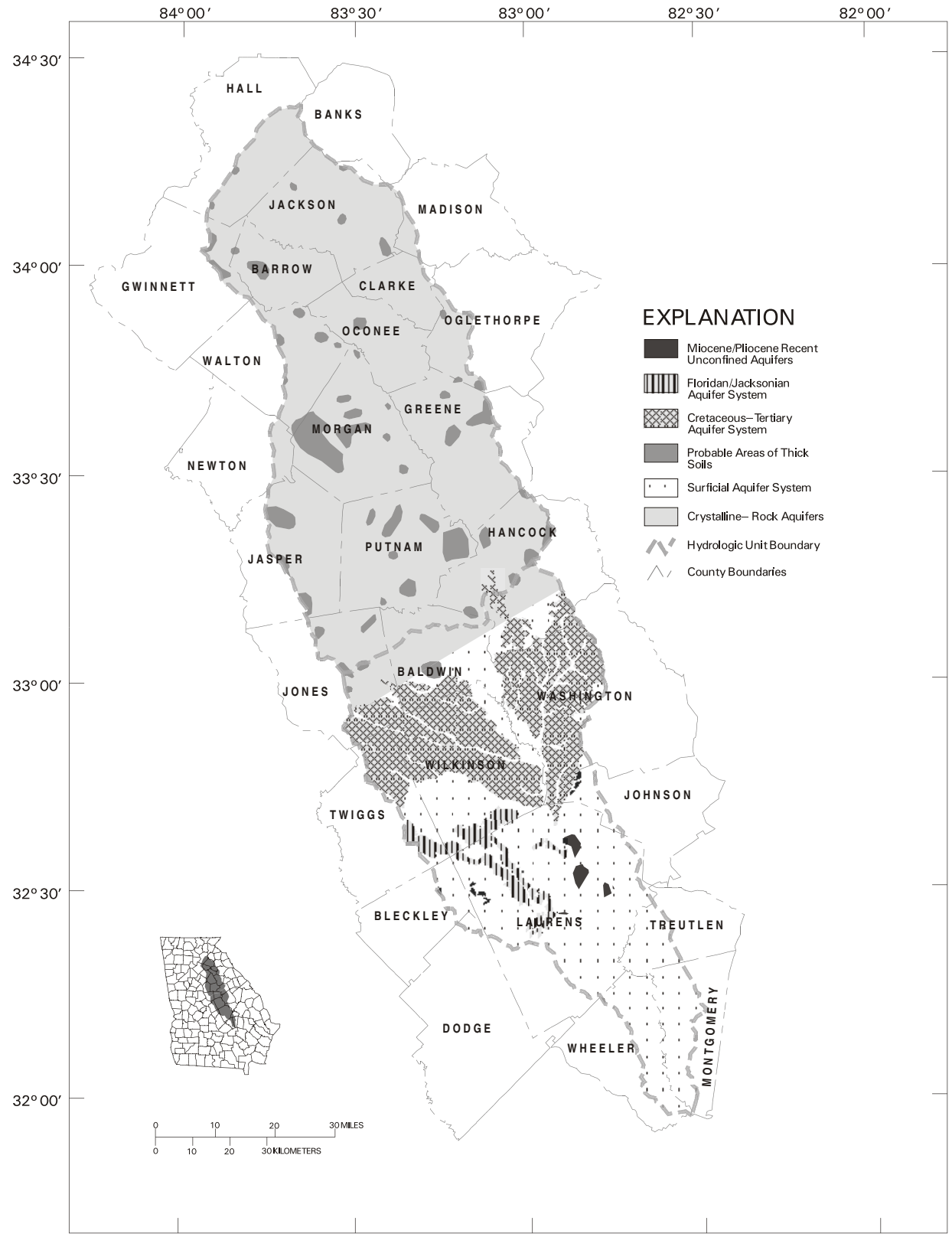

Figure 2-8. Hydrogeologic Units Underlying the Oconee River Basin

Piedmont Province - Crystalline Rock Aquifers

The Piedmont province section of the Oconee River basin is underlain by bedrock consisting primarily of granite, gneiss, schist, and quartzite. These rock formations make up the ***crystalline rock aquifers,*** which are generally unconfined and not laterally extensive. These rocks tend to be impermeable, and thus where ground water is present, it is stored in a mantle of soil and saprolite (i.e., decomposed rock) and transmitted to wells via fractures or other geologic discontinuities in the bedrock. Well yields in this aquifer tend to be unpredictable; typical yields are 1 to 25 gallons per minute, though systematic well-siting techniques have produced high-yielding wells (greater than 100 gallons per minute) on a regular basis. Currently, the crystalline rock aquifers are used primarily for private water supplies and livestock watering. It is commonly believed that ground water in this part of the state is not sufficient to supply such uses as municipal supplies and industry.

Because water is transmitted through faults and fractures, each surface water drainage basin or watershed is also a ground water drainage basin or watershed; surface and ground water are in such close hydraulic interconnection that they can be considered as a single and inseparable system. In the Piedmont, the decomposed rock or saprolite which holds groundwater also contains considerable clay, which acts as a barrier to ground water pollution. This section of the Oconee River basin has below-average pollution susceptibility.

Coastal Plain Province - Floridan and Cretaceous Aquifer Systems

South of the Fall Line, the Oconee River flows through the Coastal Plain hydrogeologic province. Here, the aquifers are porous sands and carbonates and include alternating units of sand, clay, sandstone, dolomite, and limestone that dip gently and thicken to the southeast. Several of these are prolific producers of ground water. Unlike the Piedmont, ground water is the dominant source of water. In this area, the aquifers are of two types—unconfined and confined. The unconfined aquifers are hydraulically interconnected to surface water bodies and the two form a single system; the confined or artesian aquifers, however, are buried and hydraulically isolated from surface water bodies. Confining units between these aquifers are mostly silt and clay. The unconfined aquifers in this area are susceptible to pollution. The confined aquifers, because they are buried and isolated, are somewhat immune to pollution from ground-level activities.

To the south of the Fall Line, progressively younger sediments crop out and overlie older sediments. The complex interbedded clastic rocks and sediments of Coastal Plain aquifers range in age from Quaternary to Cretaceous. Because of gradational changes in hydrologic properties, aquifer and stratigraphic boundaries are not always coincident.

The regional direction of ground-water flow in the Coastal Plain is from north to south; however, local flow directions vary, especially in the vicinity of streams and areas having large ground-water withdrawals. Rivers and streams in the Coastal Plain province commonly are deeply incised into underlying aquifers and receive substantial amounts of ground-water discharge.

The Coastal Plain portion of the Oconee River contains two distinct aquifer systems, described below.

Cretaceous Aquifer System

The Cretaceous aquifer system is the deepest of the principal aquifers in South Georgia. Cretaceous units crop out immediately below the Fall Line. The principal water-bearing formation is the Providence Sand of Late Cretaceous Age. Older Cretaceous strata generally are too deep to be economically developed (Couch et al.,

1995). The Cretaceous aquifer system serves as a major source of water in the northern third of the Coastal Plain. The aquifer system consists of sand and gravel that locally contain layers of clay and silt that function as confining beds. Wells in this aquifer typically yield between 50 and 1,200 gallons per minute.

Floridan Aquifer System

The Floridan aquifer system is one of the most productive ground water reservoirs in the United States. This system supplies about 50 percent of the ground water used in the state. It is used as a major water source throughout the Coastal Plain region of the state. The Floridan aquifer system consists primarily of limestone, dolostone, and calcareous sand. It is generally confined, but is semiconfined to unconfined near its northern limit. Wells in this aquifer are generally high-yielding (typically 1,000 to 5,000 gallons per minute) and are extensively used for irrigation, municipal supplies, industry, and private domestic supply.

2.1.6 Biological Resources

The Oconee River basin supports a diverse and rich mix of terrestrial and aquatic habitats and is home to a number of federally and state-protected species. The basin includes portions of three "bottomland forest habitat regions," as delineated by the Georgia Natural Heritage Inventory—Lower Piedmont, Upper Coastal Plain, and Vidalia Uplands (Ambrose, 1987). These regions describe areas that are relatively homogeneous with respect to vegetation associated with river, lake, and wetland environments. Some of the most important biological resources of the basin are summarized below.

Terrestrial Habitats

The health of aquatic ecosystems is linked to the health of terrestrial ecosystems. All parts of the Oconee River basin have been subjected to varying degrees of forest-cover alteration. Small-scale disturbance of native forests began with American Indians who used fire to create fields for cultivation. Forest disturbance was greatly accelerated by European settlers who logged throughout the basin and extensively cleared land for agriculture in the Piedmont and Coastal Plain.

Prior to European settlement, the Oconee River basin was mostly forested. Historically, native forests in the Piedmont province were dominantly deciduous hardwoods and mixed stands of pine and hardwoods. The Coastal Plain supported oak-sweetgum-pine forests, with gum-cypress in floodplain forests. Parts of the lower Coastal Plain were vegetated by open savannahs of wiregrass and longleaf pine (Wharton, 1978).

Lower Piedmont

This habitat region includes the Winder Slope, Washington Slope, Greenville Slope, and Pine Mountain districts. With the exception of the Pine Mountain district, topography in this area is gently to steeply undulating. The lower Piedmont contains the lower stretches of major Piedmont alluvial streams, as well as the headwaters of Coastal Plain alluvial streams (Oconee, Ocmulgee, Savannah, and Flint). Streams of the lower Piedmont have a high periodicity of flooding (roughly four peaks per year, as opposed to the two peaks of Coastal Plain streams) and are characterized by an alternation of shoals, slow runs, and slow water areas. Bottomland sites may contain thick layers of alluvium from erosion of the intensively farmed upland sites.

Floodplain forests of the Lower Piedmont contain a combination of northern and southern elements. Dominant species along stream banks include oak (*Quercus* sp.), hickory (*Carya* sp.), ash (*Fraxinus* sp.), elm (*Ulmus* sp.), American hornbeam (*Carpinus caroliniana)*, cottonwood (Populus deltoides), water tupelo (*Nyssa aquatica*), and black

tupelo (*Nyssa sylvatica*) (Evans, 1994). Forests of the "low swamp" may contain red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), black tupelo (*Nyssa sylvatica*), swamp chestnut oak (*Quercus michauxii*), willow oak (*Q. phellos*), overcup oak (*Q. lyrata*), red mulberry (*Morus rubra*), stiff dogwood (*Cornus stricta*), he-huckleberry (*Lyonia ligustrina*), and possumhaw (*Ilex decidua*). Higher banks and terraces may contain loblolly pine (*Pinus taeda*), American beech (*Fagus grandifolia*), water oak (*Quercus nigra*), river birch (*Betula nigra)*, American hornbeam (*Carpinus caroliniana)*, mountain laurel (*Kalmia latifolia)*, and common pawpaw (*Asimina triloba*).

Floodplains in the Lower Piedmont region may also contain several Coastal Plain elements such as sweet bay (*Magnolia virginiana*), water tupelo (*Nyssa aquatica*), and water hickory (*Carya aquatica*). Ravine forests of the Pine Mountain area contain a mixture of Mountain, Piedmont, and Coastal Plain biotic elements (Wharton, 1978) and thus represent an important anomalous vegetation type.

Upper Coastal Plain

This region, which includes the Fall Line Hills and Fort Valley Plateau districts, represents the zone of contact between older metamorphic rocks of the Piedmont and younger sediments of the Coastal Plain. Characteristics of alluvial streams draining the Piedmont change rapidly in this region; floodplains widen considerably, and rapids, shoals, and waterfalls are common.

Below the Fall Line, the Oconee basin's forest type changes from pine-oak-hickory to southeastern evergreen. The bottomland swamp forest (flooding more than 6 months annually) is mainly cypress-tupelo with hardwood bottoms (flooding less than 6 months annually) composed of hickory-gum communities (GADNR, 1976). While the Upper Coastal Plain region is more easily distinguished from other regions on the basis of its upland sand hill and red loam hill communities, bottomland forests in this region are quite variable, differing from those in the Lower Piedmont mainly in the number of coastal plain elements. Species typically found include black tupelo (*Nyssa sylvatica*), water tupelo (*N. aquatica*), sweetgum (*Liquidambar styraciflua*), flowering dogwood (*Cornus florida*), southern red oak (*Quercus falcata*), water oak (*Q. nigra*), sycamore (*Platanus occidentalis*), red maple (*Acer rubrum*), swamp chestnut oak (*Quercus michauxii*), overcup oak (*Q. lyrata*), laurel oak (*Q. laurifolia*), white oak (*Q. alba*), willow oak (*Q. phellos*), American beech (*Fagus grandifolia*), boxelder (*Acer negundo*), black willow (*Salix nigra*), common alder (*Alnus serrulata*), and southern magnolia (*Magnolia grandiflora*).

The Fort Valley Plateau represents an anomalous physiographic area that is similar in its geologic and soil characteristics to the extensive Black Lands of Alabama. It is included in this region primarily because of its geographic location within the Fall Line Hills and its limited extent.

Vidalia Upland

This area contains a well-developed dendritic system over Irwington sand, Twiggs clay, or undifferentiated Neogene sediments. Streams in this region flow toward the Atlantic Ocean via the Oconee, Ocmulgee, Altamaha, Ogeechee, and Savannah drainages. Extensive alluvial deposits have formed on the wide floodplains and terraces of these three river systems. This region contains some outstanding examples of Coastal Plain alluvial river swamp systems. Several blackwater swamp systems (e.g., the Ohoopee and Canoochee) are also well represented. This region contains few or no limesinks, but has many small Carolina bays and a few disappearing streams. Upland areas bordering the Oconee and Ocmulgee Rivers have been used extensively for row-crop production, pasture, and timber production. Many bottomlands along these rivers are similarly intensively managed for hardwood pulp and timber production. Much of the bottomland hardwood acreage in these areas consists of young secondary growth stands,

containing species such as baldcypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), water hickory (*Carya aquatica*), river birch (*Betula nigra*), overcup oak (*Quercus lyrata*), swamp chestnut oak (*Q. michauxii*), willow oak (*Q. phellos*), laurel oak (*Q. laurifolia*), water oak (*Q. nigra*), shumard oak (*Q. shumardii*), loblolly pine (*Pinus taeda*), spruce pine (*Pinus glabra*), American elm (*Ulmus americana*), red maple (*Acer rubrum*), persimmon (*Diospyros virginiana*), sweetgum (*Liquidambar styraciflua*), and sycamore (*Platanus occidentalis*).

Wetland Habitats

Wetlands are lands transitional between terrestrial and deep-water habitats where the water table is at or near land surface or the land is covered by shallow water (Cowardin et al., 1979). Most wetlands in the Oconee River basin are forested wetlands located in floodplains of streams and rivers. Forested-floodplain wetlands are maintained by the natural flooding regime of rivers and streams, and in turn, influence the water and habitat quality of riverine ecosystems.

Assessments of wetland resources in Georgia have been carried out with varying degrees of success by the Natural Resources Conservation Service (NRCS), the U.S. Fish and Wildlife Service National Wetland Inventory (NWI), and Georgia's Department of Natural Resources. Georgia DNR compiled a wetlands mapping database in 1991 which is based on classification of Landsat Thematic Mapper (TM) satellite imagery taken during 1988-1990. Total wetland acreage based on landsat TM imagery is 265,125 acres or 7.8 percent of land area in the Oconee River basin. These data underestimate the acreage of forested wetlands, where considerable acreage may have been classified as hardwood or mixed forest.

Aquatic Fauna

This section focuses on aquatic or wetland species including fishes, amphibians, aquatic reptiles, and aquatic invertebrates. However, the Oconee River basin is rich in many other fauna that rely on the water resources of the basin, including many species of breeding birds and mammals. Although a description of these bird and mammal species is beyond the scope of this report, the water needs of these species, such as bald eagles, fish-eating mammals, and migratory water fowl, should be considered in water-resource planning and management.

Fish Fauna

The Oconee River basin is dominated by a warm-water fishery. Warm-water species of recreational importance include largemouth bass, white bass, the hybrid sunshine bass, crappie, pickerel, channel and white catfish, and several varieties of sunfish and suckers.

The diverse fish fauna of the Oconee River basin includes 74 species representing 13 families. Two species of fish occurring within the basin have been listed for protection by state agencies as endangered. The largest number of species is in the minnow family Cyprinidae. Minnows are small fish that can be seen darting around in streams that are only a few feet wide. Other families with large numbers of species are the sunfish and bass family, the catfish family, and the sucker family. Species that have the largest numbers of individuals living in streams typically are minnows and suckers. These species are often not well known because unlike sunfish, bass, and catfish, people do not fish for them, although certain minnows may be used as bait. Minnows have an important role in the aquatic food chain as prey for larger fish, snakes, turtles, and wading birds such as herons. Suckers can grow to more than 1 foot long and are named for their down-turned mouths, which they use to “vacuum” food from stream bottoms. Although suckers are not popular game fish, they are ecologically important because they often account for the largest fish biomass in streams.

Freshwater Fisheries. Several lakes within the Oconee River basin provide excellent habitat for various freshwater fisheries. The Wildlife Resources Division owns and manages Marben Farms Public Fishing Area, a series of ponds totaling 295 acres on tributaries of the Oconee River in Jasper and Newton Counties. These ponds offer excellent fishing for bluegill, channel catfish, and largemouth bass. The ponds lie within the Charlie Elliott Wildlife Center, a 6,400-acre multiuse facility that provides wildlife education through outreach programs and through on-site facilities. The property also includes Clybel Wildlife Management Area, which is managed for public hunting.

The two major reservoirs in the Oconee basin, Lake Oconee and Lake Sinclair, provide good fisheries for largemouth bass, white bass, hybrid bass, crappie, sunfish, and catfish.

Below Lake Sinclair, the Oconee River between Milledgeville and Dublin contains the only known viable population of robust redhorse suckers. A memorandum of understanding between Georgia Power and state and federal agencies was drafted in 1995 to facilitate recovery of the species through a "prelisting" recovery approach.

Amphibians and Reptiles

As a result of this drainage occurring in both the Piedmont and Coastal Plain physiographic provinces, a high diversity of amphibian and reptile species exists. Many of these species may occur in the northern portion (Piedmont) or the southern portion (Coastal Plain), but not both. Consult range maps in appropriate field guides for more precise distribution.

The Oconee River basin is inhabited by 37 documented species of amphibians (17 salamanders and 20 frogs) that require freshwater for all or part of their life cycle (Williamson and Moulis, 1994). Two additional salamanders, *Plethodon glutinosus* (slimy salamander) and *Desmognathus aeneus* (seepage salamander), that omit an aquatic life-stage are nevertheless associated with riparian zones of the Oconee River basin and others. Further, four undocumented amphibians, *Rana grylio* (pip frog), *Rana hecksheri* (river frog), *Hyla gratiosa* (barking treefrog), and *Necturus punctatus* (dwarf waterdog) are quite likely to inhabit this region due to their occurrence in other portions of the greater Altamaha River drainage, of which the Oconee River basin is a part (Williamson and Moulis, 1994). Of these 43 amphibian species, four (*Desmognathus aeneus* [seepage salamander], *Hemidactylium scutatum* [four-toed salamander], *Necturus punctatus* [dwarf waterdog], and *Pseudotriton montanus* [mud salamander]) are considered of "Special Concern" by the Georgia Natural Heritage Program. None of these amphibian species are state or federally listed/protected. Six other amphibians found in the Oconee River basin region, including three of global rarity (*Rana capito* [goper frog], *Ambystoma cingulatum* [flatwoods salamander], and *Notophthalmus perstriatus* [striped newt]), are not included in the above discussion since their breeding, larval, and adult habitats typically do not incorporate stream drainages. These six species breed in isolated, rain-filled wetlands and move into upland situations following transformation.

Eleven turtle species, seven snake species, and the American alligator comprise the documented reptiles strongly associated with freshwater habitats (Williamson and Moulis, 1994) of the Oconee River basin and others. Four other species, *Apalone ferox* (Florida softshell), *Deirochelys reticularia* (chicken turtle), *Farancia erytrogramma* (rainbow snake), and *Regina rigida* (glossy crayfish snake), quite likely inhabit this region due to their occurrence in other portions of the greater Altamaha River drainage. Of these 23 reptile species, four (*Clemmys guttata* [spotted turtle], *Kinosternon baurii* [striped mud turtle], *Farancia erytrogramma* [rainbow snake], and *Alligator mississippiensis* [American alligator]) are considered of "Special Concern" by the Georgia Natural Heritage Program. *Clemmys guttata* is protected as "Unusual" under the state Protected Species List. The eastern indigo snake (*Drymarchon couperi*), federally

listed as threatened, is seasonally associated with swamp edges and floodplains from late spring through early fall.

Aquatic and Wetland Vegetation

Although the Oconee River basin supports a diverse population of upland plants, wetland areas are limited and lakes and ponds occur only as a result of human activities. The Georgia Natural Heritage Program has identified six "Special Concern" wetland or aquatic plant species occurring in the Oconee River basin that are designated as unusual, rare, threatened, or endangered (Table 2-3).

2.2 Population and Land Use

2.2.1 Population

In 1995, the Oconee River basin had a population of slightly more than 400,000 residents, almost 6 percent of the total state population. The heaviest concentration of the population resides in the upper end of the basin in Clarke, Barrow, Jackson, and portions of Hall and Walton counties (approximately 50 percent of the total basin population). The number of basin residents is expected to grow to a population of about 500,000 by the year 2020; growing to more than 700,000 by the year 2050.

Population distribution in the basin at the time of the 1990 Census by Census blocks is shown in Figure 2-9. A summary of 1990 population estimates by HUC units based on census tract/block centroids (EPA Geographic Information Query System) for Georgia by HUC is shown in Table 2-4.

2.2.2 Employment

Employment in the basin is about 5.0 percent of Georgia's total employment, and job growth is expected to average about 0.8 percent per year over the decades between 1995 and the year 2050. Manufacturing jobs now constitute about a quarter of the basin's total jobs, down from 33 percent in 1975. Manufacturing jobs are not expected to account for nearly as high a percentage of total basin jobs in the decades to come (largely due to increases in productivity). Jobs in the service sector now account for about 16 percent of the total jobs in the basin, but this is expected to grow to near 30 percent of the total basin jobs in 2050. Government sector jobs (i.e., city, county, state, and federal) now stand at about 26 percent of the total basin jobs (about 42,000 jobs), and this percentage is expected to grow to around 31 percent of the total by 2050.

2.2.3 Land Cover and Use

Land use/land cover classification was determined for the Oconee River basin based on high-altitude aerial photography for 1972-1976 (U.S. Geological Survey, 1972-1978). In 1991 land cover data were developed based on interpretation of Landsat TM satellite image data obtained during 1988-1990, 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.

Table 2-3. Federal and State Protected Aquatic and Wetland Species in the Oconee River Basin

Common Name	Species	Federal Status	State Status	Ranking	Occurrence by HUC 03150101	Occurrence by HUC 03150102
Vertebrate Animals						
Altamaha Shiner	*Cyprinella xaenura*		E	Imperiled or critically imperiled in state; rare and local throughout range	✔	
Bald Eagle	*Haliaeetus leucocephalus*	De-listed	E	Imperiled in state because of rarity; apparently secure globally	✔	
Robust Redhorse Sucker	*Moxostoma robustum*		E	Imperiled or critically imperiled in state because of rarity	✔	✔
Plants						
Pool Sprite, Snorkelwort	*Amphianthus pusillus*	LT	T	Imperiled globally and in state because of rarity	✔	✔
Black-Spored Quillwort	*Isoetes melanospora*	LE	E	Critically imperiled globally and in state due to extreme rarity	✔	
Mat-Forming Quillwort	*Isoetes tegetiformans*	LE	E	Critically imperiled globally and in state due to extreme rarity	✔	✔
Oglethorpe Oak	*Quercus oglethorpensis*		T	Imperiled in state due to rarity; rare or imperiled globally	✔	
Hooded Pitcherplant	*Sarracenia minor*		U	Apparently secure globally and in state		✔
Silky Camellia	*Stewartia malacodendron*		R	Imperiled in state due to rarity; apparently secure globally		✔

E: Endangered T: Threatened R: Rare L: Listed P: Proposed U: Unusual

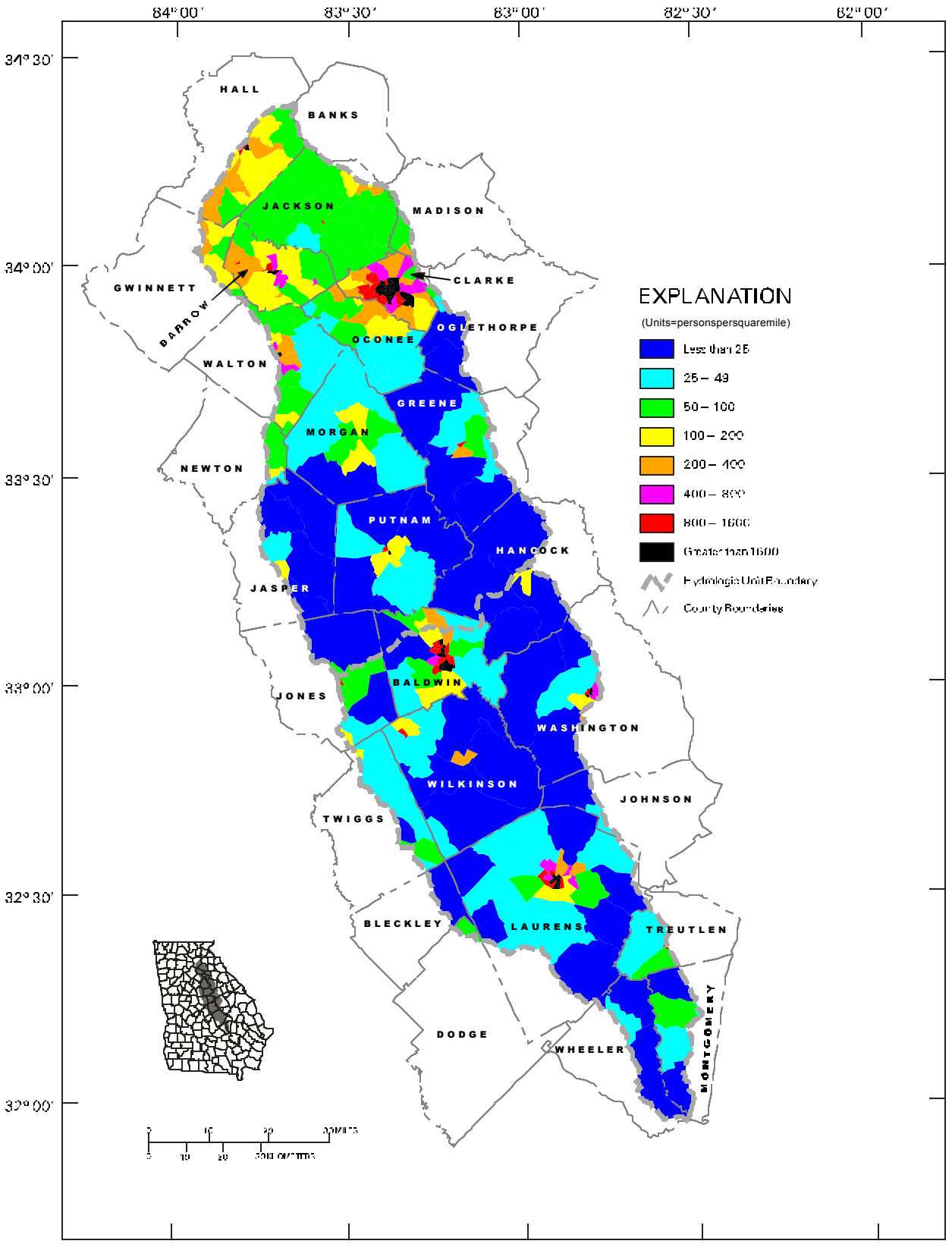

Figure 2-9. Population Density in the Oconee River Basin

Table 2-4. Population Estimates for the Oconee River Basin by HUC (I990)

HUC	Population	Housing Units
03070101	265,369	106,647
03070102	118,891	45,158
Total	*384,260*	*151,805*

The 1972-1976 land cover classification (Figures 2-10 and 2-11) indicated that 69.6 percent of the basin land area was forest, 24.4 percent was agriculture, and 2.2 percent was urban land use, with 3.8 percent in other land uses, including 2.7 percent wetlands.

The 1988-1990 land cover interpretation showed 66.1 percent of the basin in forest cover, 7.8 percent in wetlands, 1.8 percent in urban land cover, and 19.6 percent in agriculture (Figures 2-12 through 2-13). Statistics for 15 land cover classes in the Oconee basin for the 1988-1990 coverage are presented in Table 2-5 (EPD, 1996).

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, and other products. Statewide, the forest industry output for 1997 was approximately $19.5 billion. 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. Georgians benefit directly from 177,000 job opportunities created by the manufacture of paper, lumber, furniture, and various other wood products; consumers of these products also benefit. Other benefits of the forest include hunting, fishing, aesthetics, wildlife watching, hiking, camping, and other recreational opportunities, as well as important environmental benefits such as clean air and water and wildlife habitat.

According to the 1989 U.S. Forest Service's Forest Statistics for Georgia (Thompson, 1989), there are approximately 2,336,500 acres of commercial forest land in the basin, representing about 69 percent of the total land area (Table 2-6). Private landowners account for 77 percent of the commercial forest ownership, while the forest industry companies account for 18 percent. Governmental entities account for about 5 percent of the forest land (Figure 2-14).

The pine type is composed of 406,400 acres of plantations and 673,400 acres of natural stands.

For the period from 1982 through 1989, there was a statewide trend of loss of forest acreage resulting from both conversion to urban and related uses and clearing for agricultural uses. For the entire counties within the basin, there was little change since the area classified as commercial forest land decreased only 1,053 acres from 3,749,556 acres to 3,748,503 acres. The area classified as pine type decreased 88,337 acres (5 percent) from 1,952,028 acres to 1,863,691 acres. The area classified as oak-pine type increased 25,055 acres (5 percent) from 492,730 acres to 517,785 acres. Upland hardwood acreage increased 51,367 acres (5 percent) from 914,152 acres to 965,519 acres. Lowland hardwood acres increased 10,862 acres (3 percent) from 390,646 acres to 401,508 acres.

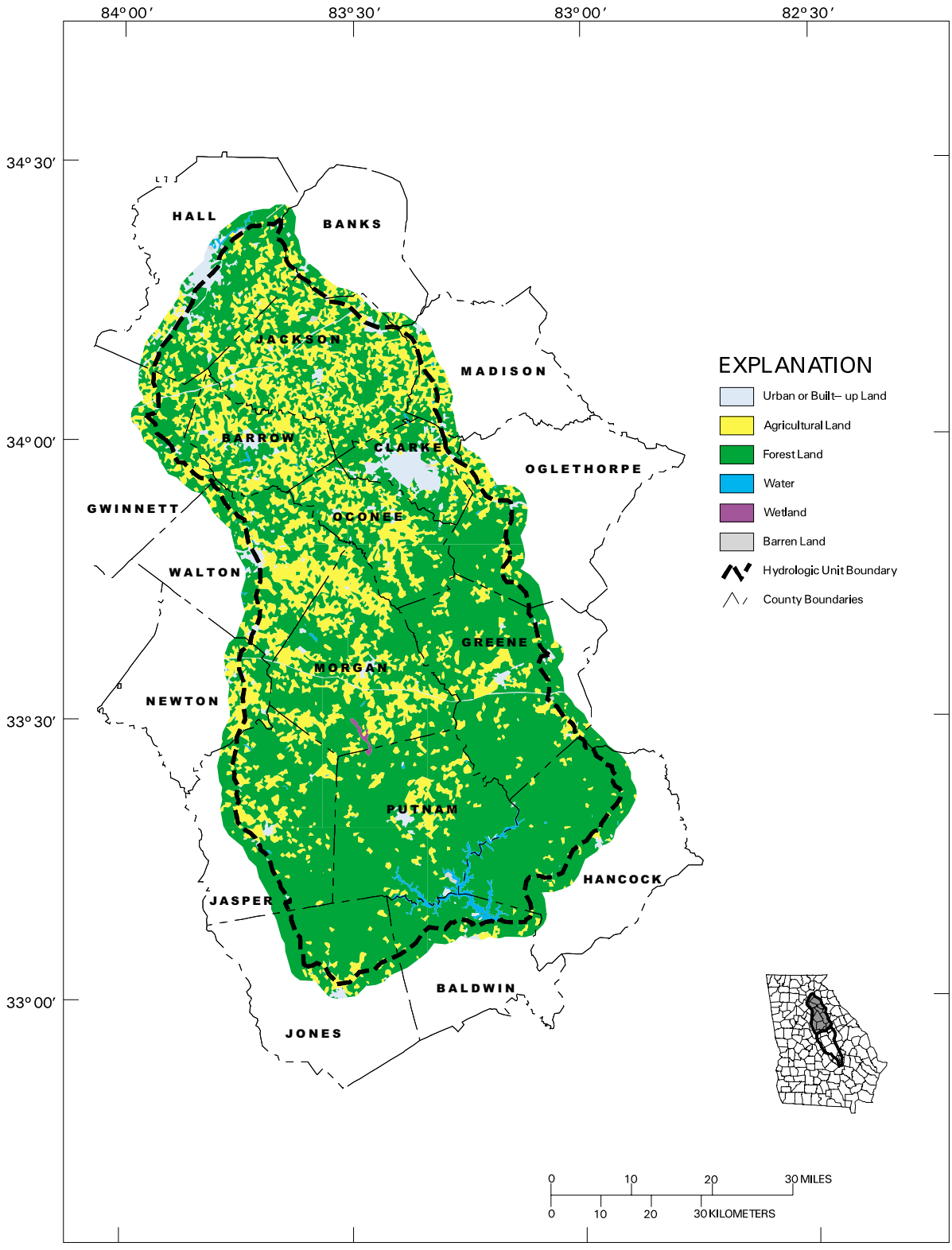

Figure 2-10. Land Use, Upper Oconee River Basin, HUC 03070101, USGS 1972-76 Classification Updated with 1990 Urban Areas

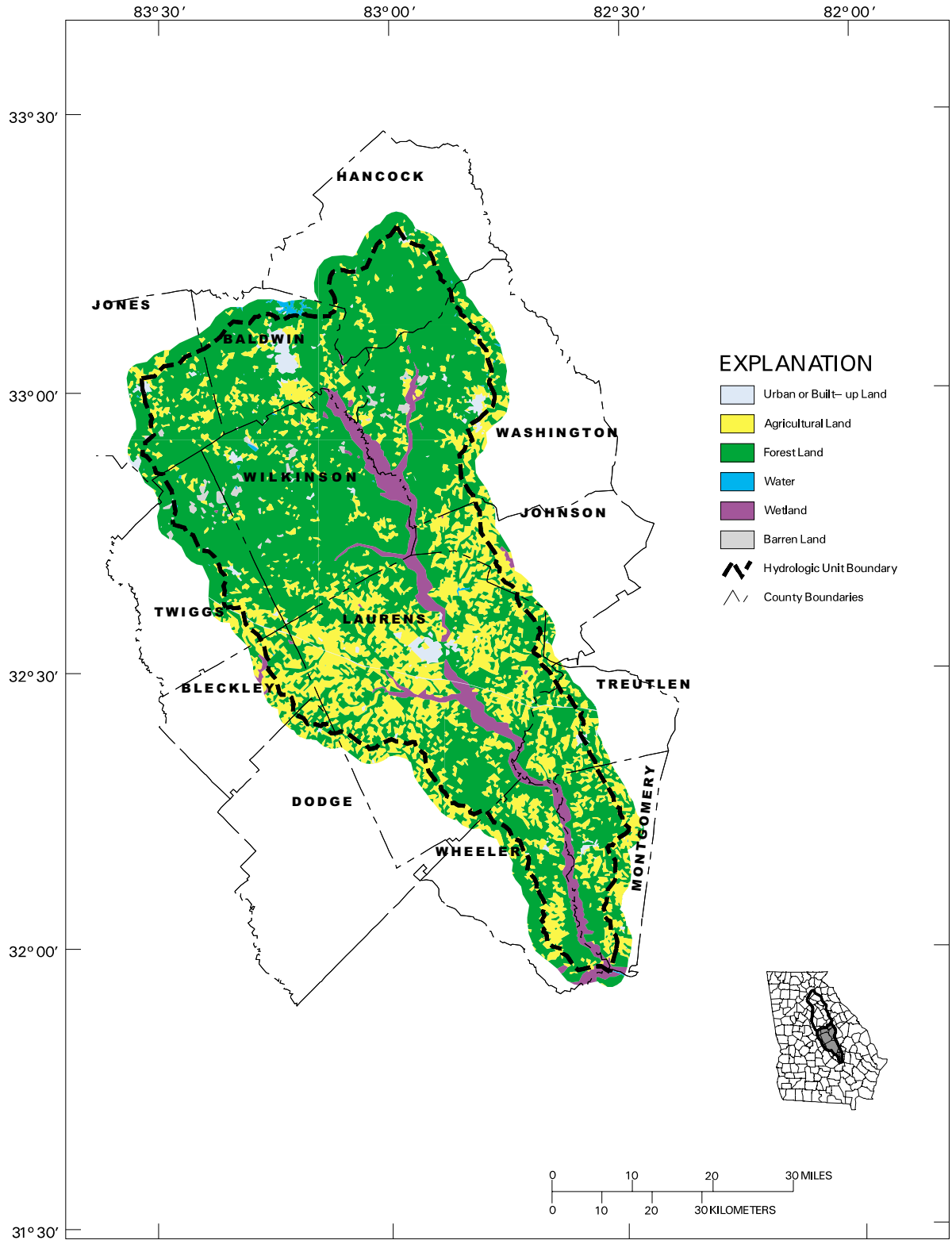

Figure 2-11. Land Use, Lower Oconee River Basin, HUC 03070102, USGS 1972-76 Classification Updated with 1990 Urban Areas

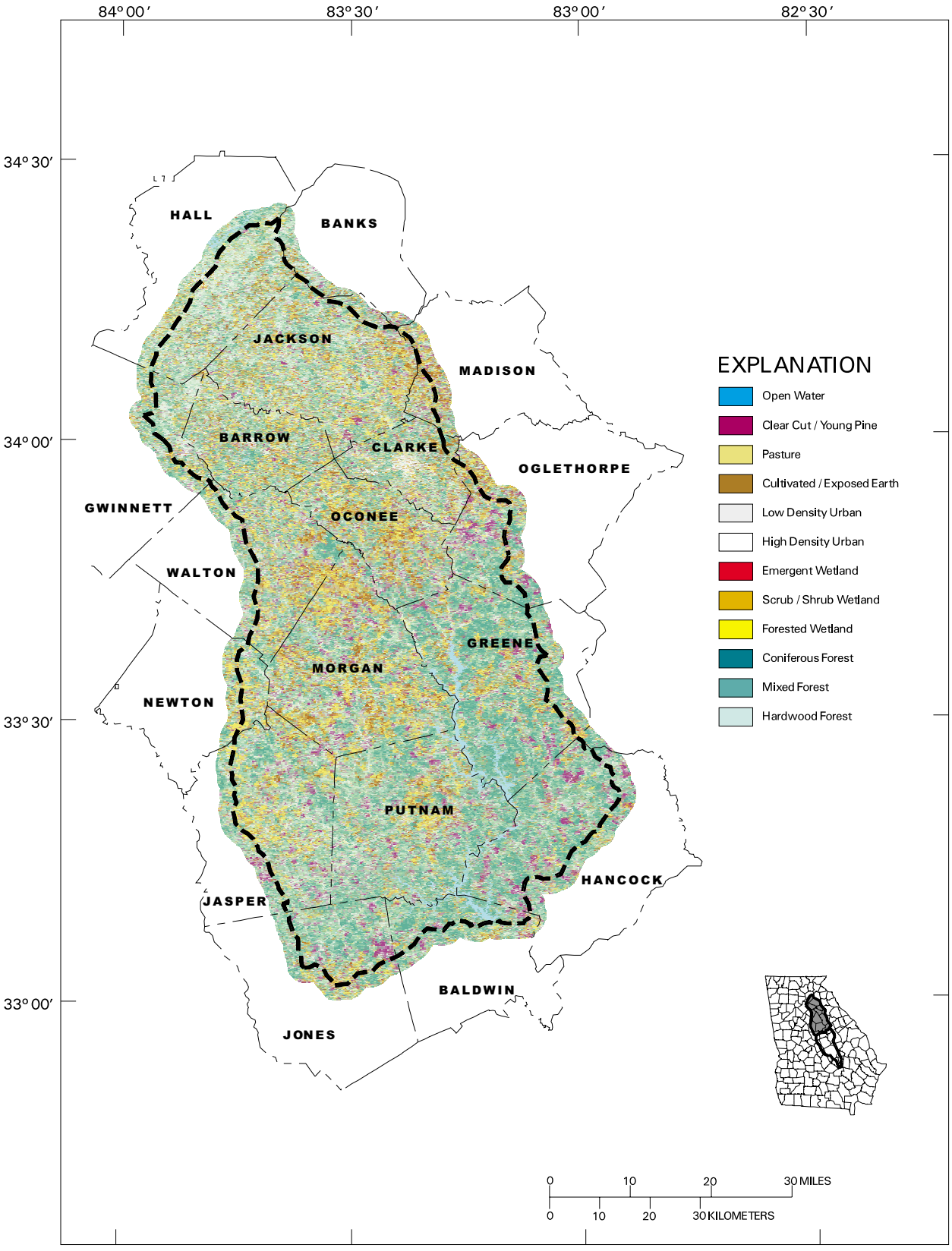

Figure 2-12. Land Cover 1990, Upper Oconee River Basin, HUC 03070101

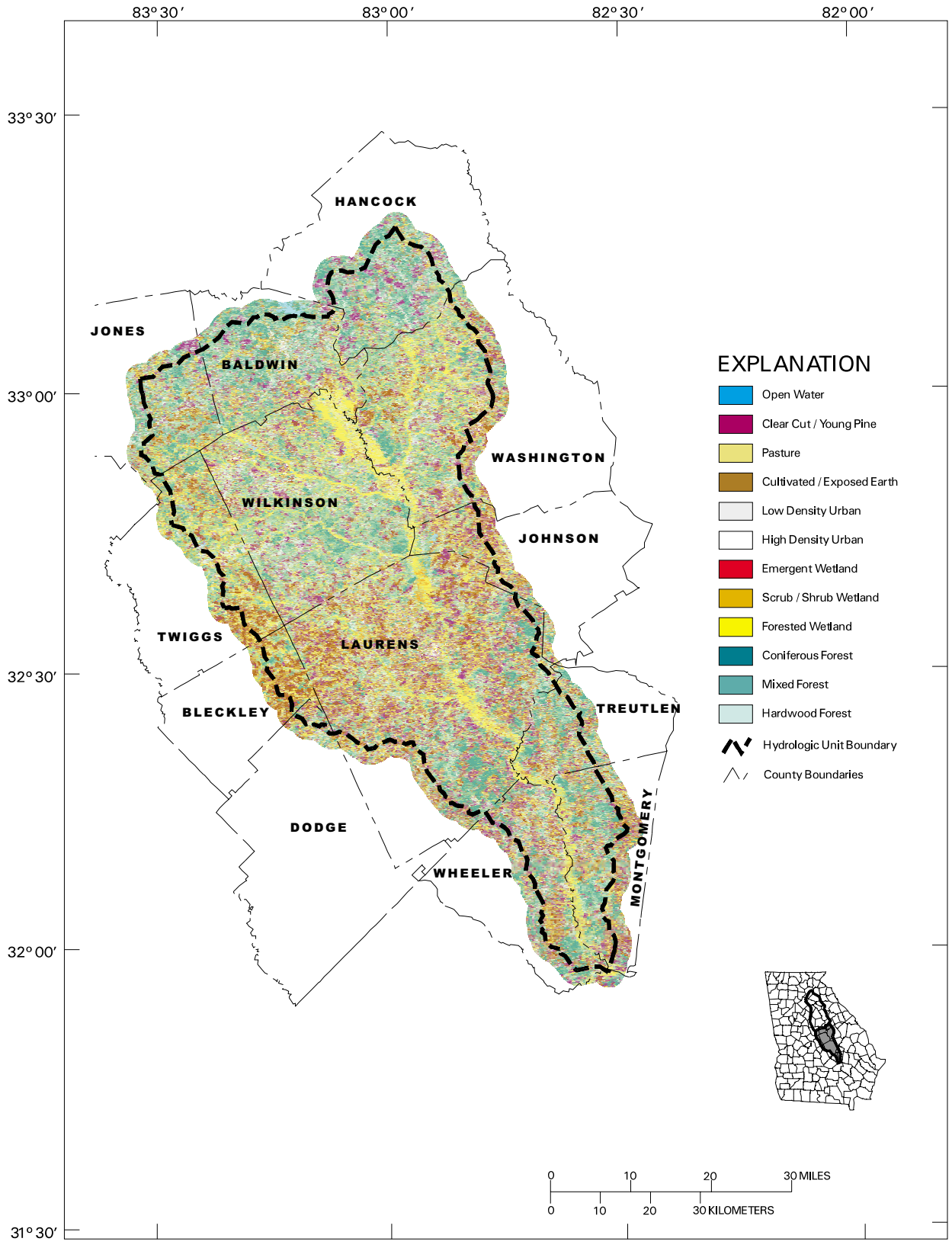

Figure 2-13. Land Cover 1990, Lower Oconee River Basin, HUC 03070102

Table 2-5. Land Cover Statistics for the Oconee River Basin, 1988-1990

Class Name	%	Acres
Open Water	1.5	52,223.4
Clear Cut/Young Pine	9.8	335,733.2
Pasture	11.5	392,142.1
Cultivated/Exposed Earth	8.1	275,807.4
Low Density Urban	1.5	51,467.6
High Density Urban	0.3	11,163.5
Emergent Wetland	0.1	2,895.3
Scrub/Shrub Wetland	1.1	36,132.4
Forested Wetland	6.6	226,097.3
Coniferous Forest	17.2	586,396.3
Mixed Forest	23.5	801,581.8
Hardwood Forest	18.8	640,538.0
Salt Marsh	0.0	0.0
Brackish Marsh	0.0	0.0
Tidal Flats/Beaches	0.0	0.0
Total	*100.0*	*3,412,179.0*

Table 2-6. Forestry Acreage in the Oconee River Basin

County	All Land (acres)	Non-Forest	Commercial Forest	Pine	Oak-pine	Upland Hardwood	Lowland Hardwood
Baldwin	164,800	45,900	118,800	84,600	11,200	12,000	11,100
Barrow	104,100	55,300	48,800	23,600	5,900	16,300	3,000
Bleckley	19,500	7,100	12,500	4,100	3,700	0	4,700
Clarke	78,000	42,300	35,700	14,700	11,000	10,100	0
Dodge	7,700	2,800	4,900	4,900	0	0	0
Greene	199,700	39,400	160,400	115,900	10,500	34,000	0
Gwinnett	44,500	34,000	10,500	3,500	100	7,000	0
Hall	106,100	26,600	79,500	17,000	9,200	53,400	0
Hancock	212,900	22,800	190,100	129,800	27,900	25,200	7,200
Jackson	211,100	89,300	121,900	28,800	43,100	45,900	4,100
Jasper	125,600	31,800	93,800	41,900	23,900	27,900	0
Johnson	21,600	11,100	10,500	5,300	0	2,600	2,600
Jones	120,900	24,000	96,900	59,300	15,800	11,400	10,400
Laurens	435,000	169,500	265,500	99,600	26,300	78,800	60,700
Madison	19,000	7,400	11,600	3,900	3,900	0	3,900
Montgomery	81,700	24,900	56,800	22,500	2,700	19,700	12,000
Morgan	223,300	83,500	139,800	67,400	32,400	34,900	5,200
Newton	29,000	18,300	10,700	10,700	0	0	0
Oconee	119,300	52,700	66,600	28,300	8,400	25,500	4,400
Oglethorpe	63,200	7,500	55,700	18,200	3,400	15,400	18,600
Putnam	219,900	56,900	163,000	79,000	38,200	45,700	0
Treutlen	52,200	20,200	32,100	18,700	2,700	5,400	5,200
Twiggs	73,200	18,700	54,500	29,200	4,000	21,300	0
Walton	105,300	50,300	55,000	9,900	6,600	35,100	3,300
Washington	160,100	26,900	133,200	46,300	23,100	52,400	11,500
Wheeler	90,000	31,500	58,500	27,400	10,800	5,800	14,300
Wilkinson	288,900	39,500	249,400	88,300	32,300	74,100	54,900
Total	*3,376,700*	*1,040,200*	*2,336,500*	*1,079,800*	*356,800*	*663,000*	*236,900*

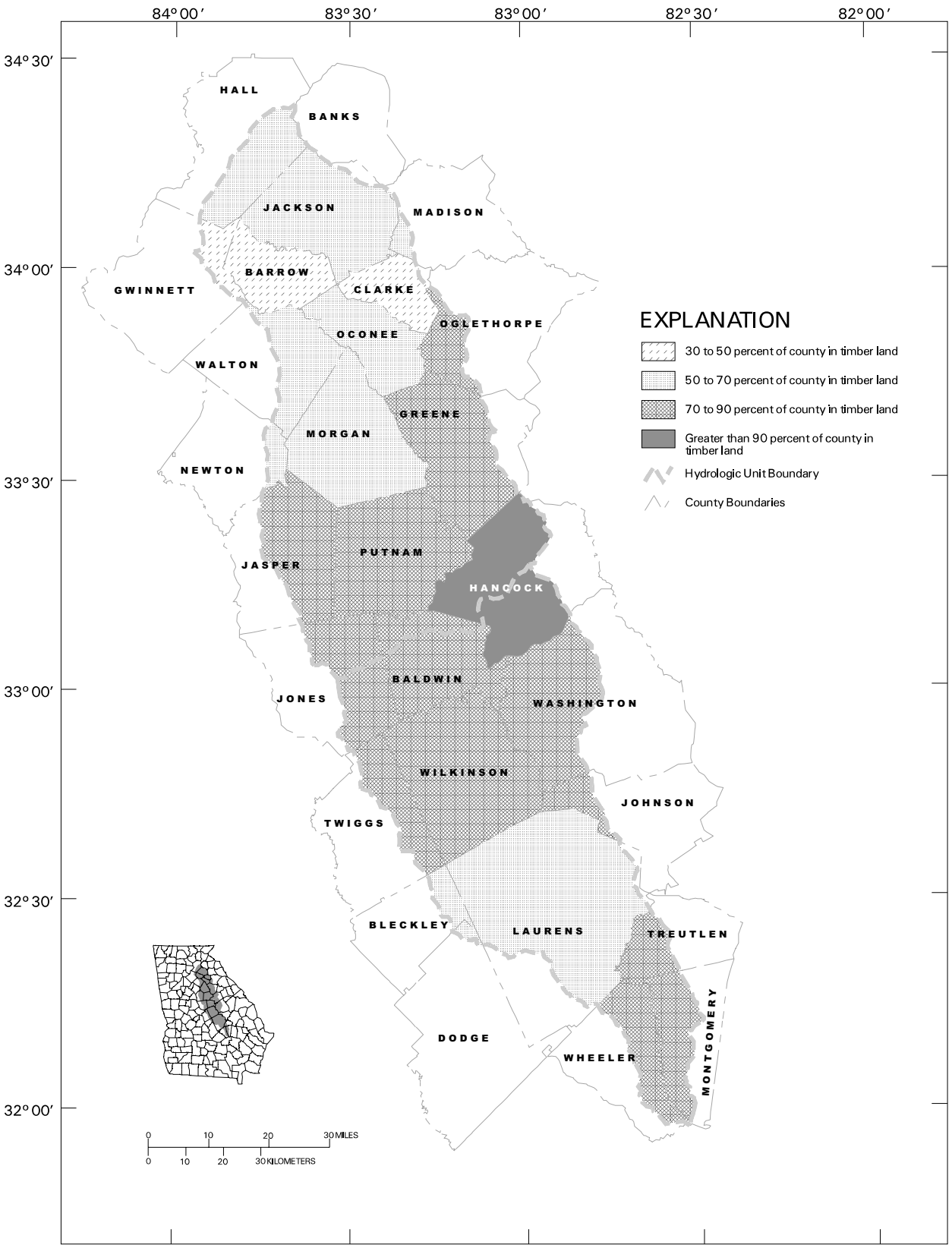

Figure 2-I4. Silvicultural Land in the Oconee River Basin

Agriculture

Agriculture in the Oconee River basin is a varied mixture of animal operations and commodity production. Total farmland in the basin (Figure 2-15) has decreased every agricultural census year from 1974 to 1987 (U.S. Bureau of the Census, 1981a,b,c). By 1992, the total amount of land in farms in the basin had fallen to 717,000 acres. Much of the land in farms in the Upper Oconee basin is in pasture (350,000 acres) contrasted by extensive cropland in the Lower Oconee basin (175,000). More than 240,000 acres of cropland is harvested each year in the basin. The principal crops include corn, cotton, peanuts, and small grain (oats, rye, sorghum, soybeans, and wheat). Regionally famous Vidalia onions are also grown in portions of Laurens, Montgomery, Truetlen, and Wheeler Counties. The ranking of harvested acres among crops varies from year to year in response to market conditions, government subsidy programs, and the weather.

Livestock and poultry production in the Oconee River basin is relatively intense, particularly in the Upper Oconee River basin. Approximately 200,000 head of cattle, 72,000 head of swine, and 163,000,000 broilers and layers are currently being raised on farms in the basin (Table 2-7). Morgan and Jackson Counties rank first and second, respectively, among Georgia counties in cattle production, with 38,000 head in Morgan County and 28,000 head in Jackson County. Two other counties, Hall and Madison, also rank among the top 10 cattle producing counties in the state. The heart of Georgia's dairy industry is located in the Upper Oconee basin as well, primarily in Putnam, Morgan, and Greene Counties. Clarke, Oconee, and Oglethorpe Counties contain the heaviest concentration of hog production in the basin, with Oglethorpe ranking among the state's top 15 producing counties. Finally, Madison, Hall, and Jackson Counties host the largest concentrations of poultry operations in the basin, with each county ranking among the top 10 producing counties in the state.

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 (Figure 2-15) 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, and local governments.

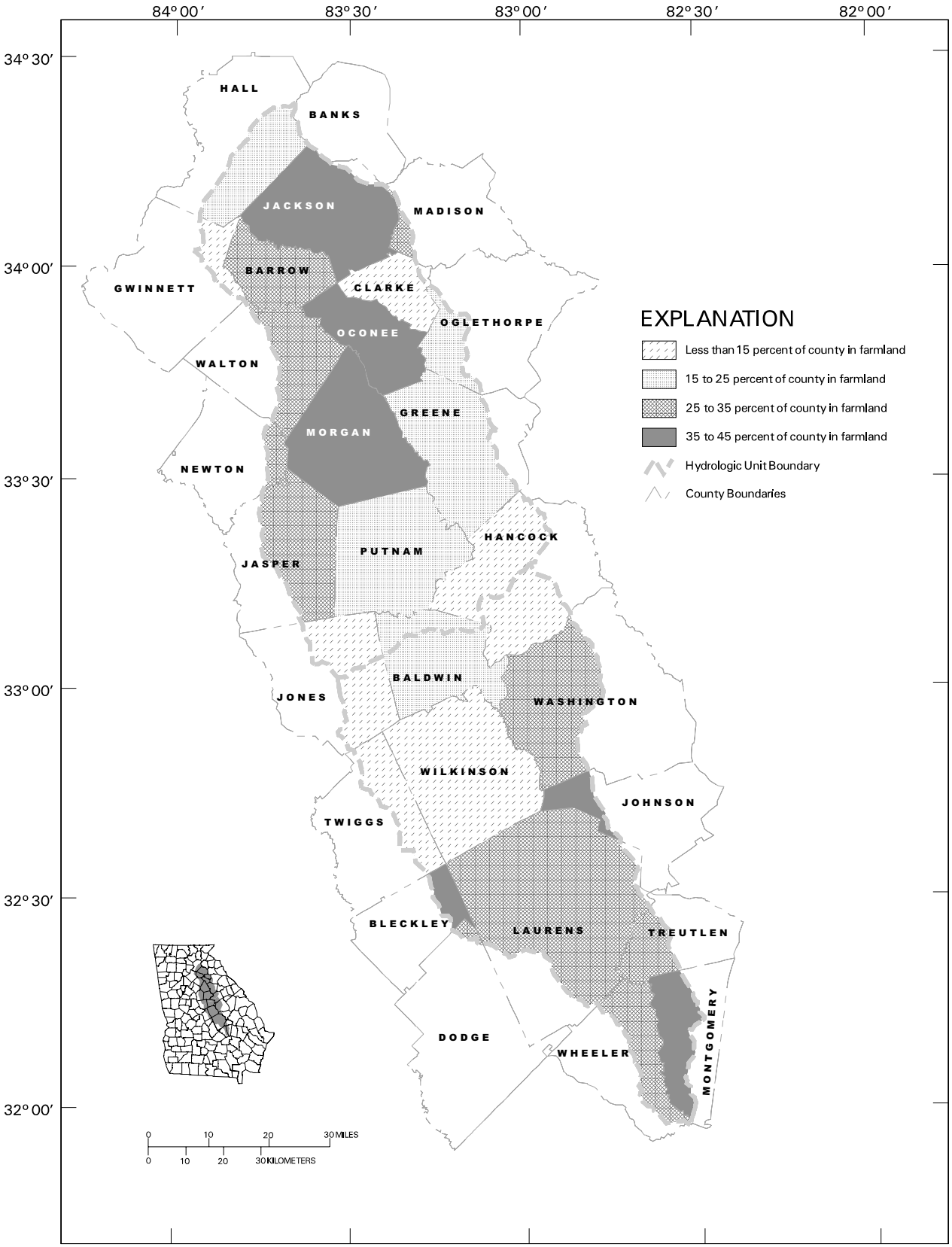

Figure 2-15. Agricultural Land in the Oconee River Basin

Table 2-7. Agricultural Operations in the Oconee River Basin, 1987-1991 (data supplied by NRCS)

Element	HUC 03070101	HUC 03070102	Total for Basin
Dairy Cows	20,810	1,130	21,940
Beef Cows	116,690	25,960	142,650
Hogs	45,450	15,340	60,790
Layer Hens (thousands)	2,816	17	2,833
Broilers (thousands)	134,040	1,922	135,962
Harvested Cropland (acres)	68,140	55,600	123,740
Total Agriculture (acres)	397,070	226,980	624,050

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 Oconee basin includes part or all of 27 Georgia counties (Table 2-8 and Figure 2-2); however, only 6 counties are entirely within the basin, and 7 counties have a small fraction (< 20 percent) of their land area within the basin. Thus there are a total of 20 counties with significant jurisdictional authority in the basin. Municipalities or cities are communities officially incorporated by the General Assembly. Georgia has more than 530 municipalities. Table 2-9 lists the municipalities in the basin.

Table 2-8. Georgia Counties in the Oconee River Basin

Counties Entirely Within the Oconee Basin	Counties Partially Within the Oconee Basin	Counties with Less Than 20% Area Within the Basin
Barrow, Baldwin, Morgan, Putnam, Oconee, Wilkins	Clarke, Greene, Hall, Hancock, Jackson, Jasper, Jones, Laurens, Montgomery, Treutlen, Twiggs, Walton, Washington, Wheeler	Bleckley, Dodge, Gwinnett, Johnson, Newton, Madison, Oglethorpe

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 2-10 summarizes the RDCs and the associated counties within the Oconee basin.

Table 2-9. Georgia Municipalities in the Oconee River Basin

HUC 03070101 (Oconee River above Lake Sinclair Dam)				
Apalachee	Carl	Good Hope	Maxwell	Shady Dale
Arcade	Cawthon	Gratis	Maysville	Siloam
Arkenton	Center	Greensboro	Monroe	Statham
Arnoldsville	Chestnut Mountain	High Shoals	Monticello	Stephens
Athens	Chicopee	Hillsboro	Neese	Swords
Auburn	Commerce	Hoschton	Newborn	Veazey
Bairdstown	Crawford	Hutchings	Nicholson	Watkinsville
Bishop	Devereux	Jefferson	Oconee Heights	Whitehall
Blackshear Place	Eastville	Kelly	Pendergrass	White Plains
Bogart	Eatonton	Lula	Penfield	Winder
Bostwick	Farmington	Machen	Round Oak	Winterville
Braselton	Farrar	Madison	Russell	Woodville
Buckhead	Gillsville	Mansfield	Rutledge	
Campton	Godfrey	Maxeys	Sanford	
HUC 03070102 (Oconee River below Lake Sinclair Dam)				
Ailey	Dudley	Ivey	Minter	Sparta
Allentown	East Dublin	James	Montrose	Stevens Pottery
Brewton	Glenwood	Jeffersonville	Mt. Vernon	Tennille
Coopers	Gordon	Linton	Ochwalkee	Toomsboro
Danville	Gray	Lothair	Oconee	Wriley
Deepstep	Griswold	Lovett	Rentz	
Dexter	Haddock	McIntyre	Rockledge	
Dublin	Hardwick	Milledgeville	Sandersville	

Table 2-I0. Regional Development Centers in the Oconee River Basin

Regional Development Center	Member Counties with Land Area in the Oconee Basin
Atlanta Regional Commission	Gwinnett
Central Savannah River Area	Hancock, Johnson, Washington
Georgia Mountains	Hall
Heart of Georgia	Bleckley, Dodge, Laurens, Montgomery, Treutlen, Wheeler
Middle Georgia	Baldwin, Jasper, Jones, Putnam, Twiggs, Wilkinson
Northeast Georgia	Barrow, Clarke, Greene, Jackson, Madison, Morgan, Newton, Oconee, Oglethorpe, Walton

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.

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 that established a framework to be used by the Water Quality Control Board and later the EPD in making water use regulatory decisions.

In 1972 the EPD applied the water use classification system to interstate waters. Georgia was again one of the first states to receive federal approval of a statewide system of water use classifications and standards. Table 2-11 provides a summary of water use classifications and criteria for each use.

Congress made changes in the Clean Water Act 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-II. 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 had originally been 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 those for fishing with the exception of dissolved oxygen, which has site-specific standards.*

Upgrades For Georgia's Stream Classifications

In the late 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 reclassified 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 fishing, recreation, drinking water, wild river, scenic river, or coastal fishing.

2.4.2 Water Use Classifications for the Oconee River Basin

Waters in the Oconee River basin are classified as fishing, recreation, or drinking water. Most of the waters are classified as fishing. Those waters explicitly classified in Georgia regulations are shown in Table 2-12; all waters not explicitly classified are classified as fishing.

Table 2-I2. Oconee River Basin Waters Classified in Georgia Regulations[1]

Waterbody	Description of Segment	Use Classification
Middle Oconee River	Georgia Hwy 82 to Athens Water Intake	Drinking Water
North Oconee River	Jackson County Road 432 to Athens Water Intake	Drinking Water
Oconee River	Georgia Hwy 16 to Sinclair Dam	Recreation
Oconee River	Sinclair Dam to Georgia Hwy 22	Drinking Water
Oconee River	Georgia Hwy 57 to U.S. Hwy 80	Drinking Water

[1] *Rules and Regulations for Water Quality Control, Chapter 391-3-6 (13). Waters within the Oconee 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) in the Oconee, whereas water quality in the basin is discussed in Section 4. Water use in the Oconee River basin is measured by estimates of freshwater withdrawn from ground and surface water sources. Water availability is assessed based on annual surface water flows and ground water storage. Saline water is not used in the basin. Uses of water include both consumptive uses (in which the water is no longer available to the basin) and nonconsumptive uses (in which the water is returned to the basin after use).

Surface water is the primary water source in the Piedmont province of the Oconee 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. 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.

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 Oconee River Basin

The Oconee River and its tributaries serve most of the city municipalities in the Oconee River basin, such as Athens, Winder, Jefferson, Greensboro, Madison, Monticello, Eatonton, Sparta, Milledgeville, and Dublin. Most surface water intakes in the Oconee basin are located above the Fall Line, with the exceptions of Milledgeville and Dublin. Most private communities and rural cities located below the Fall Line use

ground water pumped from wells as a source of drinking water. Also a cluster pattern of smaller subdivisions located near Athens, Dublin, Lake Oconee, and Lake Sinclair use ground water since they are located too far from a public water system that sells surface water.

The Oconee River basin provides drinking water for about 281,614 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 systems 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 6 months per year. Examples of non-community non-transient systems are schools, office buildings, and factories that are served by a well or privately owned surface water plant.

A non-community transient public water system does not meet the definition of a non-community non-transient. A non-community transient public water system provides piped water for human consumption to at least 15 service connections or regularly serves at least 25 persons at least 60 days a year. Examples of a non-community transient systems 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 ensuring water quality.

In the Oconee River Basin there are approximately 20 community public water systems utilizing surface water and serving 201,279 people and 178 community public water systems utilizing ground water and serving approximately 59,154 people (Table 3-1). The locations of surface water intakes within each of the Hydrologic Units of the Oconee River basin are shown in Figures 3-1 and 3-2.

3.I.2 Drinking Water Demands

Drinking water demands for surface and ground water located in the basin are expected to increase due to the growth in the Athens, Lake Oconee, and Lake Sinclair area. A regional drinking water reservoir on Bear Creek for Clarke, Oconee, Jackson, and Barrow Counties is being built and expected to be finished in the year 2000.

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

Public Water System Name	Water System ID	County	Source Name
Systems Directly Supplied by Surface Water (arranged by HUC)			
Oconee River Above Lake Sinclair Dam HUC 03070101			
City of Jefferson	1570003	Jackson	Curry Creek
City of Winder	0130002	Barrow	1. Cedar Creek 2. Fort Yargo Lake 3. Mulberry River
City of Athens - Clarke County	0590000	Clarke	1. Sandy Creek (Inactive) 2. North Oconee River 3. Middle Oconee River
City of Statham	0130001	Barrow	Barber Creek Reservoir
City of Madison	2110002	Morgan	1. Hard Labor Creek 2. Speeds Branch 3. Lake Oconee
City of Greensboro	1330000	Greene	Lake Oconee
City of Monticello	1590000	Jasper	1. Lowery Branch 2. Pope's Branch
Eatonton	2370000	Putnam	Little River
Oconee River Below Lake Sinclair Dam HUC 03070102			
City of Milledgeville	0090001	Baldwin	1. Oconee River 2. Oconee River (Central State Hospital)
City of Dublin	1750002	Laurens	Oconee River
City of Sparta	1410001	Hancock	1. Lake Sinclair 2. Fort Creek
Systems Supplied by Other Sources (arranged by county)			
Meriwether-Golden Pond S/D	0090042	Baldwin	Groundwater
Mallard Glen Subdivision	0090045	Baldwin	Groundwater
Lands End Subdivision	0090046	Baldwin	Groundwater
Baldwin County	0090000	Baldwin	Purchased Surface Water
Green Tree Acres Subdivision	0130007	Barrow	Groundwater
Great SE-Bent Creek S/D	0130008	Barrow	Groundwater
Auburn Mobile Home Park	0130011	Barrow	Groundwater
Oak Hills Water System	0130032	Barrow	Groundwater
River Bluff Subdivision	0130033	Barrow	Groundwater
Auburn	0130000	Barrow	Purchased Surface Water
Barrow County Water System	0130031	Barrow	Purchased Surface Water
Country Corners Mobile Home Pk	0590003	Clarke	Groundwater
Hallmark Mobile Home Estates	0590004	Clarke	Groundwater
Great SE-Sandy Springs S/D	0590007	Clarke	Groundwater
Pinewoods Mobile Home Comm.	0590009	Clarke	Groundwater
Cherokee Mobile Home Park	0590013	Clarke	Groundwater
Seminole Mobile Home Park	0590014	Clarke	Groundwater
Whispering Pines Subdivision	0590017	Clarke	Groundwater
Great SE-Norwood Village S/D	0590018	Clarke	Groundwater

Public Water System Name	Water System ID	County	Source Name
Ramble Hills Subdivision	0590020	Clarke	Groundwater
Beacon Point Mobile Home Park	0590023	Clarke	Groundwater
Glenn Forest Mobile Homes	0590024	Clarke	Groundwater
Beaver Dam Estates M. H. P.	0590054	Clarke	Groundwater
Great SE-Mineral Springs S/D	0590055	Clarke	Groundwater
Fairfax Hall	0590063	Clarke	Groundwater
Great SE-Fowler's Mill S/D	0590070	Clarke	Groundwater
Crestmont Farms Sd	0590071	Clarke	Groundwater
Siloam	1330001	Greene	Groundwater
Rocky Creek Subdivision	1330007	Greene	Groundwater
Park Mill Crossing Subdivision	1330008	Greene	Groundwater
Whispering Pines Subdivision	1330011	Greene	Groundwater
Deerfield-Sandy Creek S/D	1330012	Greene	Groundwater
Beaverdam-West Place S/D	1330013	Greene	Groundwater
Oconee Heights Subdivision	1330014	Greene	Groundwater
Richland Subdivision	1330015	Greene	Groundwater
Indian Hill Estates S/D	1330016	Greene	Groundwater
Port Armour Development	1330041	Greene	Groundwater
Reynolds Plantation	1330046	Greene	Groundwater
Great SE-Cherokee Point	1330048	Greene	Groundwater
Great SE-Hidden Point	1330049	Greene	Groundwater
Carey Station Water Works	1330050	Greene	Groundwater
Salem Plantation Subdivision	1330051	Greene	Groundwater
Harbor Club on Lake Oconee	1330052	Greene	Groundwater
Parks Mill Subdivision	1330054	Greene	Groundwater
Double Branches Subdivision	1330055	Greene	Groundwater
Armour Point	1330056	Greene	Groundwater
The Vintage Club Subdivision	1330057	Greene	Groundwater
Granite Cove Subdivision	1330058	Greene	Groundwater
Twin Rivers-Twin Rivers Farms	1330059	Greene	Groundwater
Northwoods S/D	1330067	Greene	Groundwater
Lula (one well)	1390002	Hall	Groundwater
Shady Grove Trailer Park	1390015	Hall	Groundwater
Trailwood Acres Mobile Home Pk	1390032	Hall	Groundwater
Woodland Valley Subdivision	1410004	Hancock	Groundwater
Island Creek Subdivision	1410006	Hancock	Groundwater
Scenic Shores Subdivision	1410007	Hancock	Groundwater
Holiday Shores Subdivision	1410016	Hancock	Groundwater
Hancock Co-GA15E/Devereau	1410019	Hancock	Purchased Surface Water
Braselton	1570000	Jackson	Groundwater
Hoschton	1570002	Jackson	Groundwater
Nicholson Water Association	1570004	Jackson	Groundwater
Pleasant Acres Subdivision	1570009	Jackson	Groundwater

Public Water System Name	Water System ID	County	Source Name
Charclar Subdivision	1570010	Jackson	Groundwater
Crooked Creek Subdivision	1570011	Jackson	Groundwater
Arcade Mobile Home Park	1570014	Jackson	Groundwater
Forest Lakes Subdivision	1570019	Jackson	Groundwater
Pleasant Hill Mobile Home Park	1570030	Jackson	Groundwater
Atl Union Mission-Potter's H	1570058	Jackson	Groundwater
Colony Mobile Home Park	1570064	Jackson	Groundwater
Countryside Mobile Home Park	1570088	Jackson	Groundwater
Suni-Pines Mobile Home Park	1570109	Jackson	Groundwater
Ponderosa Mobile Home Park	1570119	Jackson	Groundwater
Trotter's Ridge Subdivision	1570120	Jackson	Groundwater
Jackson County Water Authority	1570116	Jackson	Purchased Surface Water
Western Jackson Co Water Sys	1570117	Jackson	Purchased Surface Water
Shady Dale	1590001	Jasper	Groundwater
Gray	1690000	Jones	Groundwater
Haddock Water Commission, Inc.	1690001	Jones	Groundwater
Kitchen's Trailer Park	1690024	Jones	Groundwater
Cadwell	1750000	Laurens	Groundwater
Dexter	1750001	Laurens	Groundwater
Dudley	1750003	Laurens	Groundwater
East Dublin	1750004	Laurens	Groundwater
Montrose	1750005	Laurens	Groundwater
Rentz	1750006	Laurens	Groundwater
Meadowdale Mobile Home Park	1750018	Laurens	Groundwater
Tarpley's Mobile Home Park	1750020	Laurens	Groundwater
Woodland Trails Mobile Estates	1750025	Laurens	Groundwater
Pinedale Estates Subdivision	1750026	Laurens	Groundwater
Laurens Water Co-Holly Hills	1750030	Laurens	Groundwater
Shady Pines Mobile Home Park	1750033	Laurens	Groundwater
Thundering Springs Assoc., Inc.	1750043	Laurens	Groundwater
Chimney Hill Subdivision	1750104	Laurens	Groundwater
Hitchiti Mobile Home Park	1750110	Laurens	Groundwater
Pecan Mobile Home Park	1750121	Laurens	Groundwater
Ailey	2090000	Montgomery	Groundwater
Charlotte Water Association	2090002	Montgomery	Groundwater
Mount Vernon	2090003	Montgomery	Groundwater
Tarrytown	2090004	Montgomery	Groundwater
Three Rivers Estates	2090018	Montgomery	Groundwater
Bostwick	2110000	Morgan	Groundwater
Buckhead	2110001	Morgan	Groundwater
Rutledge	2110003	Morgan	Groundwater
Source of Light Mission	2110005	Morgan	Groundwater
Bell View Shores Subdivision	2110008	Morgan	Groundwater

Public Water System Name	Water System ID	County	Source Name
Sugar Bend-Lake Oconee S/D	2110009	Morgan	Groundwater
Blue Spring S/D Units 1-2	2110010	Morgan	Groundwater
Appalachee Woods Subdivision 1	2110011	Morgan	Groundwater
Morgan Estates Subdivision	2110049	Morgan	Groundwater
Morgan Co Detention Facility	2110054	Morgan	Groundwater
Cedar Grove Mobile Home Ldg.	2170018	Newton	Groundwater
Northwest Woods	2190002	Oconee	Groundwater
Pleasant Hill Subdivision	2190003	Oconee	Groundwater
Great SE-Indian Hills S/D	2190005	Oconee	Groundwater
Great SE-Northwest Woods S/D	2190006	Oconee	Groundwater
Great SE-Woodlands/Oconee Vill	2190015	Oconee	Groundwater
Great SE-Deerwood Est. S/D	2190018	Oconee	Groundwater
Great SE-Osceola Village S/D	2190019	Oconee	Groundwater
Family Life Enrichment Center	2190020	Oconee	Groundwater
Great SE-Brookwood Est. S/D	2190021	Oconee	Groundwater
Great SE-Oak Grove S/D	2190022	Oconee	Groundwater
Great SE-Birchmore Hills S/D	2190023	Oconee	Groundwater
Great SE-Killarney West S/D	2190026	Oconee	Groundwater
Carrs Circle C Mobile Home Pk	2190031	Oconee	Groundwater
Great SE-Pinehill S/D	2190035	Oconee	Groundwater
Great SE-Elder Heights S/D	2190045	Oconee	Groundwater
Great SE-Fieldstone/Canyon Ck.	2190049	Oconee	Groundwater
Barnetts Bluff	2190053	Oconee	Groundwater
Ashland Subdivision	2190054	Oconee	Groundwater
Fernwood Subdivision	2190055	Oconee	Groundwater
Oconee Co.-Oakpoint	2190056	Oconee	Groundwater
Eaglewood Subdivision	2190057	Oconee	Groundwater
Old Mill Chase Subdivision	2190058	Oconee	Groundwater
Harrowford Subdivision	2190060	Oconee	Groundwater
Oconee Co-Skip Stone S/D	2190064	Oconee	Groundwater
Oconee Co-Appalachee Pointe	2190067	Oconee	Groundwater
Oconee Co-Eastville Village	2190068	Oconee	Groundwater
Oconee Co.-Watkinsville	2190000	Oconee	Purchased Surface Water
Oconee Co.-Bishop	2190024	Oconee	Purchased Surface Water
Oconee Co.-Tanglebrook S/D	2190062	Oconee	Purchased Surface Water
Lexington	2210001	Oglethorpe	Groundwater
Maxeys	2210002	Oglethorpe	Groundwater
Arnoldsville	2210004	Oglethorpe	Groundwater
Forest Lake Village S/D	2370002	Putnam	Groundwater
Pine Forest Subdivision	2370006	Putnam	Groundwater
Tanglewood Subdivision	2370007	Putnam	Groundwater
Tall Timbers-Oak Openings	2370008	Putnam	Groundwater
Long Shoals Crossing S/D	2370012	Putnam	Groundwater

Public Water System Name	Water System ID	County	Source Name
Cedar Cove Subdivision	2370013	Putnam	Groundwater
Parks Mill Landing Subdivision	2370014	Putnam	Groundwater
Bayside Haven MHP	2370037	Putnam	Groundwater
Thunder Valley Subdivision	2370043	Putnam	Groundwater
Phoenix Lake Subdivision	2370044	Putnam	Groundwater
River Bend/Horseshoe Bend	2370045	Putnam	Groundwater
Lake Oconee Plantation S/D	2370046	Putnam	Groundwater
Timber Lake/Rock Isl Point	2370047	Putnam	Groundwater
Long Island Forest Subdivision	2370048	Putnam	Groundwater
Martin-River Lk Landing/Place	2370049	Putnam	Groundwater
Eagle Nest/Eagle Ridge	2370051	Putnam	Groundwater
Sebastian Cove Subdivision	2370052	Putnam	Groundwater
Martin Oaks Subdivision	2370053	Putnam	Groundwater
Oconee Springs Landing	2370057	Putnam	Groundwater
Great Waters at Reynolds Plant	2370059	Putnam	Groundwater
Flat Rock Subdivision	2370060	Putnam	Groundwater
Misty River Landing	2370062	Putnam	Groundwater
Whippoorwill Cove	2370063	Putnam	Groundwater
Soperton	2830000	Treutlen	Groundwater
Danville	2890000	Twiggs	Groundwater
Jeffersonville	2890001	Twiggs	Groundwater
Twiggs County Water System	2890009	Twiggs	Groundwater
Kalonia Heights Subdivision	2890012	Twiggs	Groundwater
Twiggs Co.-Blackbottom WS	2890023	Twiggs	Groundwater
Little Bethlehem	2970005	Walton	Groundwater
Hillside Village MHP, Inc.	2970020	Walton	Groundwater
Wildwood Estates	2970041	Walton	Groundwater
Deepstep	3030001	Washington	Groundwater
Oconee	3030003	Washington	Groundwater
Sandersville	3030005	Washington	Groundwater
Warthen Water Association	3030007	Washington	Groundwater
Alamo	3090000	Wheeler	Groundwater
Glenwood	3090001	Wheeler	Groundwater
Allentown	3190000	Wilkinson	Groundwater
Gordon	3190001	Wilkinson	Groundwater
Irwinton	3190002	Wilkinson	Groundwater
Ivey	3190003	Wilkinson	Groundwater
McIntyre	3190004	Wilkinson	Groundwater
Toomsboro	3190005	Wilkinson	Groundwater

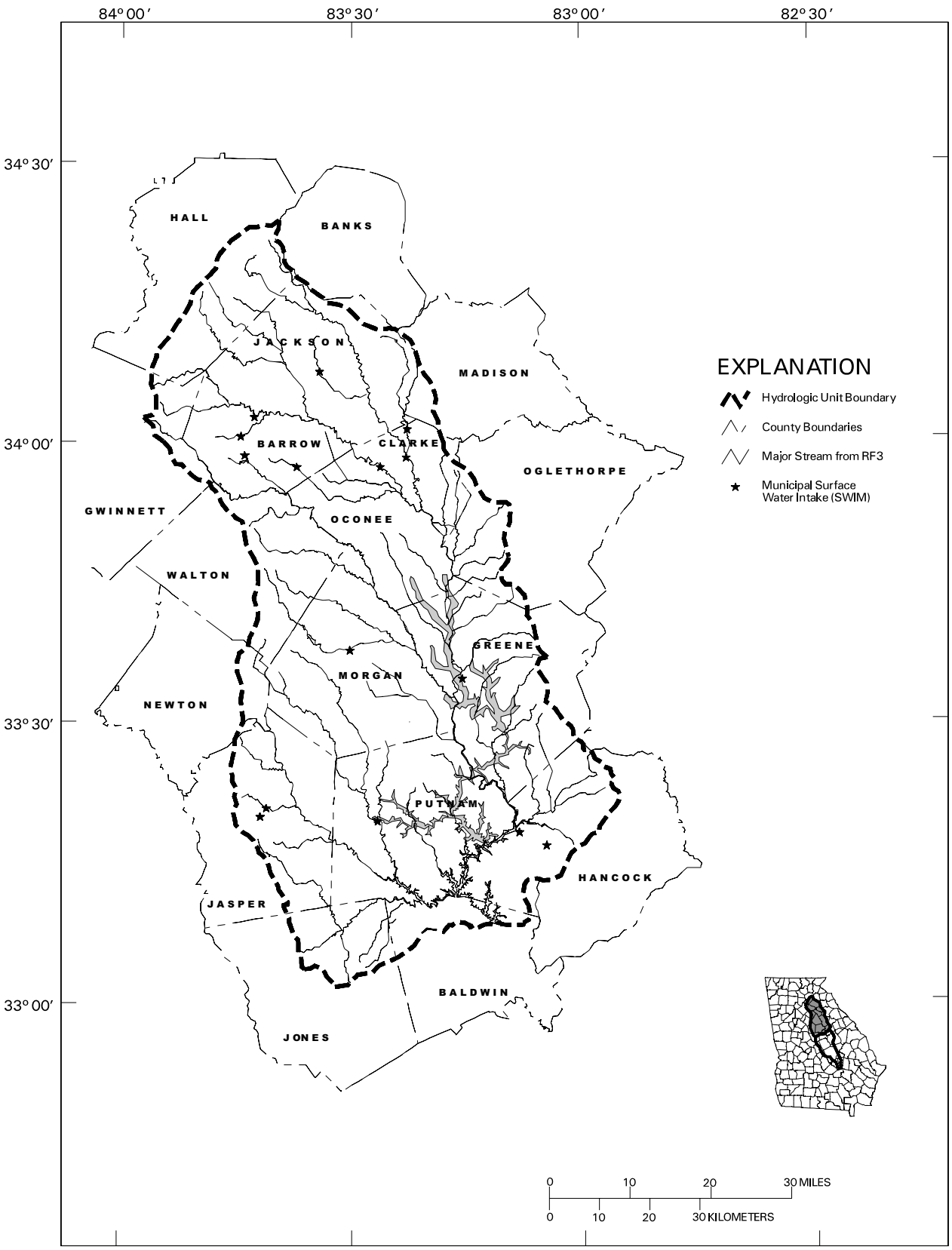

Figure 3-I. Surface Water Intakes, Upper Oconee River Basin, HUC 03070101

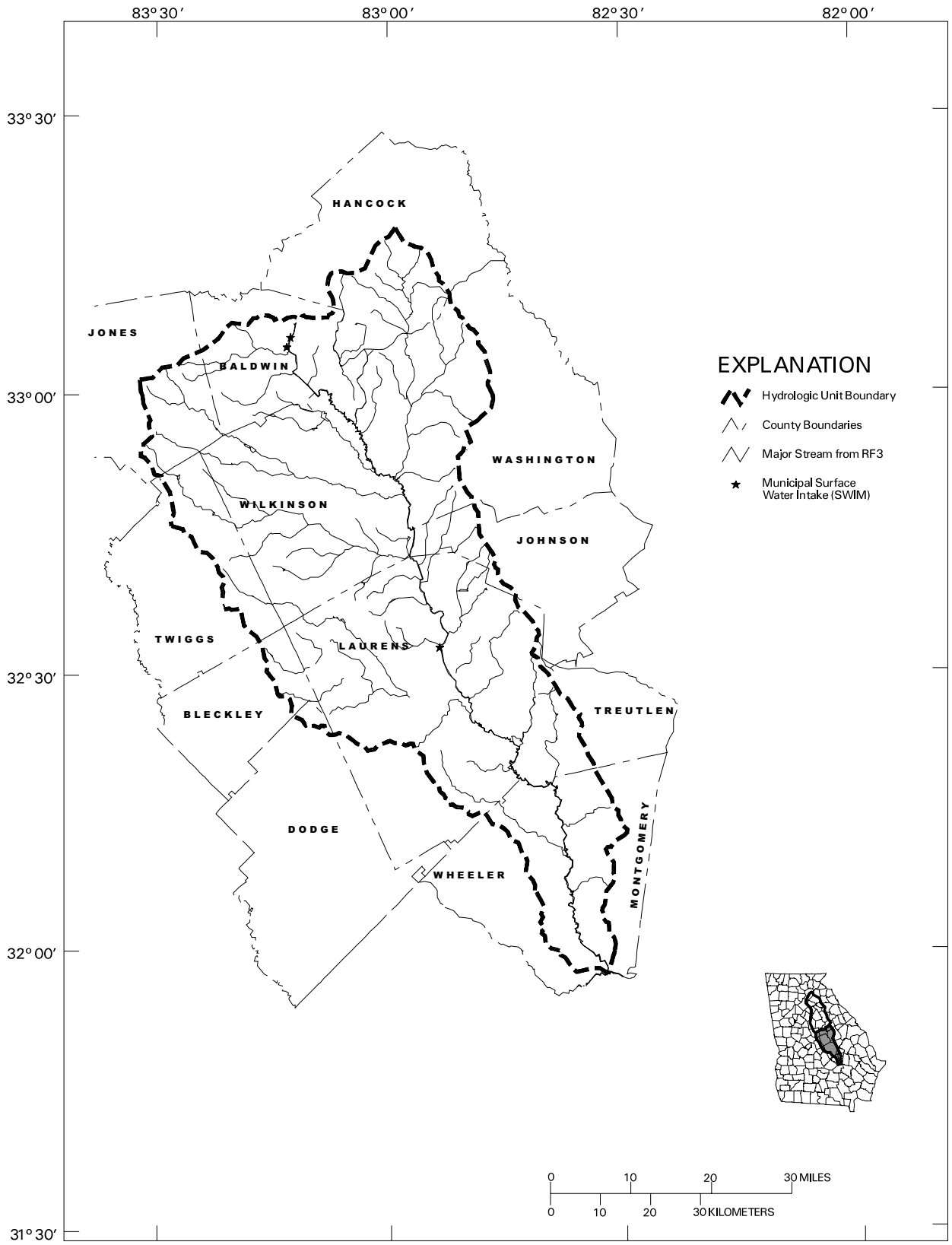

Figure 3-2. Surface Water Intakes, Lower Oconee River Basin, HUC 03070102

3.1.3 Drinking Water Permitting

The Georgia Safe Drinking Water Act of 1977 and 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 owner must provide detailed description of the project; demonstrate the reliability of the water source site; render plans and specifications demonstrating the construction integrity of wells, plants, and distribution systems; conduct preliminary water sample testing; and submit legal documentation including application to operate a public water system. Permits contain specific conditions the owner must meet for different types of water sources, plants, and distribution systems, including a list of approved water sources, filter rates, disinfection and treatment requirements, operator certification, documentation and reporting requirements, compliance with water sample testing schedule, and number of allowed service connections. Permits are issued for 10 years and are renewable. The Drinking Water Program has 285 active and permitted systems in the Oconee River basin.

3.2 Surface Water Quantity

3.2.1 Surface Water Supply Sources

Surface water supplies in the Oconee basin include water in rivers, ponds, and reservoirs, including two major impoundments (see Section 2.1.4). Total annual flow in the Oconee is estimated at 1,190,000 million gallons per year (based on average flow at Dublin gage since completion of Wallace Dam in 1979). Reservoirs provide a storage capacity within the basin of approximately 260,700 million gallons (800,000 acre-feet).

Storage capacity in the basin will be increased somewhat with the completion of the Bear Creek Regional Reservoir in mid-2001 (see Section 2.1.4). This reservoir is designed to hold 14,980 acre-feet of water at normal pool and is expected to satisfy water needs for Clarke, Oconee, Jackson, and Barrow Counties through the year 2050.

Other than the Middle Oconee, North Oconee, and Apalachee Rivers, the remaining tributaries (e.g., Mulberry River, Hard Labor Creek, Murder Creek) have relatively small flows because the fairly narrow Oconee Basin does not provide much drainage area upstream of the points of confluence with the Oconee River. Consequently, these tributaries do not provide very dependable flow and are not widely used as significant water supply sources.

3.2.2 Surface Water Supply Demands and Uses

Municipal and Industrial Demand

Municipal and industrial (M&I) water demands include publicly and privately supplied residential, commercial, governmental, institutional, industrial, manufacturing, and other demands such as distribution system water losses. There are 30 municipal and industrial (15 each) surface water withdrawal permits in place in the Oconee River basin.

The largest municipal user of surface water in the basin is the City of Athens, which withdraws water to serve the city, Athens-Clarke County, and other potable water customers. Athens has two surface water withdrawal permits totaling 28 million gallons per day (MGD) on a monthly average (16 MGD from the North Oconee River and 12 MGD from the Middle Oconee River). Other municipalities with permits to withdraw at

least 1.0 MGD include the City of Dublin (Laurens County), the City of Eatonton (Putnam County), the City of Greensboro (Greene County), the City of Jefferson (Jackson County), the City of Madison (Morgan County), the City of Milledgeville (Baldwin County), and the City of Winder (Barrow County).

Industrial surface water use is dominated by the largely nonconsumptive use of water by hydropower generation facilities. For example, Georgia Power Company has a permit to use 1,245 MGD from the Oconee River at Lake Sinclair. This flow is primarily a pump-back operation in which the company pumps water from Lake Sinclair to Lake Oconee during off-peak hours (i.e., during periods of low demand for electricity) and then uses this water to drive the turbines at Lake Oconee to produce electricity at other times of the day. Oglethorpe Power Company has a permit to "withdraw" some 533 MGD from the Middle Oconee River to produce power, but again this is a nonconsumptive use of the river's waters. Southeast Paper Manufacturing Company (Laurens County) is the largest off-stream industrial user of water with a permit for the use of 17 MGD from the Oconee River. Forstmann and Company and the kaolin industries are also fairly large off-stream users of surface water in the central and southern portions of the basin.

Additional data on existing permit holders for municipal and industrial (nonagricultural) surface water withdrawals in the Oconee River basin are shown in Table 3-2.

Agricultural Water Demand

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 360 agricultural surface water withdrawal permits to entities located within the Oconee River basin. The combined permitted pumping capacity of these permits is 258,000 GPM (370 MGD). According to the support information provided with each application, these permits are used to supply water to irrigate some 29,260 acres of crops, orchards, turf, etc. Within Georgia, surface water agricultural permit holders are by law (O.C.G.A. Section 12-5-31 et seq.) exempted from required reporting of their water use; however, agricultural water use trend information available to EPD suggests that Oconee River basin agricultural water use is on the order of 5 to 10 percent of permitted capacity. This 5 to 10 percent (i.e., 19 to 38 MGD) occurs primarily during the peak months of May to August.

The total water demand from agriculture, including both surface water and ground water demand, may be estimated using agricultural census data. NRCS data indicate that in 1995 the Oconee basin contained approximately 19,700 acres of irrigated farmland, which were responsible for approximately 4,000 million gallons per year (MGY) of water demand. Animal operations in the basin include approximately 158,000 cattle, 61,000 hogs, and 140,000,000 chickens, which together accounted for about 3,800 MGY of water demand. Total agricultural water demand (surface water and ground water) in the Oconee basin in 1995 was therefore approximately 7,800 MGY (21 MGD on average). Agricultural water demand can change substantially over the short term (1 to 2 years) as a result of a change in crops grown and natural variation in precipitation and evaporation.

Unlike municipal, industrial, and cooling water withdrawals, only approximately 40 percent of the water withdrawn for agricultural use is returned to streams, depending on crops grown.

Table 3-2. Permits for Surface Water Withdrawals in the Oconee River Basin

Facility	Source	24 Hr Max (Mgd)	Mo. Avg (Mgd)	County
Cherokee Products Company	Fishing Creek	0.58	0.30	Jones
Engelhard Kaolin Corporation	Engelhard Mine at Deepstep	5.76	5.00	Washington
Engelhard Kaolin Corporation	Little Commissioner Creek	0.80	0.50	Wilkinson
Englehard Corporation	Little Commissioner Creek	2.25	1.15	Wilkinson
Feldspar Corporation - Bowdon	Bowdon Creek	0.50	0.40	Greene
Feldspar Corporation - Cedar	Cedar Crek	1.20	1.20	Jasper
Forstmann and Company, Inc. - Dub	Oconee River	7.00	5.50	Laurens
Forstmann and Company, Inc. - Mill	Oconee River	3.00	3.00	Baldwin
Georgia Power Co - Branch	Lake Sinclair	1245	1245	Baldwin
High Shoals Hydro - G. Bracewell	Apalachee River	183.17	103.63	Oconee
Martin Marietta Aggregates - Auburn Quarry	Auburn Quarry Pit Sump	2.30	0.90	Barrow
Martin Marietta Aggregates - Ruby Quarry	Ruby Quarry Sump Pit	2.30	0.60	Jones
New Holland Mills	Spring Source	0.36	0.32	Hall
Oglethorpe Power Corp - Middle	Middle Oconee River	533.25	533.25	Clarke
Southeast Paper Manuf. Co.	Oconee River	19.00	17.00	Laurens
Athens, City of - Middle	Middle Oconee River	16.00	12.00	Clarke
Athens, City of - North	North Oconee River	21.00	16.00	Clarke
Dublin, City of	Oconee River	5.00	5.00	Laurens
Eatonton, City of	Little River	1.10	1.00	Putnam
Greensboro, City of	Lake Oconee	1.50	1.00	Greene
Jefferson, City of	Big Curry Creek	2.25	1.75	Jackson
Madison, City of - Hard Labor	Hard Labor Creek	1.50	1.50	Morgan
Milledgeville, City of	Oconee River	3.00	2.50	Baldwin
Milledgeville, City of	Oconee River	8.00	7.00	Baldwin
Monticello, City of - Pope's	Pope's Branch	0.75	0.50	Jasper
Sparta, City of - Lake Sinclair	Lake Sinclair	0.90	0.90	Hancock
Statham, City of	SCS Res. #6 at Barber Crk.	0.50	0.40	Barrow
Watkinsville, City of	Call's Creek	0.14	0.14	Oconee
Winder, City of - Cedar Crk & Yargo Lk	Cedar Creek Res.	1.00	1.00	Barrow
Winder, City of - Mulberry	Mulberry River	5.70	4.10	Barrow

Note: Permits are not required for withdrawals of less than 100,000 gallons per day on a monthly average.

Power Generation Water Demand

Four power-generating plants use the water resources of the basin (Figure 2-7), including three hydropower facilities, and one fossil fuel generating facility. Instream water use by the hydroelectric plants constitutes nearly the entire flow within the river, except during flood conditions, but is nonconsumptive. Water for thermoelectric power

generation is considered an off-stream use of water and generally is moderately consumptive to nonconsumptive.

Navigational Water Demand

There are no sections of the Oconee River or its tributaries for which the federal government maintains a navigation channel. Additionally, no federal projects have been constructed in the basin for purposes of storing water to meet navigation needs.

Recreation

The demand for outdoor recreation opportunities increases as Georgia's population increases. The two Georgia Power Company reservoirs along the Oconee River are moderately used for recreational activities such as boating, fishing, and water sports. The rivers, their tributaries, and the environs are also used quite extensively for recreational activities such as hunting, fishing, and sight-seeing.

Waste Assimilation Water Demand

Water quantity, wastewater treatment, and wastewater discharge permitting are addressed in Section 4. It should be noted, however, that the guidelines for discharge of treated effluent into the rivers and streams of the Oconee 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 Demand

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. Portions of the mainstem of the Oconee River have been altered by human activities, both physically and with regard to flows. From a water quantity perspective, aquatic habitat is adversely affected in some locations by unnatural extreme variations in lake levels and river flow, especially below Carters Lake and Lake Allatoona. One significant issue which is receiving increasing attention from EPD is that of the minimum stream flow rate which must be maintained below a reservoir. A current state requirement is to maintain the 7Q10 flow (7-day average low flow with a once in ten years recurrence interval), when water is available upstream. Consideration is being given to an increase in this minimum flow requirement under recommendations of the Wildlife Resources Division (Evans and England, 1995).

3.2.3 Surface Water Withdrawal Permitting

The 1977 Amendments to the Georgia Water Quality Control Act require that all nonagricultural withdrawers of more than 100,000 GPD on a monthly average (from any Georgia surface water body) to obtain a permit from EPD for this withdrawal. These users include municipalities, industries, military installations, and all other nonagricultural 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 for the Oconee River basin as of February 1998.

Applicants are required to submit details relating to the source of withdrawals, demand projections, water conservation measures, low flow protection measures (for nongrandfathered withdrawals), and raw water storage capacities. An 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 could establish that their use existed prior to July 1, 1988, *and* when these 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.

3.2.4 Flooding and Floodplain Management

Sometimes the issue is not the lack of water, but too much water. Floods, as well as droughts, can be very damaging natural hazards. Almost all of Georgia is susceptible to the threat of floods. The Georgia Emergency Management Agency (GEMA) ranks floods as the number one natural hazard in Georgia. Over the past 20 years more than 60 lives have been lost in Georgia due to flooding, with hundreds of millions of dollars in losses associated with destruction of crops, personal property, and public property.

Across the Oconee River basin, no major reservoirs (federal, state, local, or private) have been constructed with the principal purpose of abating the effects of flood flows. The previously mentioned Georgia Power Company facilities (i.e., Lake Oconee and Lake Sinclair) were constructed for power production purposes and are not capable of retaining large flood flows. Consequently, rainfall events that lead to the production of higher-than-normal stream flows frequently result in local and regional flooding conditions. This is especially true in the lower portions of the Oconee River basin. These conditions are expected to continue.

Continued growth and development within the headwaters region of the basin without due consideration to the downstream flooding impacts is a concern. Also of concern is continued development in the flood hazard areas of the lower portions of the basin. These circumstances increase flood levels and worsen the associated human and property damage.

Local governments with recognized flood hazard areas may elect to participate in the National Flood Insurance Program (NFIP). The NFIP was created by congress through the enactment of the National Flood Insurance Act of 1968, to provide property owners with access to previously unavailable flood insurance. Local government participation in the NFIP is voluntary. The NFIP requires participating communities to adopt and enforce a local flood ordinance designed to reduce flood losses by regulating development located in federally defined flood hazard areas within the jurisdiction.

3.3 Ground Water Quantity

3.3.1 Ground Water Sources

Ground water sources in the Oconee River basin are related to physiographic provinces. Ground water supplies are concentrated in the lower half of the basin in the Coastal Plain province. In the upper half of the basin, north of the Fall Line, the crystalline rock formation that underlies the Piedmont province greatly restricts ground water 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 closer to 50 GPM. Techniques for locating these reliable sources have improved greatly over the past 10 years and will likely continue to do so.

The Cretaceous sand aquifer system, located along the northern edge of the Coastal Plain, outcrops in a band about 40 miles wide across the central part of the basin, mainly in Twiggs, Wilkinson, and Washington Counties. In the northern portion of the Oconee River basin this unit is seen as one single aquifer and is sometimes referred to as the Dublin-Midville aquifer. The aquifer consists of interbedded sands and clays that begin in the northern part of the area at the Fall Line, and it is as thick as several hundred feet to the south. Ground water occurs in pore spaces of the largely unconsolidated sand layers, which are composed of largely angular to subangular quartz grains. The interbedded clay layers act as confining beds, causing the deeper ground water to occur under artesian conditions. Well yields in the portions of the Cretaceous sand aquifer underlying the Oconee River basin have been found to exceed 1,000 GPM. Recharge occurs through the sandy soil in the outcrop area near Milledgeville (Baldwin County).

The Gordon aquifer system overlies the Cretaceous sand aquifer in the Coastal Plain portion of the Oconee River basin and consists of saturated permeable sands. It is confined above and below by clay-rich layers, and it ranges in thickness from about 20 feet in northern Wilkinson County to about 150 feet in the southern part of the basin. Generally, well yields of up to 500 GPM can be found in southern portions of the basin. Gordon aquifer recharge occurs mainly through the outcrop areas in Washington and Wilkinson Counties.

The Floridan aquifer underlies the southernmost portions of the Oconee River basin. The aquifer is overlain by about 25 to 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 toward the Fall Line to more than 400 feet in the extreme southern portion of the basin. Sands and shales compose the main units in the northern portions of this aquifer, while to the south the aquifer becomes ever more carbonate (limestone) in content. To the south the aquifer consists of three thick beds of limestone (i.e., Tampa limestone, Suwannee limestone, and Ocala limestone). Well yields range from about 40 GPM in the north to more than 10,000 GPM in the thickest, southernmost portions of the aquifer.

3.3.2 Ground Water Supply Demands

Municipal and Industrial Uses

Nonagricultural permitted water withdrawals in the basin total slightly above 83 MGD (annual average), with about 70 MGD used by industrial concerns and 13 MGD used by municipal withdrawers. For the foreseeable future ground water is likely to continue to be the primary source of raw water to meet municipal and industrial water needs in the lower half of the Oconee River basin.

Eighteen municipal facilities are permitted to withdraw ground water in the Oconee River basin, the largest being the City of Sandersville in Washington County (3.5 MGD annual average from the Cretaceous Sand Aquifer). Other municipalites with ground water withdrawals larger than 1.0 MGD (annual average) include the City of Dublin (Jones County), Oconee County, and the Jones County Water System.

The largest nonagricultural users of ground water in the Oconee River basin are industrial water users. Thirty-five ground water withdrawal permits are currently in place for industrial users in the basin. The largest of these are kaolin producers in Washington, Wilkinson, and Twiggs Counties. Engelhard Corporation has a permit to withdraw 13.43 MGD from the Cretaceous sand aquifer in Wilkinson County. This is the largest nonagricultural permit in the basin.

Agricultural Water Demand

Total agricultural water demand for the Oconee River basin is discussed above in Section 3.2.2, and is derived from both surface and ground water sources.

The demands on ground water resources for agricultural activities includes 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 Environmental Protection Division had issued 128 groundwater agricultural water withdrawal permits to entities located within the Oconee River basin. The combined permitted pumping capacity of these permits is 40,000 GPM (58 MGD). According to the support information provided with each application, these permits are used to supply water to irrigate some 9800 acres of crops, orchards, turf, etc. Within Georgia, agricultural groundwater permit holders are by law (O.C.G.A. Section 12-5-91 et seq.) exempted from required reporting of their water use, however agricultural water use trend information available to EPD suggests that Oconee River basin agricultural water use is on the order of 5 to 10 percent of permitted capacity. This 5 to 10 percent (i.e., 3 to 6 MGD) occurs primarily during the peak months of May through August.

3.3.3 Ground Water Supply Permitting

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. The statute also stipulates that all pre-1972 users who could establish the quantity of their use prior to 1972 would be “grandfathered” for that amount of withdrawal. Table 3-3 lists the permits in effect for the Oconee River basin as of February, 1998.

Farm Irrigation Permits

Applicants for ground water withdrawal permits are required to submit details relating to the source of withdrawals (i.e., the aquifer and location), water demand projections, and water conservation measures. EPD-issued permits identify the aquifer from which the withdrawal is to originate, the annual average and maximum monthly 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, while the special conditions section of the permit specifies measures the permit holder is required to undertake beyond the standard conditions (e.g., installation of leak detection mechanisms, installation of metering devices). These permits (including the information and data required in support of applications for the permits) are the means by which EPD manages Georgia’s ground water resources.

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

County	Permit #	Type	Permit User	Monthly Permitted Flow (MGD)	Yearly Permitted Flow (MGD)	Aquifer
Barrow	007-0001	I	Harrison Poultry, Inc.	0.300	0.300	Crystalline Rock
Greene	066-0001	I	Port Armour Water System	0.180	0.180	Crystalline Rock
Jackson	078-0002	M	Braselton, Town of	0.300	0.250	Crystalline Rock
Jackson	078-0001	I	Wayne Poultry (Continental Grain Co)	0.600	0.500	Crystalline Rock
Jackson	078-0003	M	Hoschton, City of	0.150	0.150	Crystalline Rock
Jasper	079-0002	M	Monticello, City of	0.250	0.250	Crystalline Rock
Jasper	079-0001	I	Feldspar Corporation	0.800	0.800	Crystalline Rock
Jones	084-0002	M	Gray, City of	0.600	0.350	Crystalline Rock
Jones	084-0001	M	Jones County Water System	1.125	1.125	Cretaceous Sand, Crystalline Rock
Laurens	087-0003	M	Dublin, City of	2.000	1.600	Dublin - Midville
Laurens	087-0002	I	Mohawk Industries - Laurens Park Mill	1.400	1.200	Cretaceous Sand
Laurens	087-0004	M	Montrose, Town of	0.200	0.150	Cretaceous Sand
Laurens	087-0005	I	Forstmann & Company - Plant	0.300	0.300	Floridan
Laurens	087-0001	M	East Dublin, City of	1.000	0.800	Cretaceous Sand
Laurens	087-0006	I	Forstmann & Company - Remediation	0.500	0.500	Miocene, Unconfined Surficial
Montgomery	103-0001	M	Mount Vernon, City of	0.350	0.350	Floridan
Morgan	104-0001	M	Madison, City of	0.350	0.350	Crystalline Rock
Oconee	108-0001	M	Oconee County Utility Department	1.781	1.781	Crystalline Rock
Putnam	117-0001	I	Louisiana - Pacific Corp	0.355	0.355	Crystalline Rock
Treutlen	140-0001	M	Soperton, City of	0.750	0.650	Floridan
Twiggs	143-0006	M	Jeffersonville, City of	0.350	0.300	Cretaceous Sand
Twiggs	143-0005	I	Engelhard Corp - Griffin Mine	0.298	0.298	Cretaceous Sand
Twiggs	143-0001	I	Dry Branch Kaolin Co - Jeffersonville Plant	5.500	5.000	Dublin - Midville
Washington	150-0012	M	Tennille, City of	0.400	0.350	Cretaceous Sand
Washington	150-0016	I	Buffalo Clay China Clay Co (ECC Int)	0.700	0.700	Cretaceous Sand
Washington	150-0015	I	Lapp Insulator Division	0.300	0.210	Cretaceous Sand

County	Permit #	Type	Permit User	Monthly Permitted Flow (MGD)	Yearly Permitted Flow (MGD)	Aquifer
Washington	150-0014	M	Sandersville, City of	4.500	3.500	Cretaceous Sand
Washington	150-0018	I	Anglo-American Clays	1.440	1.440	Dublin - Midville
Washington	150-0004	I	ECC International - Plant 2 (Franklin)	0.744	0.744	Cretaceous Sand
Washington	150-0008	I	Engelhard Corp - Washington Co Mine	1.500	1.500	Cretaceous Sand
Washington	150-0007	I	ECC International - Plant 1	8.500	8.500	Dublin-Midville
Washington	150-0006	I	ECC International - Plant 2 (Main)	6.500	6.500	Cretaceous Sand
Washington	150-0005	I	ECC International - Plant 2 (Chambers)	0.744	0.400	Cretaceous Sand
Washington	150-0001	I	Thiele Kaolin Co - Avant Mine	0.850	0.660	Cretaceous Sand
Washington	150-0002	I	Thiele Kaolin Co - Sandersville Plant	3.350	3.000	Dublin - Midville
Washington	150-0017	I	Engelhard Corp - Deepstep Mine	4.300	4.300	Dublin - Midville
Washington	150-0003	I	Thiele Kaolin Co - Hall Mine	0.720	0.650	Cretaceous Sand
Washington	150-0011	I	Engelhard Corp - Scott Mine	1.750	1.750	Cretaceous Sand
Washington	150-0020	I	US Chips - Oconee Woodyard	0.432	0.432	Screens 350'-407'
Washington	150-0021	I	Thiele Kaolin Co - Limestone Plant	1.440	1.440	Dublin - Midville
Wilkinson	158-0007	I	Engelhard Corp - Dixie Mine	0.750	0.750	Cretaceous Sand
Wilkinson	158-0013	I	J.M. Huber Corp - Wilkinson County Plant	0.600	0.600	Cretaceous Sand
Wilkinson	158-0003	I	Engelhard Corp - Klondyke Mine	0.800	0.800	Cretaceous Sand
Wilkinson	158-0004	I	Engelhard Corp - Gibraltar Mine	2.064	2.064	Cretaceous Sand
Wilkinson	158-0005	M	Gordon, City of	0.400	0.400	Cretaceous Sand
Wilkinson	158-0014	I	Engelhard Corp - Hatfield Tract	1.440	1.440	Cretaceous Sand
Wilkinson	158-0006	M	McIntyre, Town of	0.220	0.220	Cretaceous Sand
Wilkinson	158-0002	I	Engelhard Corp - McIntyre Plant	13.434	13.434	Cretaceous Sand
Wilkinson	158-0009	M	Irwinton, Town of	0.320	0.250	Cretaceous Sand
Wilkinson	158-0012	I	Dry Branch Kaolin Co - M10 & M11	0.900	0.700	Cretaceous Sand
Wilkinson	158-0001	I	Engelhard Corp - Gordon Plant	6.460	6.460	Cretaceous Sand
Wilkinson	158-0011	I	Dry Branch Kaolin Co - M8 & M9	0.100	0.100	Cretaceous Sand
Wilkinson	158-0010	I	J.M. Huber Corp - Chambers Mine	2.450	2.450	Cretaceous Sand

The 1988 Amendments to the Georgia Ground Water Use Act establish the permitting authority within EPD to issue farm irrigation ground water use permits. As with the previously mentioned ground water permitting statute, the lower threshold is 100,000 gallons per day. 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. Applicants for these permits who could establish that their use existed prior to July 1, 1988, are "grandfathered" for the operating capacity if their applications were submitted prior to July 1, 1991. The previously cited statute exempts agricultural water users from required water use reporting.

Excessive Ground Water Withdrawals

Excessive ground water withdrawal can lead to lowering or drawdown of the water table. Localized ground water 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 ground water 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

Couch, C.A., E.H. Hopkins, and P.S. Hardy. 1996. Influences of Environmental Settings on Aquatic Ecosystems in the Apalachicola-Chattahoochee-Flint River Basin. Water-Resources Investigations Report 95-4278. U.S. Geological Survey, Atlanta, GA.

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In This Section

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

Section 4

Water Quality: Environmental Stressors

Section 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 Oconee 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 Nondischarging 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, which prevent discharge of wastewater effluent to surface waters, are also discussed in this section.

NPDES Permitted Wastewater Discharges

Table 4-1 displays the major municipal wastewater treatment plants with permitted discharges of 1 million gallons per day (MGD) or greater in the Oconee 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.

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

NPDES Permit #	Facility Name	Authority	County	Receiving Stream	Permitted Monthly Average Flow (MGD)
Oconee River Above Lake Sinclair Dam (HUC 03070101)					
GA0021725	Athens, North	Athens	Clarke	North Oconee River	10.72
GA0021733	Athens, Middle	Athens	Clarke	Middle Oconee River	6.00
GA0034584	Athens, Cedar Creek	Athens	Clarke	Cedar Creek	2.00
Oconee River Below Lake Sinclair Dam (HUC 03070102)					
GA0030775	Milledgeville WPCP	Milledgeville	Baldwin	Oconee River	7.00
GA0032051	Sandersville WPCP	Sandersville	Washington	Tanyard Branch	1.70
GA0025569	Dublin WPCP	Dublin	Laurens	Oconee	4.00

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 Oconee 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 $15 million in construction and upgrade of municipal water pollution control plants in the Oconee 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 1996-1997 water quality assessment, only two segments (21 miles) of river/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.

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

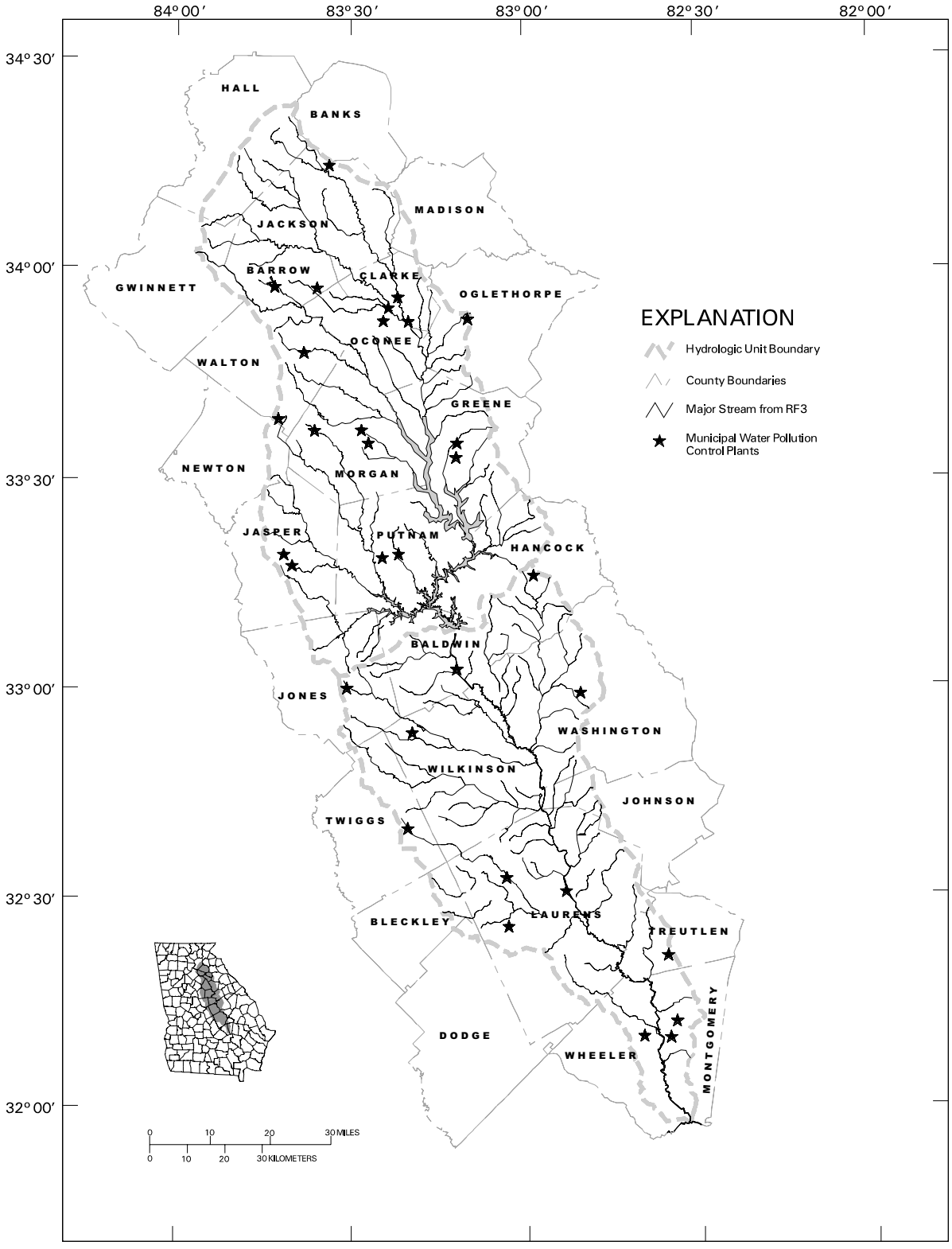

Figure 4-I. Location of Municipal Wastewater-Treatment Plants in the Oconee River Basin

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 73 permitted municipal, state, federal, private, and industrial wastewater and process water discharges in the Oconee 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 Oconee River Basin

HUC	Major Municipal Facilities	Major Industrial and Federal Facilities	Minor Public Facilities	Minor Private and Industrial Facilities	Total
03070101	3	2	18	17	40
03070102	3	2	10	18	33
Total	*6*	*4*	*28*	*35*	*73*

The flow rates for industrial discharges in the Oconee basin are relatively low. However, 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. Georgia's 1996-1997 water quality assessment report identified one segment (3 miles) of river/stream in the basin where permitted industrial discharges contributed to a failure to support designated uses; this is being addressed through the NPDES permitting process. In addition, one industry has contributed to exceedances of the temperature criterion in Lake Sinclair; this also is being addressed through the NPDES permitting process. Table 4-3 lists the major industrial and federal wastewater treatment plants WITH discharges into the Oconee River basin in Georgia.

There are also 19 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 Oconee River basin are shown in Figures 4-2 and 4-3.

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

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

NPDES Permit #	Facility Name	Description	Flow and Load	Receiving Stream
HUC 03070101: Oconee River Above Lake Sinclair Dam				
GA0002712	TEXFI Industries	Textile finishing	Average 0.123 MGD BOD-5: 93 lb/day TSS: 250 lb/day Chromium: 1.4 lb/day	Middle Oconee River
GA0026051	Georgia Power, Plant Branch	Power generation	Average 1180 MGD No significant pollutant loads.	Lake Sinclair
HUC 03070102: Oconee Below Lake Sinclair Dam				
GA0003670	Forstmann & Company	Textile finishing	Average 2.30 MGD BOD-5: 750 lb/day TSS: 1870 lb/day Chromium: 7.4 lb/day	Oconee River
GA0032620	Southeast Paper Manufacturing	Paper manufacturing	Average 14.3 MGD BOD-5: 4500 lb/day TSS: 7130 lb/day	Oconee River

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 CSOs in the Oconee River basin since no municipalities in the basin have combined sewer systems.

NPDES Permitted Storm Water Discharges

Urban storm water runoff in the Oconee basin has been identified as a major source of stressors from pollutants such as oxygen-demanding waste (BOD) and fecal coliform bacteria. Storm water can flow directly to streams as a diffuse, nonpoint process or can 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 Section 4.1.2.2.

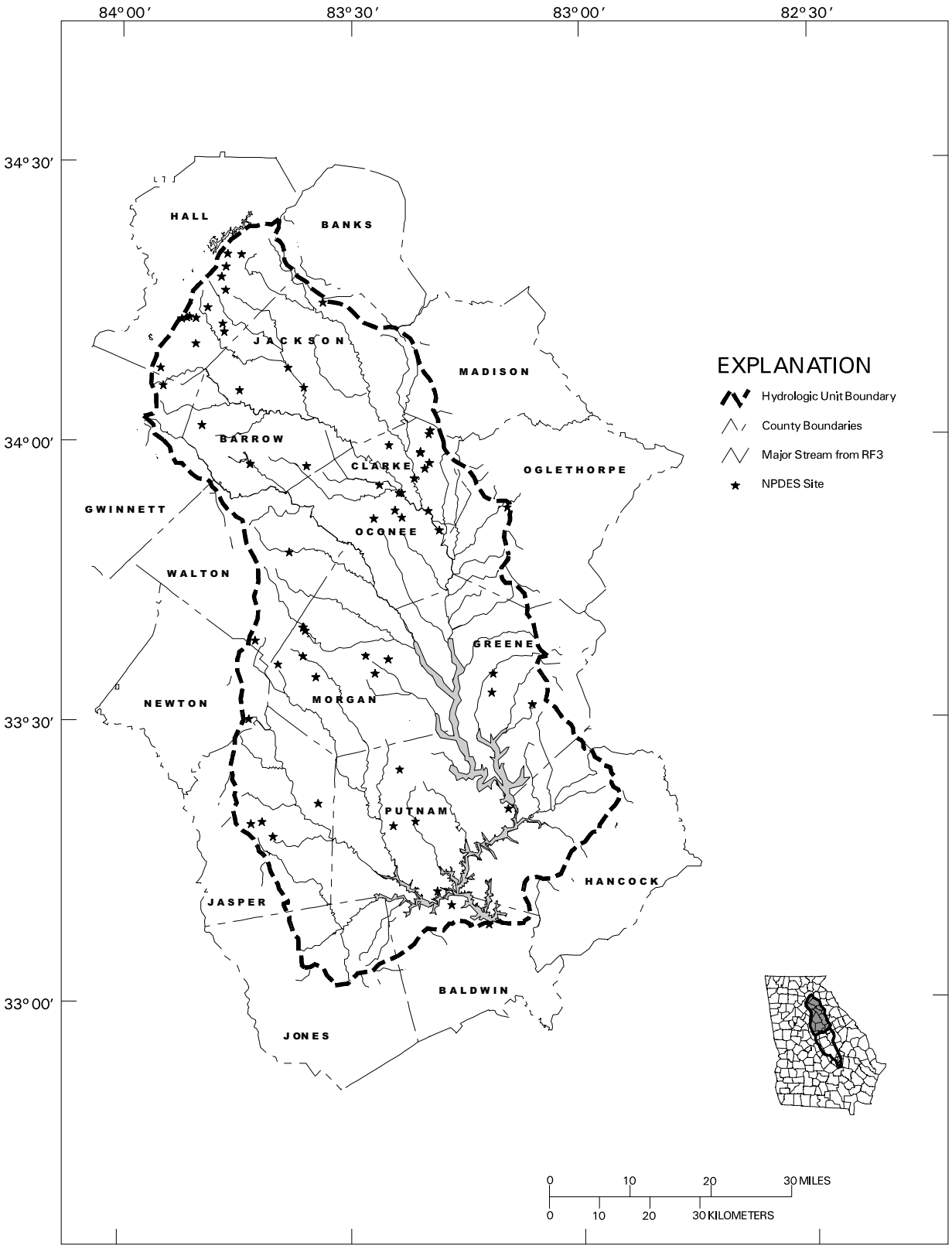

Figure 4-2. NPDES Sites Permitted by GAEPD, Upper Oconee River Basin, HUC 03070101

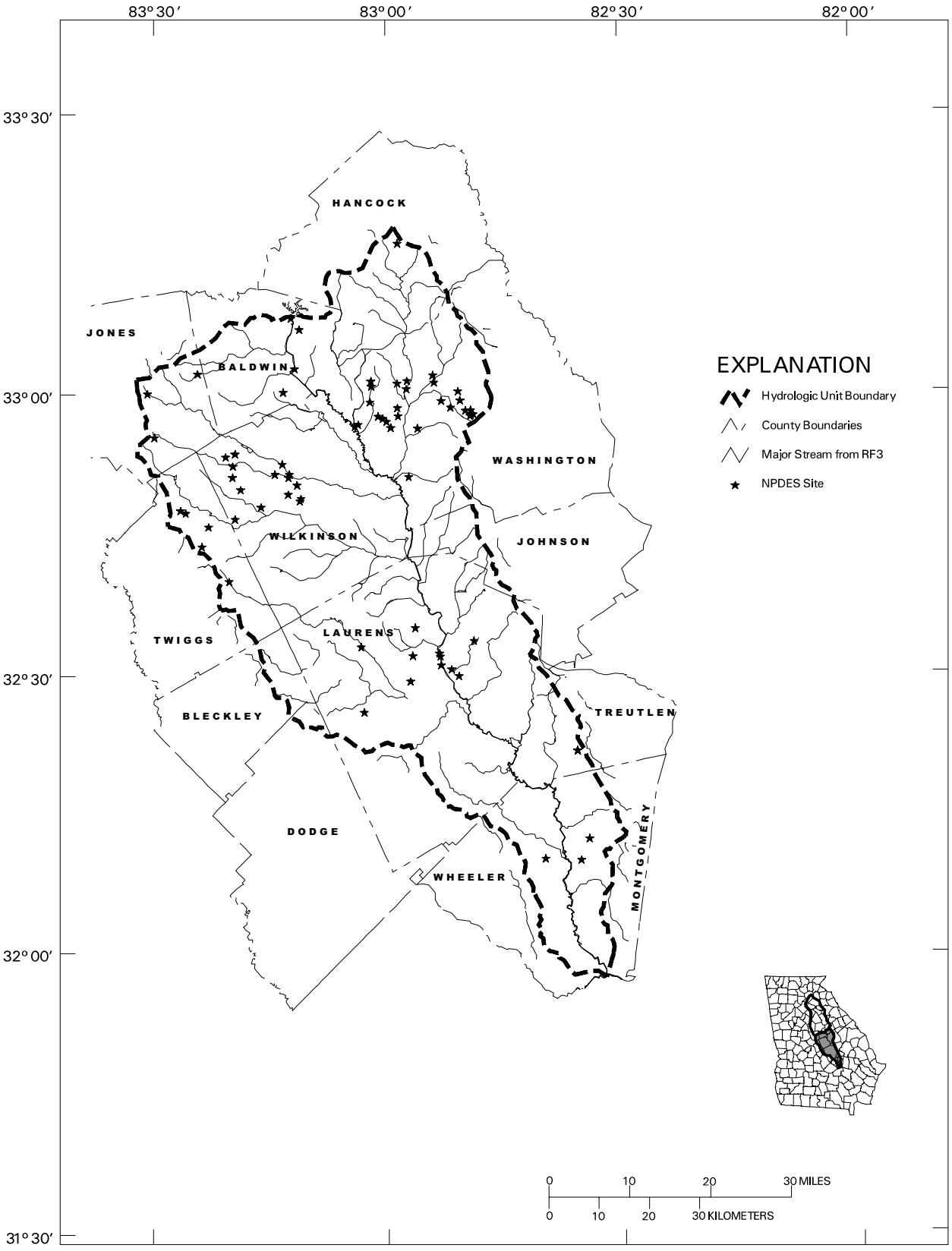

Figure 4-3. NPDES Sites Permitted by GAEPD, Lower Oconee River Basin, HUC 03070102

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 can also increase the temperature of a receiving stream during warm weather, which can have an adverse impact on aquatic life. 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. Permits in the Oconee basin are shown in Table 4-4.

Table 4-4. Permitted Municipal Separate Storm Sewer Systems, Oconee River Basin

Permit #	GAS000139	GAS000118
Permittee	Dacula	Gwinett County
Contact	Mike Moon, Mayor	David Chastant, DOT
Address	P.O. Box 400	75 Langley Drive
City	Dacula	Lawrenceville
ZIP	30211	30245
County	Gwinett	Gwinett
Type	Large/Gwinett Coapp	Large/Lead Coapp
Issued	6/15/94	6/15/94
Expires	6/14/99	6/14/99
HUC	03070101	03070101

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. 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 11th subcategory, construction activities, will be covered under a separate general permit. 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 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. As of March 1998,

201 NOIs had been filed for the Oconee basin. The distribution of NOIs by HUC is as follows:

HUC 03070101 (Upper Oconee)	151
HUC 03070102 (Lower Oconee)	51

Non-discharging 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, a 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 major wastewater land application systems (permitted flow greater than 0.01 MGD) within the Oconee Basin are listed in Table 4-5. The locations of all LASs within the basin are shown in Figures 4-4 through 4-5.

Table 4-5. Wastewater Land Application Systems in the Oconee River Basin

Operator	Location	Permit No.	Permitted Flow (MGD)
HUC 03070101 (Oconee River above Lake Sinclair Dam)			
Braselton LAS	Jackson	GA02-175	0.105
Jefferson LAS	Jackson	GA02-230	0.287
Wayne Poultry Company	Jackson	GA01-546	0.700
Mott's Valley Fresh, Inc.	Jackson	GA01-477	0.080
Winder LAS	Barrow	GA02-014	1.650
Barrow Co. Board of Comm	Barrow	GA02-271	0.500
Harrison Poultry	Barrow	GA01-532	0.700
Family Live Enrichment Center	Oconee	GA03-928	0.012
Linger Longer LAS	Greene	GA03-897	0.075
Great Waters LAS	Putnam	GA02-072	0.070
HUC 03070102 (Oconee River below Lake Sinclair Dam)			
East Dublin LAS	Laurens	GA02-270	0.312
Campbells Frest	Laurens	GA01-389	0.100

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

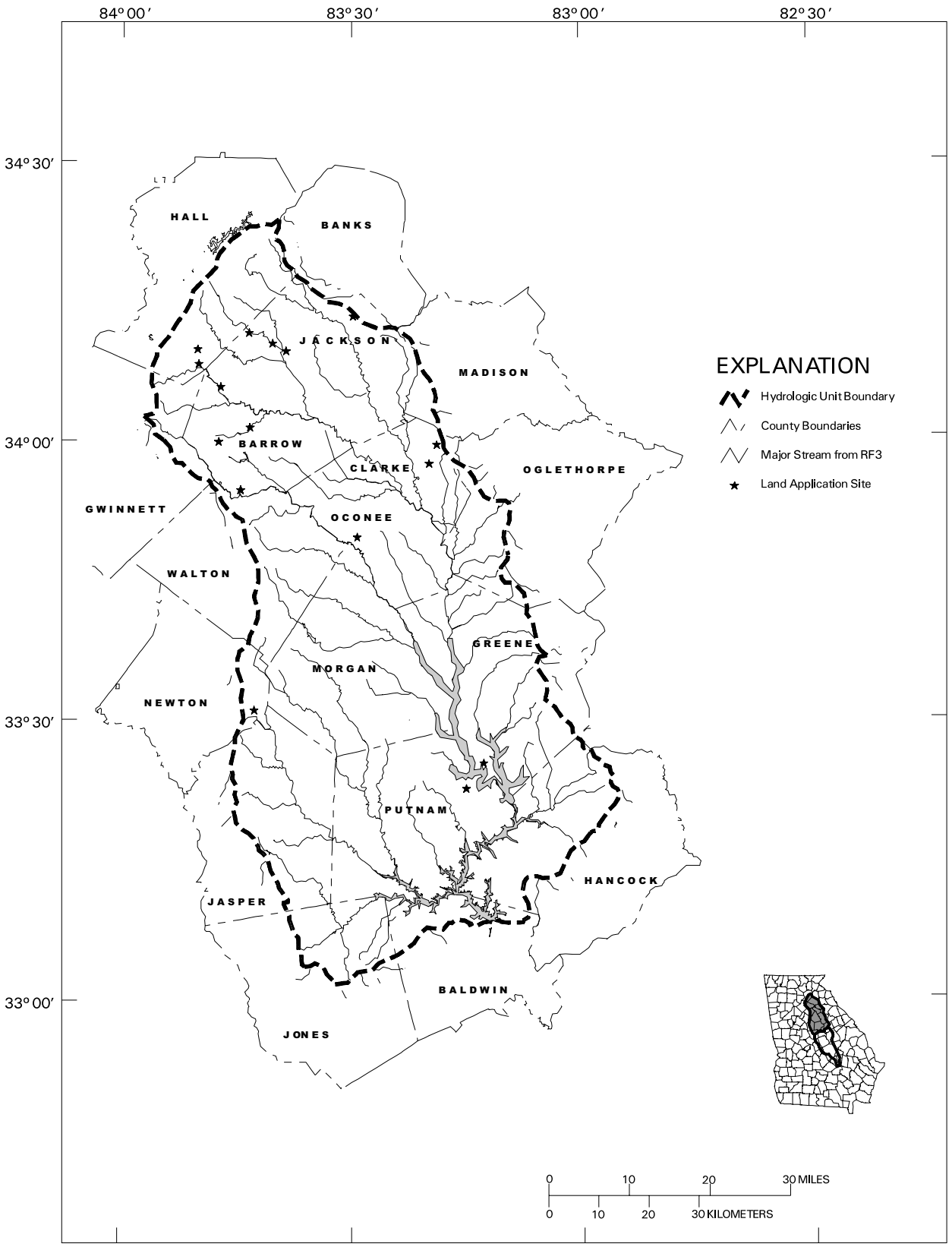

Figure 4-4. Land Application Systems, Upper Oconee River Basin, HUC 03070101

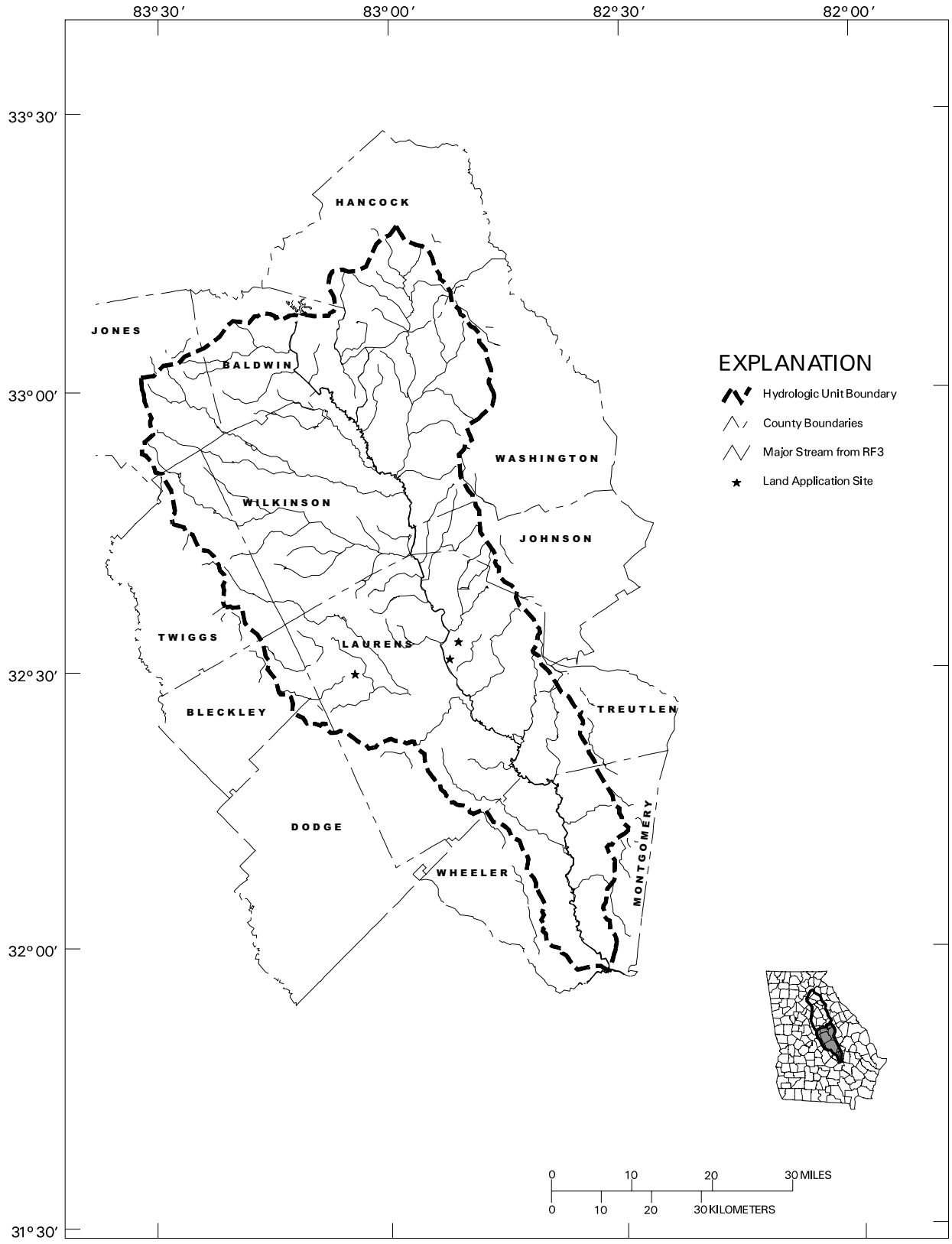

Figure 4-5. Land Application Systems, Lower Oconee River Basin, HUC 03070102

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 at any landfills in Georgia. Ground water 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 remediate potential threats. 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 Table 4-6 and Figures 4-6 through 4-7.

4.1.2 Nonpoint Sources

The pollution impact on Georgia's streams has radically shifted over the last two decades. Streams are no longer dominated by untreated or partially treated sewage discharges which 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. They can generally be defined as the pollution caused by rainfall or snowmelt moving over and through the ground. As water moves over or 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 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 1996-1997 water quality assessment results for the Oconee 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 it can also include crop debris and animal wastes. Excess sediment loads can damage aquatic habitat by smothering and shading food organisms, altering natural substrate, and destroying spawning areas. Runoff with elevated sediment concentrations can also scour

Table 4-6. Permitted Landfills in the Oconee River Basin

Permit Number	Name	County	Type
005-001D(L)	Burnett Lake Laurel Road	Baldwin	Landfill
104-007D(SL)	US 441 N PH2	Morgan	Sanitary Landfill
108-002D(SL)	Mayne Mill Rd.	Oconee	Sanitary Landfill
069-007D(SL)	US 129 landfill	Hall	Sanitary Landfill
069-008D(SL)	Allen Creek PH - A	Hall	Sanitary Landfill
117-004D(SL)	Martin Mill Rd. PH1	Putnam	Sanitary Landfill
108-007D(SL)	US 441 CR 109	Oconee	Sanitary Landfill
104-006D(SL)	US 441 N PH1	Morgan	Sanitary Landfill
007-016D(SL)	Finch Road PH2 & PH3	Barrow	Sanitary Landfill
007-018D(SL)	Speedway SR 324 Site 1	Barrow	Sanitary Landfill
007-020D(SL)	Republic Waste - Oak Grove MSW	Barrow	Sanitary Landfill
029-002D(SL)	Athens-Winterville	Clarke	Sanitary Landfill
029-004D(SL)	Dunlap Rd. PH1	Clarke	Sanitary Landfill
029-009D(L)	Coggins - Trade St.	Clarke	Landfill
029-012D(SL)	Dunlap Rd. PH2 3 &4	Clarke	Sanitary Landfill
066-007D(SL)	US 278 & 77N PH1	Greene	Sanitary Landfill
066-008D(SL)	US 278 & 77N PH2	Greene	Sanitary Landfill
067-005D(L)	City of Dacula	Gwinnett	Landfill
078-009D(SL)	Prison Farm PH2	Jackson	Sanitary Landfill
117-007D(SL)	Putnam County - CR 29	Putnam	Sanitary Landfill
069-014D(C&D)	Reliable Tire Service	Hall	Construction & Demolition
069-015D(MSWL)	Candler Rd. Hwy. 60	Hall	Municipal Solid Waste
070-002D(SL)	Sparta - Fairmount/Stockade Rd	Hancock	Sanitary Landfill
079-004D(SL)	SR 212 - Monticello	Jasper	Sanitary Landfill
104-002D(SL)	Lower Apalachee Rd.	Morgan	Sanitary Landfill
005-017D(SL)	Union Hill Church Road PH3	Baldwin	Sanitary Landfill
087-008D(SL)	Bethsaida Church Rd.	Laurens	Sanitary Landfill
087-015D(SL)	Old Macon Rd.	Laurens	Sanitary Landfill
103-001D(SL)	US 221 Ailey PH1	Montgomery	Sanitary Landfill
087-009D(SL)	East Dublin - Nathaniel Dr. Ro	Laurens	Sanitary Landfill
005-005D(SL)	D&C Refuse - Woodmine	Baldwin	Sanitary Landfill
005-002D(SL)	City of Milledgeville	Baldwin	Sanitary Landfill
005-016D(SL)	Union Hill Church Road PH2	Baldwin	Sanitary Landfill
005-015D(L)	Central State Hospital - Freem	Baldwin	Landfill
005-012D(SL)	Milledgeville - English Stouff	Baldwin	Sanitary Landfill
005-004D(SL)	Central State Hospital	Baldwin	Sanitary Landfill
143-005D(SL)	Old McCallum Pond Rd.	Twiggs	Sanitary Landfill
143-008D(SL)	US 80	Twiggs	Sanitary Landfill
150-001D(SL)	SR 68	Washington	Sanitary Landfill
150-006D(SL)	Kaolin Rd. S PH1	Washington	Sanitary Landfill
150-009D(SL)	Kaolin Rd. S No. 2	Washington	Sanitary Landfill
150-010D(MSWL)	Kaolin Rd. S PH3	Washington	Municipal Solid Waste
153-005D(SL)	Treutlen & Wheeler Cos. SR 46	Wheeler	Sanitary Landfill
158-010D(SL)	SR 57 Public Works Camp	Wilkinson	Sanitary Landfill

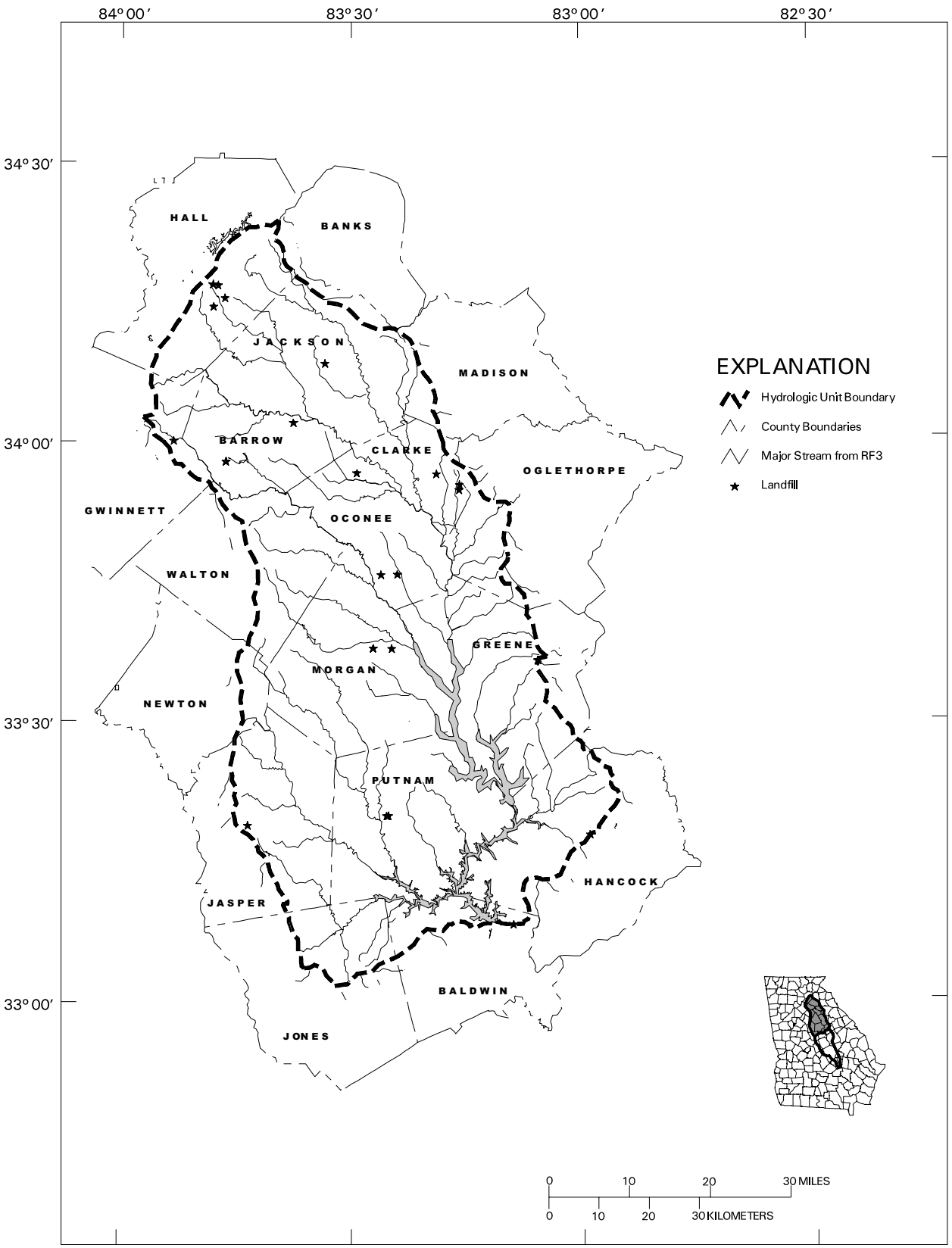

Figure 4-6. Landfills, Upper Oconee River Basin, HUC 03070101

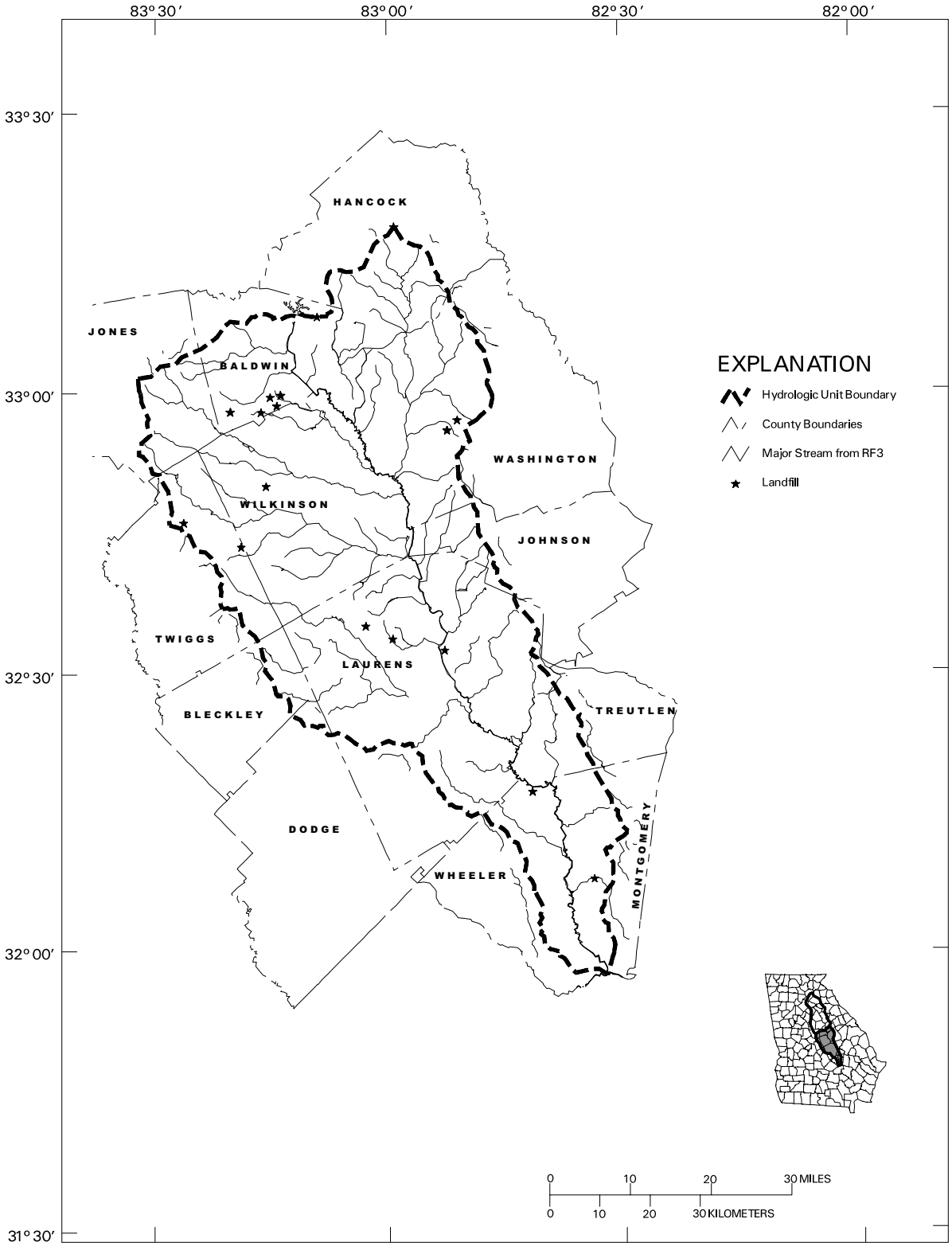

Figure 4-7. Landfills, Lower Oconee River Basin, HUC 03070102

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, is transported attached to sediment. Many organic chemicals used as pesticides or herbicides are also transported predominantly attached to sediment.

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 to 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 the phosphorus in solution.

In 1993, the Soil Conservation Service (SCS, now NRCS) completed a study to identify hydrologic units in Georgia with 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 loadings to potentially impair their designated uses, based on estimates of transported sediments, nutrients, and animal waste from agricultural lands (Table 4-7).

Table 4-7. 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)
Baldwin	100	23,104	20,698	29.5	63	0.10	25	0.038
Barrow	100	27,140	26,648	31.1	424	0.55	65	0.085
Bleckley	17	50,650	45,873	28.0	147	0.12	51	0.041
Clarke	96	8,965	16,070	55.4	121	0.48	31	0.123
Dodge	1	66,898	44,284	17.6	133	0.08	50	0.031
Greene	77	34,138	5,840	6.0	62	0.06	20	0.021
Gwinnett	14	16,491	2,761	5.9	75	0.16	18	0.038
Hall	37	44,459	33,924	26.8	453	0.36	87	0.069
Hancock	69	19,267	9,754	16.1	30	0.06	12	0.022
Jackson	93	57,347	37,374	21.3	423	0.26	101	0.062
Jasper	64	35,960	13,739	12.9	99	0.10	39	0.038
Johnson	15	52,411	52,700	26.9	202	0.16	64	0.051
Jones	56	24,772	31,043	43.5	109	0.16	39	0.056
Laurens	81	100,335	100,069	26.8	296	0.12	108	0.044

County	Percent of Area in Basin	Acres with Nutrient Application	Sediment (tons)	Sediment (ppm)	Nitrogen (tons)	Nitrogen (ppm)	Phosphorus (tons)	Phosphorus (ppm)
Madison	5	54,858	74,106	43.5	481	0.31	72	0.046
Montgomery	42	36,693	32,710	25.4	92	0.10	36	0.040
Morgan	100	63,132	56,669	29.3	272	0.15	93	0.052
Newton	11	40,140	51,916	44.0	153	0.14	60	0.053
Oconee	100	27,359	30,067	32.7	396	0.51	86	0.112
Oglethorpe	17	41,384	31,518	24.6	315	0.27	84	0.072
Putnam	100	37,926	33,302	30.9	153	0.14	48	0.045
Treutlen	35	19,053	16,644	21.6	46	0.10	18	0.039
Twiggs	36	17,745	17,509	29.4	47	0.11	18	0.043
Walton	50	46,626	49,674	31.9	198	0.15	69	0.053
Washington	42	90,978	94,776	35.3	265	0.12	101	0.046
Wheeler	45	34,600	40,088	31.7	112	0.13	43	0.051
Wilkinson	100	18,635	8,601	16.6	41	0.09	13	0.029

Note: Mass estimates are based on whole county. Concentration estimates are average event runoff concentration from agricultural lands.

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 4-8.

Table 4-8. Waters Identified as Potentially Impacted by Agricultural Nonpoint Source Loading and Added to the Georgia 303(d) List

Waterbody	County	Pollutant(s) of Concern
Little River	Morgan and Putnam	Habitat
Sugar Creek	Morgan and Putnam	Nutrients
Hard Labor Creek	Morgan and Walton	Habitat
Lower Middle Oconee River	Barrow, Clarke, and Jackson	Not Identified
Middle Mulberry River	Barrow and Jackson	Habitat
Upper Mulberry River	Hall, Barrow, and Jackson	Habitat/Sediment
Walnut Creek	Hall and Jackson	Habitat
North Oconee River	Hall and Jackson	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 water 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, including 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 primary transported directly through surface runoff, either in dissolved form 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 pesticides/herbicides used within the basin include 2,4-D, Prowl, Blazer/Basagran, Trifluralin/Treflan/Trilin, AAtrex/Atrizine, Gramoxone, Classic, Lexone/Sencor, and Lasso (alachlor) (compiled from the Georgia Herbicide Use Servey Summary [Monks and Brown, 1991]). Since 1990, the use of alachlor in Georgia has decreased dramatically since peanut wholesalers no longer buy peanuts treated 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, insects). Other common nonherbicide pesticides include chlorothalonil, aldicarb, chlorpyrifos, methomyl, thiodicarb, carbaryl, acephate, fonofos, methyl parathion, terbufos, disulfoton, phorate, triphenyltin hydroxide (TPTH), and synthetic pyrethroids/pyrethrins. Application periods of the principal agricultural pesticides span the calendar year in the basin. However, agricultural pesticides are applied most intensively and on a broader range of crop types 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. All these pesticides are now banned by USEPA 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 Oconee basin is diffuse runoff from urban, industrial, and residential land uses (jointly referred to as “urban runoff”). Nonpoint source contamination can 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 (Section 4.1.1.3). Separate storm water systems, however, are typically found in developed areas with high imperviousness and, frequently, sanitary sewer systems. 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 lawn, 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 Oconee River basin, although estimates of loading rates by land use types have been widely applied in other areas. Peters and Kandell (1997) present a water quality index for streams in the Atlanta region, based primarily on nutrients and nutrient-related parameters. Data for metals, organics, biological conditions, and suspended sediment were generally unavailable. They report that the annual average index of water quality conditions generally improved at most long-term monitoring sites between 1986 and 1995. However, conditions markedly worsened between 1994 and 1995 at several sites where major development was ongoing.

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 Statistical Area (MSA). The herbicides most commonly used by the lawn-care industry are combinations of dicamba, 2,4D, mecoprop (MCPP), 2,4DP, and MCPA, or other phenoxy-acid herbicides. 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, and 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, 2,4D, 2,4DP, dicamba, and chlorsulforon. Herbicides are used for preemergent control of crabgrass in February and October and for postemergent control in the summer. 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 is the responsibility of the EPD Land Protection Branch. Petroleum hydrocarbons and lead are typically the pollutants associated with such tanks.

Nonpoint Sources from Forestry

Forest land is the dominant cover in the Oconee Basin, accounting for 69 percent of land cover in 1991. Undisturbed forest land generally presents very low stressor loading compared to other land uses, while conversion of forest to urban/residential land uses is often associated with water quality degradation. From 1982 through 1989, the area classified as commercial forest land within the Oconee basin decreased by approximately 1,053 acres.

Silvicultural operations may serve as sources of stressors, primarily contributing 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 on water quality from erosion and sedimentation is increased if BMPs are not adhered to.

As of the 1996-1997 *Water Quality in Georgia* report (EPD, 1998), no streams in the basin were identified 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 entire Oconee basin, the GFC evaluated 34 sites involving 3,718 acres of land. Twenty three sites totaling 2,319 acres were located on private lands, 8 sites totaling 1,159 acres were located on forest industry land, and 3 sites totaling 200 acres were located on public land. Overall compliance with BMPs was 93 percent. By ownership, compliance was 90 percent on private lands, 97 percent on forest industry lands, and 100 percent on public lands. Compliance for roads, timber harvesting, site preparation, and regeneration is discussed in the following paragraphs.

The majority of main haul roads evaluated on 34 sites were in compliance with BMPs. Problems were noted where roads did not follow the contour, and where water diversions to slow surface water flow and divert the flow out of the road were needed but not installed. Main haul roads crossed streams on almost half of the sites, and culverts were sized correctly for the majority of the watershed. Almost a third of the crossings were located on grades that were too steep, and were not stabilized correctly. By ownership, road compliance for private lands, forest industry, and public lands was 94 percent, 97 percent and 100 percent, respectively.

The majority of the harvested acres evaluated on 32 sites were in compliance with BMPs. Problems were noted where water bars were not installed in skid trails on sites with sloping terrain. Only 47 percent of the log decks were stabilized. Equipment was improperly serviced on 9 percent of the sites. Harvesting within the recommended Streamside Management Zones (SMZs) occurred on only 16 sites and resulted in 25 percent of the zones being rutted or damaged and excess logging debris left in the streams on 63 percent of the sites. Log decks were properly located outside the recommended zone. Temporary stream crossings occurred on a few sites and were properly removed after the harvest on almost half of the sites. By ownership, harvesting compliance for private, forest industry, and public lands was 90 percent, 97 percent, and 100 percent, respectively.

The majority of the 351 site-prepared acres which were evaluated on five sites were in compliance with BMPs. The main problem with noncompliance involved heavy mechanical clearing where too much topsoil was pushed into windrows. There was

excellent compliance with other BMPs. By ownership, site preparation compliance for private lands and forest industry was 99 percent and 97 percent, respectively.

Two tracts involving 115 acres were evaluated for regeneration, and all 115 were in compliance with BMPs. The tracts occurred on private lands.

Pesticides and Herbicides from Silviculture

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 1970s.

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

Chemical control of insects and diseases is not widely practiced except in forest tree nurseries, 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 is one commercial forest tree nursery in Laurens County and one seed orchard in Baldwin County.

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. 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 can increase oxygen consumption by aquatic species.

Natural flows in the Oconee have been altered by the construction of major and minor dams.

4.1.4 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 Oconee 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 Oconee 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.

Sources of Nutrient Loading

The major sources of nutrient loading in the Oconee basin are wastewater treatment facilities, urban runoff and storm water, and agricultural runoff. Concentrations found within rivers and lakes of the Oconee 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 net load arising from all sources may, however, be examined from instream monitoring. Long-term trends in nutrients within the Oconee River basin can be obtained by examining results from EPD long-term trend monitoring stations.

Trends in instream total phosphorus concentrations at three sites in the Oconee River are shown in Figures 4-8 through 4-10, and are summarized in Table 4-9.

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. Problems with oxygen depletion in rivers and streams of the Oconee basin are associated with oxygen-demanding wastes from point and nonpoint sources. Historically,

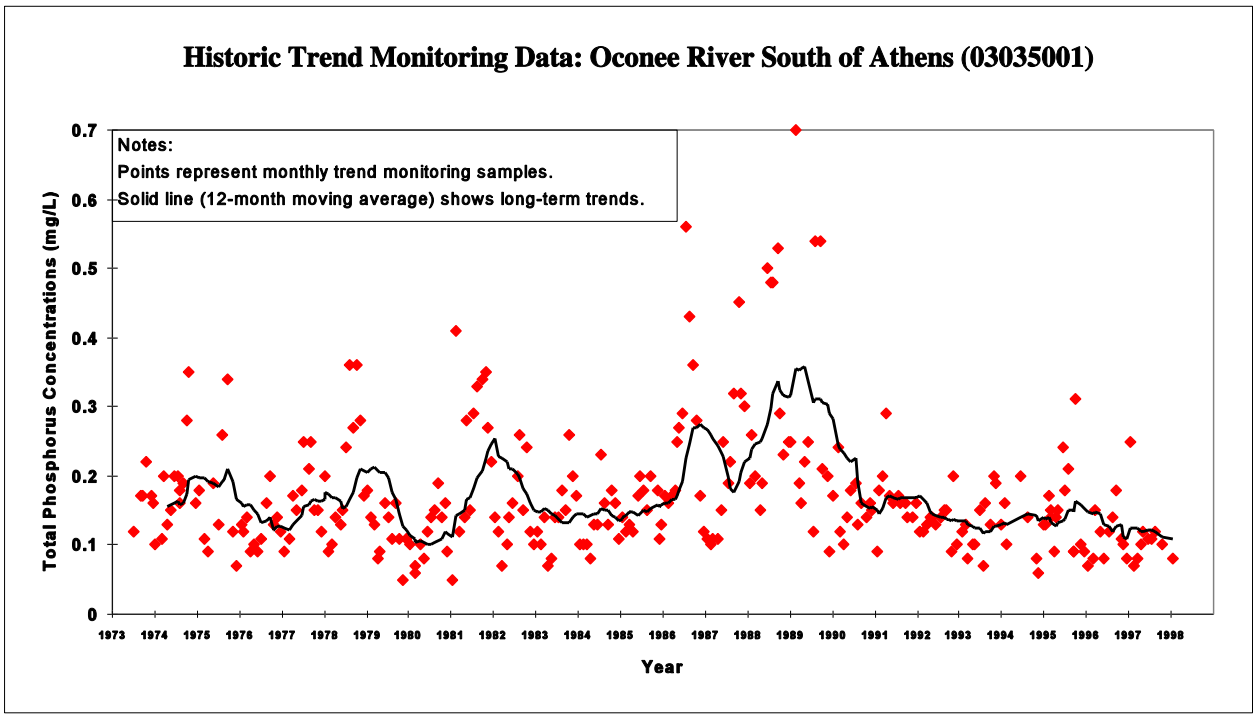

Figure 4-8. Total Phosphorus Concentrations, Oconee River South of Athens, 1973-1998

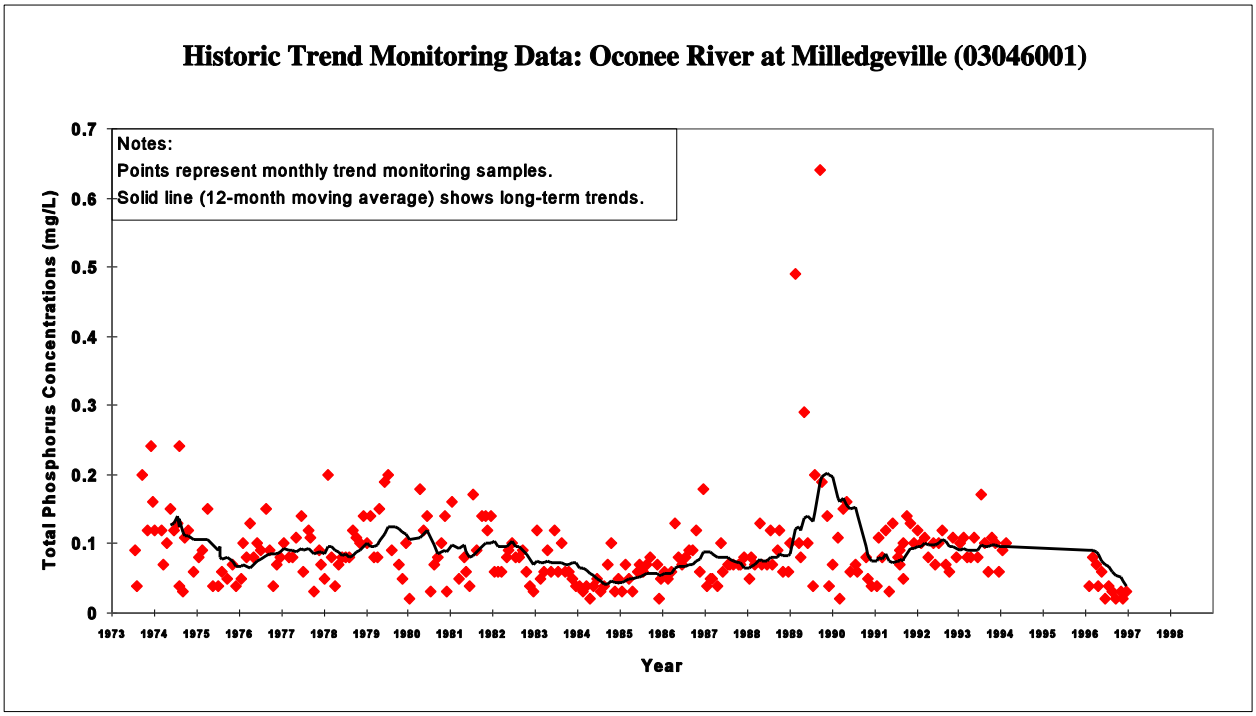

Figure 4-9. Total Phosphorus Concentrations, Oconee River near Milledgeville, 1973-1996

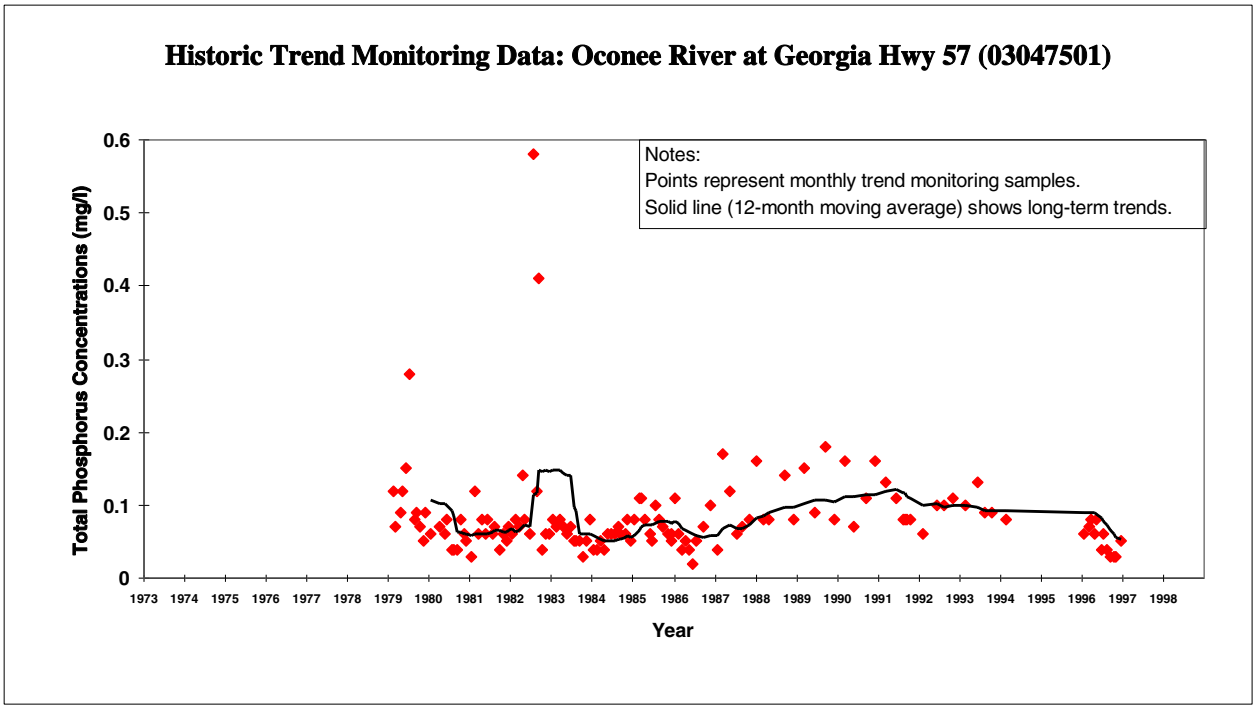

Figure 4-10. Total Phosphorus Concentrations, Oconee River at Georgia Highway 57, 1979-1996

Table 4-9. Summary of Phosphorus Concentration Data in Oconee River Mainstem

Station	Years	Phosphorus Concentrations (mg/L)			
		Average	Median	Minimum	Maximum
South of Athens	1973-1998	0.17	0.15	0.05	0.70
Near Milledgeville	1973-1996	0.09	0.08	0.02	0.64
Georgia Highway 57	1979-1996	0.08	0.07	0.02	0.58

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.

Trends in instream dissolved oxygen concentrations at three sites in the Oconee River are shown in Figures 4-11 through 4-13, and are summarized in Table 4-10. All waters in the Oconee basin have a state water quality standard of 5.0 mg/L. As shown in Figures 4-11 through 4-13, this standard has seldom been violated at these three sites, and there has been a general upward trend in dissolved oxygen concentrations as point sources have been brought under tighter control.

4.2.3 Metals

Violations of water quality standards for metals (e.g., lead, copper, zinc) were the third most commonly listed causes of nonsupport of designated uses in the 1996-1997 water quality assessment of the Oconee basin, after fecal coliform and poor fish communities. In most cases, these metals are attributed to nonpoint urban runoff and

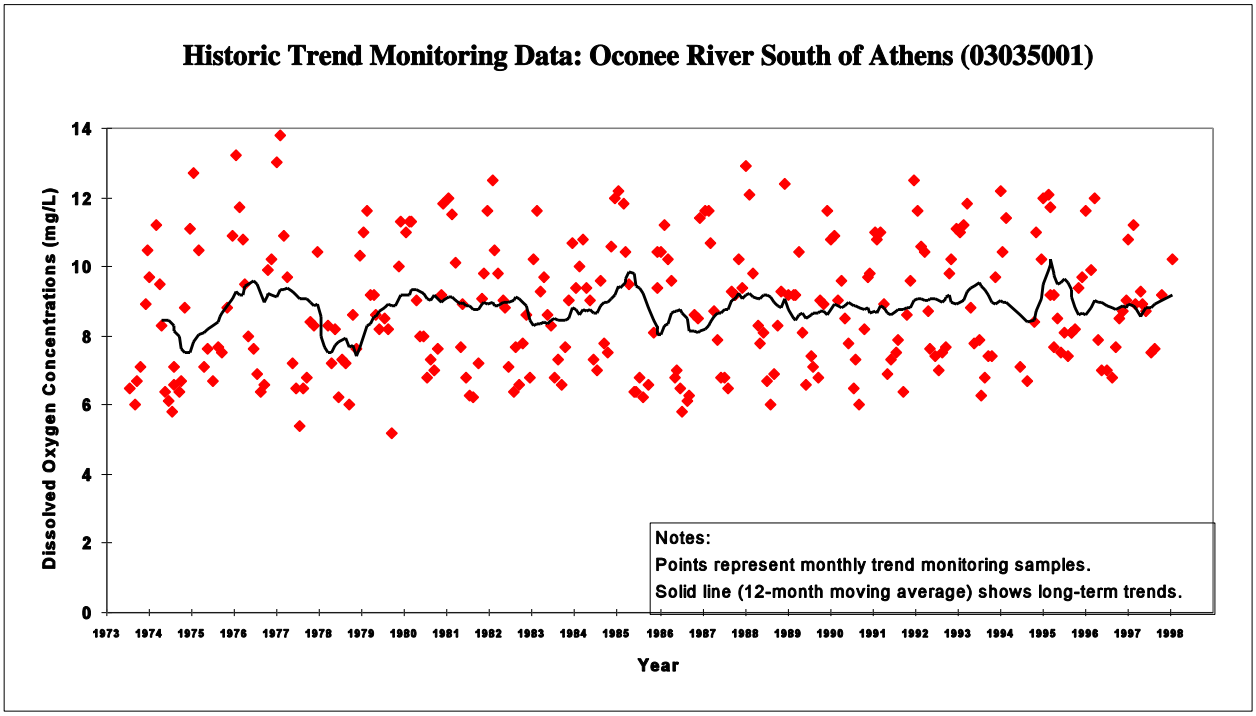

Figure 4-11. Dissolved Oxygen Concentrations, Oconee River South of Athens, 1973-1998

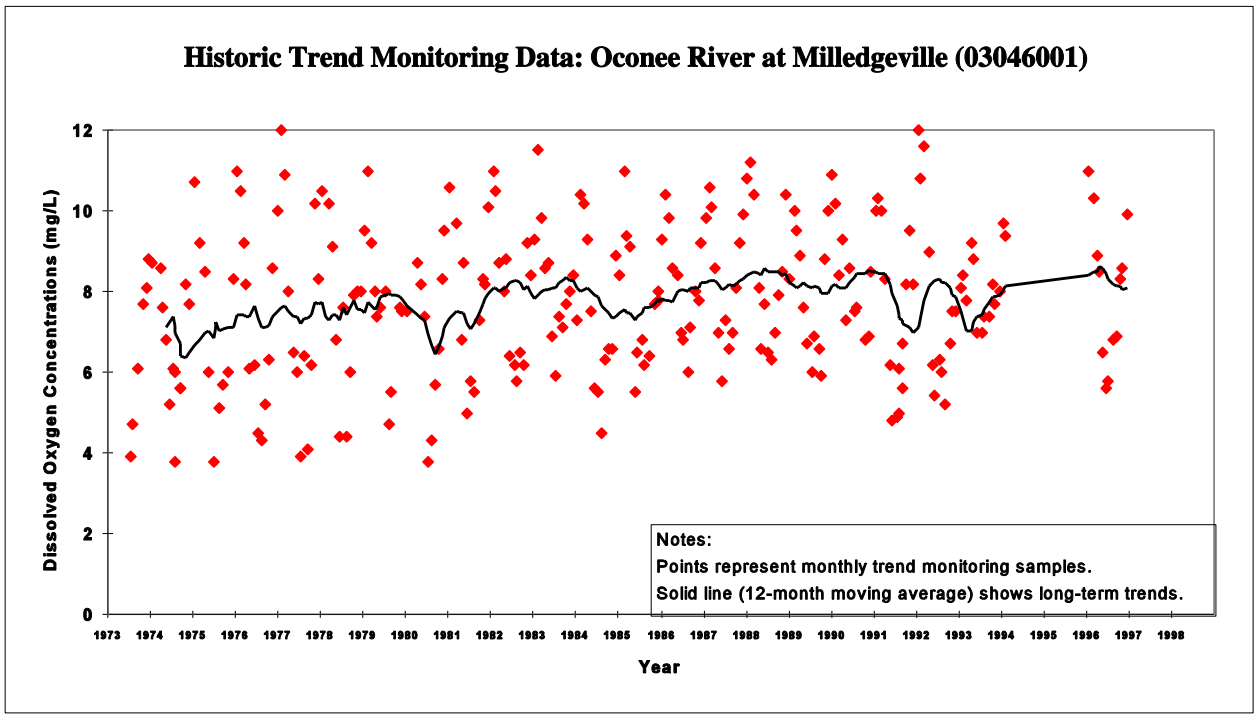

Figure 4-12. Dissolved Oxygen Concentrations, Oconee River near Milledgeville, 1973-1996

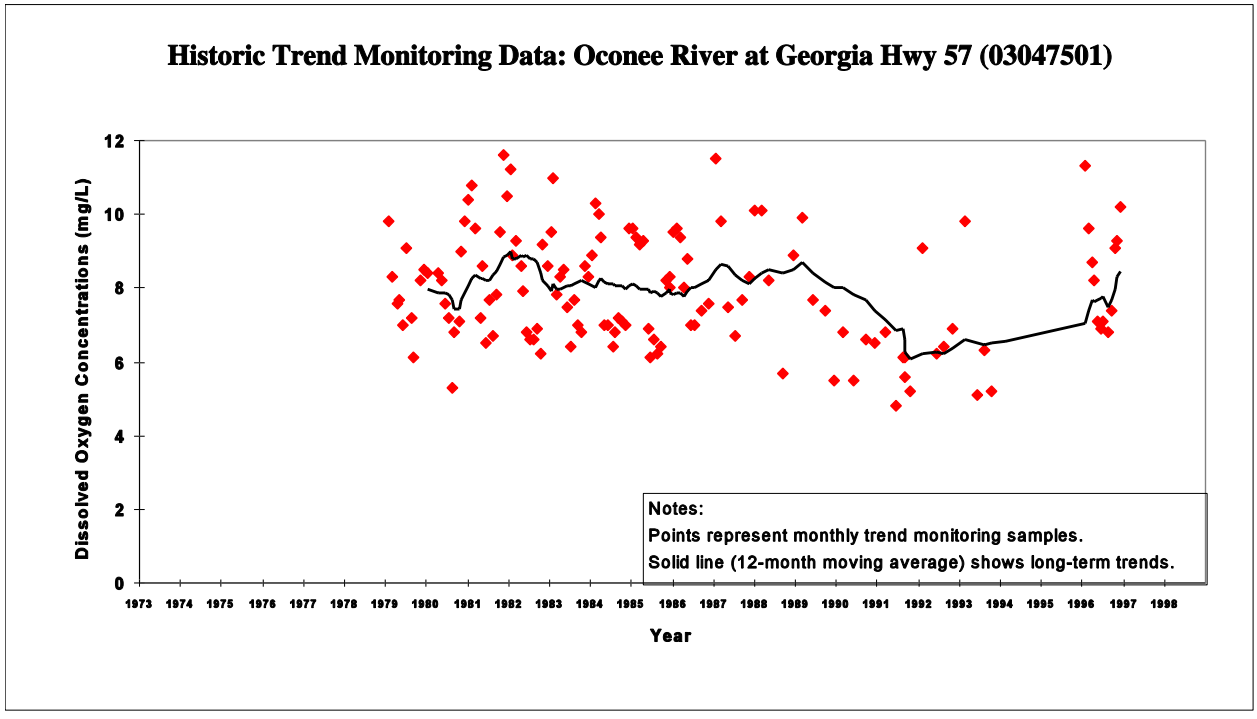

Figure 4-13. Dissolved Oxygen Concentrations, Oconee River at Georgia Highway 57, 1979-1996

Table 4-I0. Summary of Dissolved Oxygen Concentration Data in Oconee River Mainstem

Station	Years	Dissolved Oxygen Concentrations (mg/L)			
		Average	Median	Minimum	Maximum
South of Athens	1973-1998	8.8	8.6	5.2	13.8
Near Milledgeville	1973-1996	7.8	7.8	3.8	12.0
Georgia Highway 57	1979-1996	8.0	7.7	4.8	11.6

storm water. Point sources also contribute metals loads; however, major point sources of metals in the Oconee 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.

It should be noted that sample data on metals in many streams is rather sparse, and there are concerns regarding the quality of some of the older data. Although urban runoff appears to be the primary source of loading of these stressors, loading rates have not been quantified and will require additional study.

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 1996-1997 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. 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 Oconee River have generally been rapidly corrected in recent years.

Trends in instream fecal coliform concentrations at three sites in the Oconee River are shown in Figures 4-14 through 4-16, and are summarized in Table 4-11. These figures show that fecal coliform concentrations have been dropping at all three sites as point sources have been brought under tighter control.

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 nonpoint sources of pollution appear to present the greatest problem for fecal coliform loading in the upper portion of the Oconee basin (HUC 03070101).
- Urban and rural input from failed or ponding septic systems.

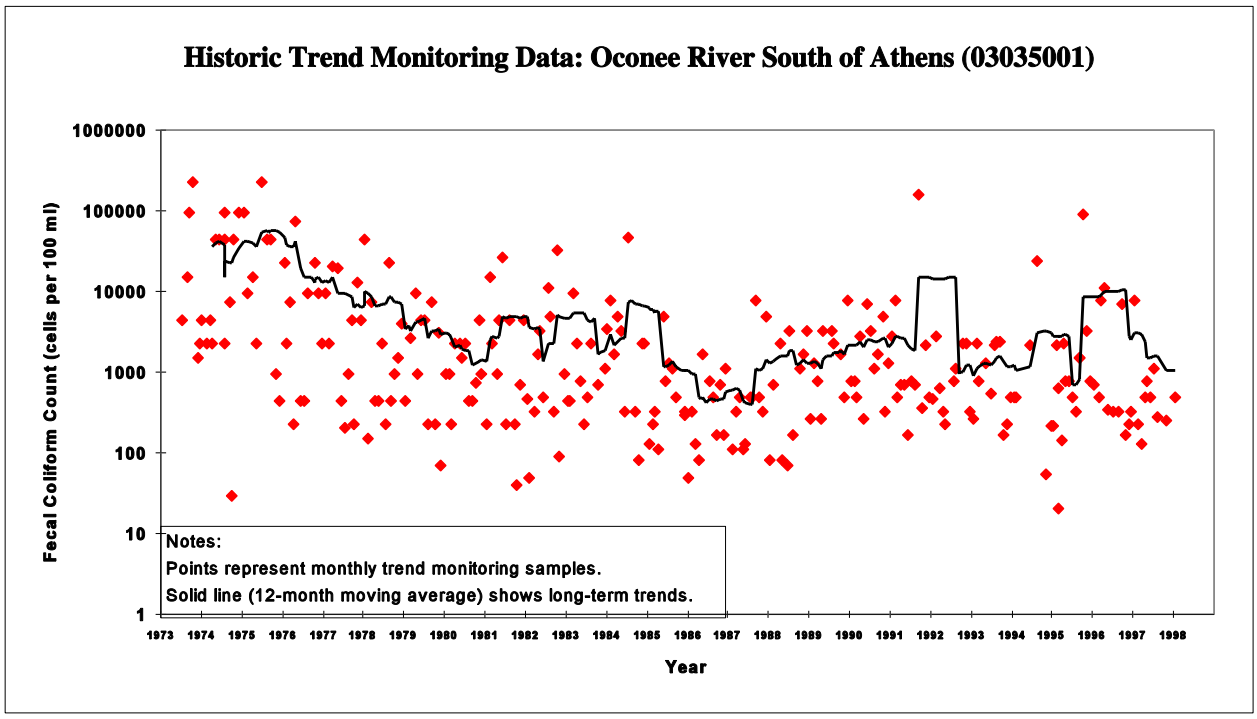

Figure 4-14. Fecal Coliform Counts, Oconee River South of Athens, 1973-1998

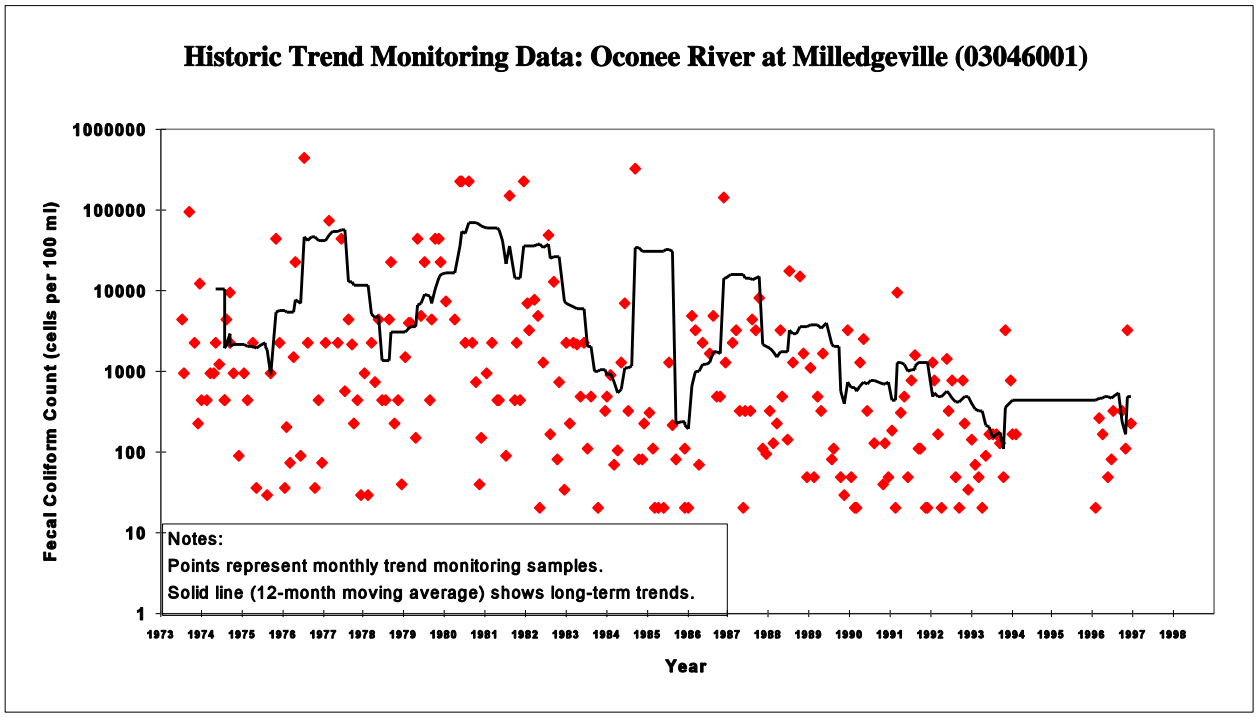

Figure 4-15. Fecal Coliform Counts, Oconee River near Milledgeville, 1973-1996

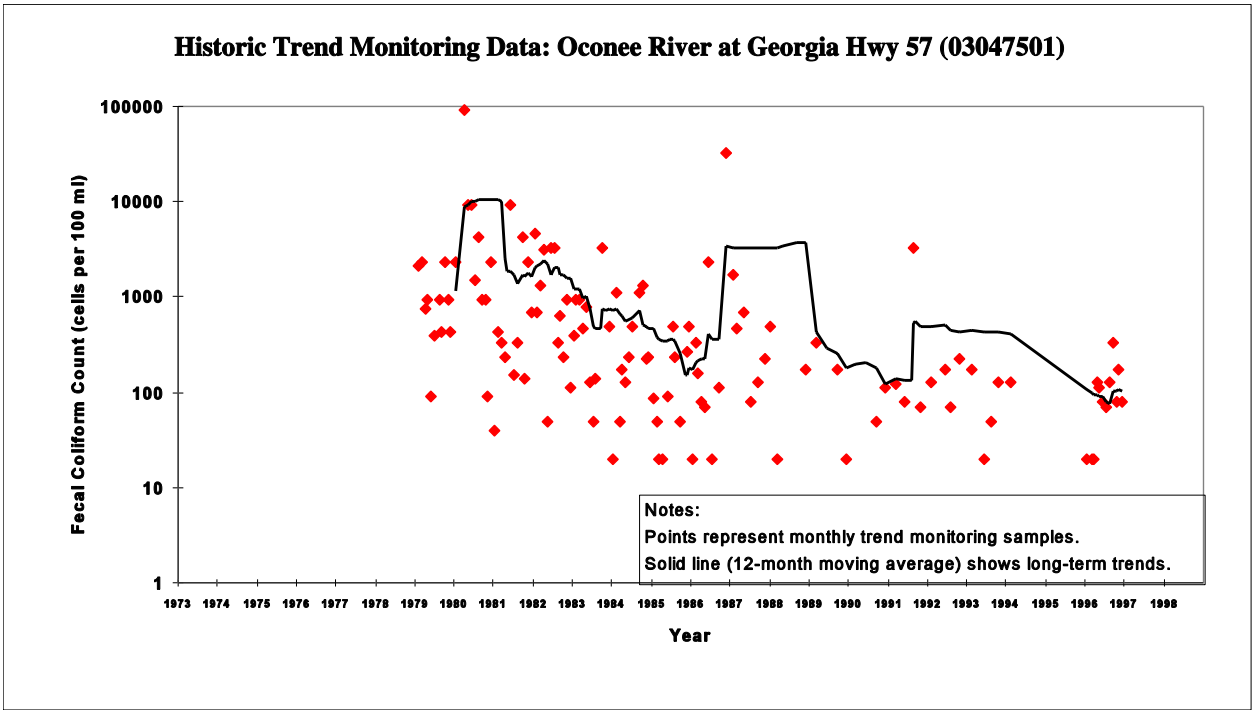

Figure 4-16. Fecal Coliform Counts, Oconee River at Georgia Highway 57, 1979-1996

Table 4-11. Summary of Fecal Coliform Concentration Data in Oconee River Mainstem

		Fecal Coliform Count (cells per 100 ml)				
Station	Years	Average	Median	Geometric Mean	Minimum	Maximum
South of Athens	1973-1998	8,150	930	1,280	20	230,000
Near Milledgeville	1973-1996	11,890	430	610	20	430,000
Georgia Highway 57	1979-1996	1,900	230	300	20	93,000

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.

To date, SOCs have not been detected in the surface waters of the Oconee River basin in problem concentrations. 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 and Temperature Modification

Stress from flow modification is primarily associated with peaking hydropower operation of dams on the Oconee River, as well as 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 metropolitan 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.

4.2.8 Habitat Degradation and Loss

In many parts of the Oconee basin, support for native aquatic life is 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 Oconee basin is loss of riparian tree cover, which can lead to increased water temperatures.

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Stell, S.M., E.H. Hopkins, G.R. Buell, and D.J. Hippe. 1995. Use and Occurrence of Pesticides in the Apalachicola-Chattahoochee-Flint River Basin, Georgia, Alabama, and Florida, 1960-91. Open-File Report 95-739. U.S. Geological Survey, Atlanta, Georgia.

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 Oconee 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

5.1.1 Municipal and Industrial Water Uses

As noted in Section 3.2, Municipal and Industrial (M&I) water use projections are not available for the entire Oconee basin, but they have been calculated for the growing area around Athens. According to Athens-Clarke County estimates, total municipal and industrial water demand for Clarke, Barrow, Jackson, and Oconee Counties is projected to increase from 29.54 MGD in 2000 to 63.23 MGD by 2050. As stated in Section 2.1.4, the Upper Oconee basin Water Authority has proposed a 52-MGD reservoir to supply water to the four-county region. This reservoir, the Bear Creek Regional Reservoir, is under development and is expected to begin selling water by mid-2001. The reservoir will cover 505 acres and hold 14,980 acre-feet of water at normal pool, and it is expected to satisfy water needs for the four counties through the year 2050.

Overall Surface Water Quality

Overall the surface water quality in the Oconee River basin is good for use as drinking water. All public water systems in the state of Georgia that use surface water meet the 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 that withdraw surface water from the Oconee River and tributaries. The contaminant of most concern is high 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 must be applied to settle out the sediment. Many water plants have reservoirs to store larger amounts of water and to settle out excess sediment (turbidity). In some

cases, taste and odor problems are associated with algae blooms in reservoirs, or with elevated concentrations or iron and manganese, which can arise when an anoxic, reducing environment exists in the bottom water of reservoirs. Table 5-1 summarizes the known and potential raw water quality problems affecting drinking water supplies associated with surface water intakes within the Oconee basin.

Overall Ground Water Quality

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 Oconee basin some public water system wells have been contaminated by local pollution sources such as leaking underground storage tanks, malfunctioning septic tank systems, and spills. If a well exceeds the Maximum Contaminant Level (MCL) for a contaminant, it is removed from service or additional treatment is added to the system. Also, a few springs in the basin have been found to be under the direct influence of surface water due to the geology of the area in which they are located. These springs are monitored and have additional treatment requirements.

5.1.2 Agriculture

Agricultural water demand is significant in the Oconee River basin. In 1995, water usage by animal operations was estimated at 3.8 billion gallons per year; crops and orchards, 4.0 billion gallons per year. For purposes of comparison, average annual flow in the Oconee River is over 1 trillion gallons per year (see Section 3.2.1). It is estimated that in 1995 there were 19,739 acres of irrigated land in the basin and 158,000 beef cattle, 140 million broilers, and 61,000 head of swine (estimates based on UGA-CES Georgia County Guide, 1996 Edition).

5.1.3 Recreation

Water-based recreation in the Oconee basin is primarily dependent on sufficient water flow in the streams to support boating, fishing, and water sports. It is unlikely that there will be any significant effect on these activities due to unavailability of water, with the possible exception of short-term stream flow changes during droughts when agricultural irrigation is very high.

5.1.4 Hydropower

Lake Oconee and Lake Sinclair are two major hydropower facilities, both operated by the Georgia Power Company. Wallace Dam has a generating capacity of 321 megawatts and impounds Lake Oconee, a 21,000-acre reservoir. The water released by Wallace Dam flows into Lake Sinclair, a 15,330-acre reservoir impounded by Sinclair Dam, with a generating capacity of 45 megawatts. Neither of these reservoirs has sufficient depth to provide meaningful storage volume for flood control.

5.1.5 Navigation

As noted in Section 3.2, there are no sections of the Oconee River or its tributaries for which the federal government maintains a navigation channel.

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

Oconee River above Lake Sinclair Dam (HUC 03070101)

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 Jefferson 1570003	Curry Creek	1	Y	1	Problems with algae blooms in reservoir due to runoff from upstream private ponds and poultry operations. Had to implement reservoir treatment. County has no local poultry ordinances. Shallow source subject to flashing and has natural occurrence of iron and manganese. Potential development upstream of intake.	Water system in compliance. Plant needs some upgrades. Partner in Upper Oconee Reservoir Project. City and county need to increase communication with agricultural interests upstream regarding runoff.
City of Winder 0130002	Cedar Creek	1	Y	2	Spring-fed creek flows through heavy urban and industrial area. Known problems with some industrial runoff, specifically soap suds. Major transportation corridors, CSX railroad, and Hwy 8 could pose significant potential pollution sources. Used to be primary source but city now relies on Fort Yargo Lake.	Water system in compliance. Plant located on Hwy 53 is older but recently upgraded. City needs to implement a better plan to handle backwash discharge to Fort Yargo Lake so that turbidity is not increased. Also, city needs to improve communication with local industries that might impact Cedar Creek.
	Fort Yargo Lake	1	Y		Source located in Fort Yargo State Park has well-protected watershed. New Hwy 8 plant has no discharge permit and backwash from plant is discharging into the lake. Discharge could become significant potential pollution source by increasing turbidity in the lake.	
	Mulberry River	1	N		Some development in watershed and major transportation corridor, I-85. Some erosion and sedimentation problems.	

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 Athens - Clarke County 0590000	Sandy Creek (Inactive)	1	N	1	Inactive intake.	Water system in compliance. Plant in good condition. Currently undergoing plant expansion. Partner in Upper Oconee Reservoir Project. Unified government needs to work with developer of land near Middle Oconee intake to implement erosion and sedimentation practices to ensure minimum impact on water near intake.
	North Oconee River	1	Y		Intake pumps directly to plant and reservoir. Potential pollution sources from transportation corridors (Athens Bypass), urban development, local industrial runoff, and poultry operations upstream. Naturally occurring manganese sometimes a problem.	
	Middle Oconee River	1	Y		Intake impacted from runoff development. Occasionally, color problem caused by overflow of dye discharging from textile mill upstream in different county. Intake located at shallow area of river where natural sand buildup requires constant dredging. Potential pollution source from erosion and sedimentation runoff located in close proximity (100 yards) to intake. Adjacent area recently sold and being developed into homes.	
City of Statham 0130001	Barber Creek Reservoir	1	N	1	Shallow source in a swampy area. Past problem with taste and odor and extremely high iron and manganese due to shallow source. Problems with flashing due to erosion and sedimentation problems caused by increased residential and commercial development in drainage area. Heavy flashing problem has made water difficult to treat by package plant.	Package plant water system in compliance. Although system is only 4 years old, it was briefly out of compliance due to lack of maintenance, lack of certified personnel, and problems with treating water. System uses backup connection to Winder during heavy flashing periods. Partner in Upper Oconee Reservoir Project. City needs to look at other short-term options for providing drinking water. City needs to work with developers to implement erosion and sedimentation BMPs and improve treatment plant.

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 Madison 2110002	Hard Labor Creek	1	N	2	Shallow source subject to flashing. Intake subject to occasional silting and sand buildup.	Water system in compliance. Overall in good condition but needs more staff.
	Speeds Branch	1	N		Inactive intake.	
	Lake Oconee	1	Y		New intake and plant being developed to be on line by end of 1998.	
City of Greensboro 1330000	Lake Oconee	1	Y	1	Lake has high turbidity after heavy rain, erosion and sedimentation runoff due to residential development around the lake. Also potential pollution sources from transportation corridors (Hwy 278).	Water system in compliance. Overall in good condition but needs more staff.
City of Monticello 1590000	Lowery Branch	1	N	1	Drainage area is primarily pasture and agricultural, but overall water quality good.	Water system in compliance. Overall in good condition.
	Pope's Branch	1	N		Well protected drainage area except transportation corridors present (Hwy 228)	
Eatonton 2370000	Little River	1	N	1	Shallow source that naturally causes taste and odor problems and algae blooms. Also problems with iron and manganese.	Water system in compliance. Plant is at full capacity and cannot support future growth. In past system has violated water withdrawal permit.
City of Sparta 1410002	Lake Sinclair	1	Y	1	Subject to flashing from agricultural runoff. Potential pollution problems from recreational use of lake and transportation corridors (I-20, Hwy 441, and Rte 16)	Water system in compliance. Overall in good condition but needs more staff. Multiple users of Lake Sinclair need to work with agricultural interests upstream to ensure proper agricultural BMPs are being used.
	Fort Creek	1	N		Subject to flashing after heavy rain. Intake inactive.	
Georgia Power Company 2370003	Lake Sinclair	1	Y	1	Subject to flashing from agricultural runoff. Potential pollution problems from recreational use of lake and transportation corridors (I-20, Hwy 441, and Rte 16)	Water system in compliance. Overall in good condition. Multiple users of Lake Sinclair need to work with agricultural interests upstream to ensure proper agricultural BMPs are being used.

HUC 03170102 - Oconee River below Lake Sinclair Dam

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	Other Comments
City of Milledgeville 0090001	Oconee River (Central State Hospital)	1	N	2	Subject to some flashing. Potential pollution problems from Georgia Power - Plant Branch, railroad river crossing 1½ mile upstream, and other transportation corridors.	Water system in compliance. Overall in good condition. Plant recent upgrades and new filters.
	Oconee River	1	N		Subject to some flashing. Potential pollution problems from Georgia Power - Plant Branch, railroad river crossing upstream and other transportation corridors.	
City of Dublin 1750002	Oconee River	1	N	1	Some silting of intake and source subject to flashing. Potential pollution problems upstream from Georgia Power - Plant Branch. Milledgeville discharges may have impact also.	Water system in compliance. Overall in good condition.

5.1.6 Waste Assimilation Capacity

Sufficient flow for assimilation of treated wastewater in the Oconee River is most critical in the Athens area. Georgia has obligations under the Clean Water Act to meet instream water quality standards, and the state places a high priority on this obligation (see Section 6.0). Only under extreme drought conditions, when sufficient water flow is not available after domestic water supply needs are met, would there be insufficient water to meet instream water quality standards.

5.1.7 Assessment of Ground Water

Ground water zones are based on underlying geology and their rock units. Ground water assessment is discussed separately for each HUC since the two defined HUCs in the Oconee basin are relatively close to defining the natural ground water divide of Piedmont crystalline rock to the north and Coastal Plain sedimentary rocks to the south.

Piedmont Region: Oconee River above Lake Sinclair Dam (HUC 03070101)

There is some use of ground water in this area, as well as limited ground water potential. Small amounts of agricultural irrigation are present in these areas, while some locations have large or expanding poultry and poultry processing operations. Such facilities can be large ground water users. These operations can also lead to contamination of the underground aquifer and nearby streams because of nitrogen loading from land application of wastes.

Within this HUC, Hall and Barrow Counties are experiencing urban growth related to the continued expansion of Atlanta. The Athens-Clarke County area is also growing rapidly. Athens has investigated the use of ground water to supplement its water supply in certain outlying areas. Such larger users might decrease aquifer levels and therefore associated water supply to the streams during dry weather. South of these urbanizing areas, ground water use is limited.

Coastal Plain Region: Oconee River below Lake Sinclair Dam (HUC 03070102)

South of the Fall Line, the rock units present in the near surface are Cretaceous to Tertiary age sand, shale, and limestone units of the coastal plain depositional environment. Most industrial or municipal users rely solely on ground water for their water supply, though in this region associated municipal growth in water use is minimal. Agricultural interests use the underlying Cretaceous aquifer heavily near the fall line, while the overlying Floridan aquifer accounts for ground water supply at the southern limit of the basin. Laurens and Montgomery Counties have large and ever-expanding agricultural users, pulling hard on the Cretaceous and Floridan aquifers.

In Twiggs, Wilkinson, and Washington Counties, the major ground water users are the kaolin mining and clay processing companies. Large amounts of ground water are withdrawn both for mine de-watering, where lowering the water table in an area is essential for the continued mining of the kaolin clay, and for kaolin processing operations, where the water is used in the clay cleaning process. Clay operations are very substantial water users. Because of the nature of the business, they also continually change the locations of their mines as kaolin is mined out. Because of this movement, this sort of water use may dramatically affect the level of water in ever-changing, but localized, spots of the aquifer.

Generally, some springs might have been reduced in the Oconee basin either through lowering of the ground water table by withdrawals, especially in the kaolin belt, or

possibly by land use changes caused by the switch from forest to agricultural lands. Currently, no major ground water problems are present in the basin.

5.2 Assessment of Water Quality

This assessment of water quality reflects Georgia's water quality assessments for reporting to EPA under Section 305(b) of the Clean Water Act. 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 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, in 1989 the Board of Natural Resources adopted 31 numeric standards for the 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

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 standards, which are 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 water body 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...

promulgated by the U.S. Environmental Protection Agency (EPA). 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,
- 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 uses a variety of monitoring tools to collect information to determine if the waterbodies are supporting its designated uses. 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

During the late 1960s, EPD initiated long-term monitoring of streams at strategic locations throughout Georgia, called trend or ambient monitoring. This work is primarily accomplished through cooperative agreements with federal, state, and local agencies that 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 1996-1997 assessment were collected by other federal, state, and local governments, universities, contracted Clean Lakes projects, and utility companies. Trend monitoring stations located in the Oconee basin in 1994 are shown in Figure 5-1.

Changes in Trend Monitoring Stations

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 Oconee, Coosa, and Tallapoosa basins during the 1996 sampling.

Figure 5-2 shows the focused trend monitoring network for the Oconee basin used in 1996. During this period statewide trend monitoring was continued at the 37 core station locations statewide, in the Savannah Harbor, in the Chattahoochee at Atlanta and Columbus, and at continuous monitoring locations. The remainder of the trend monitoring resources were devoted to the Oconee, Coosa, and Tallapoosa 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 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 model. Models are used for wasteload allocations and/or TMDLs and as tools for use in making regulatory decisions. Impact studies are conducted where 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.

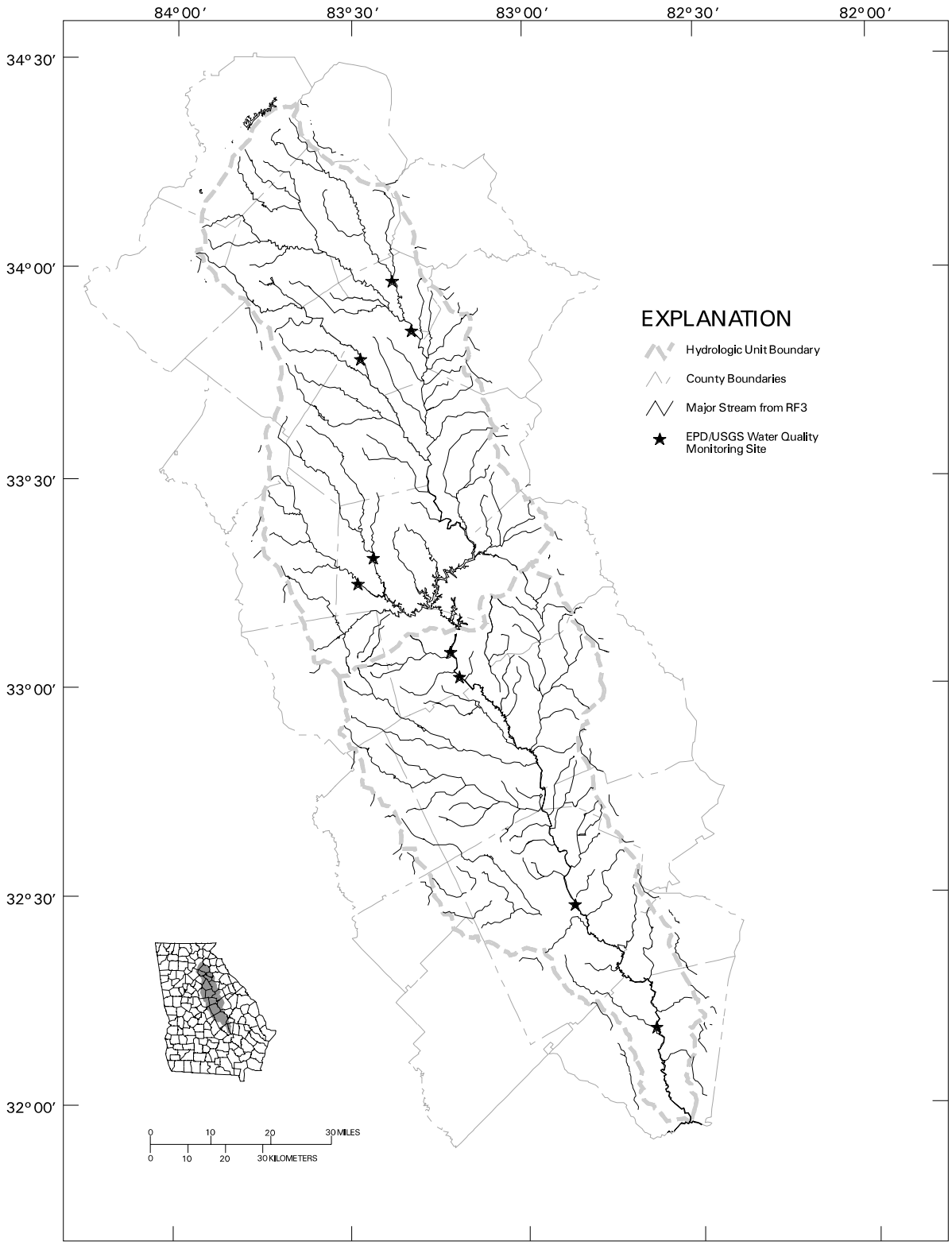

Figure 5-I. Oconee Basin Fixed Sampling Station Locations

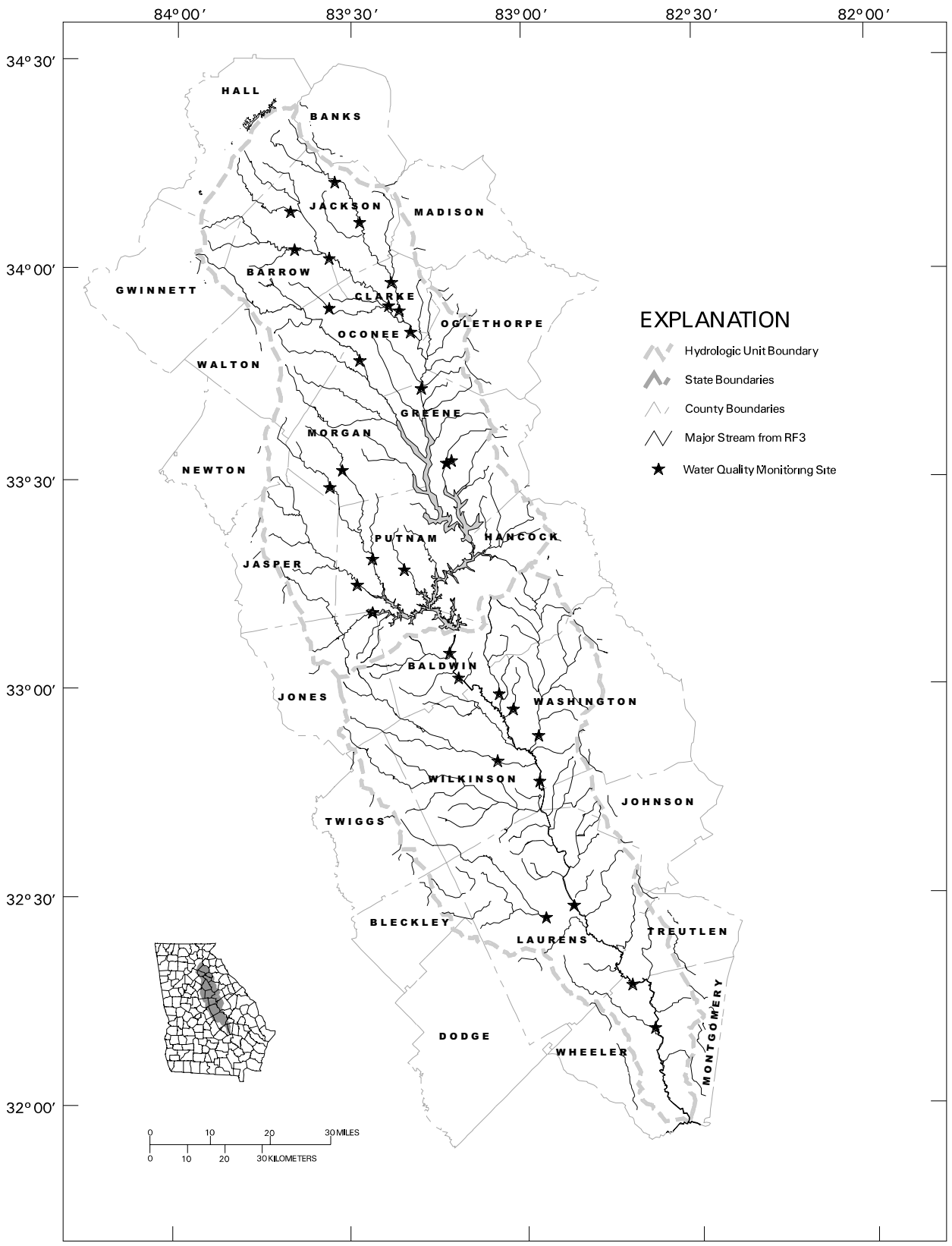

Figure 5-2. Oconee Basin Trend Monitoring Network Station Locations, 1996

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. The three measures of Carlson's Trophic State Index were combined into a single total trophic state index (TTSI) and used with other field data and observations to assess the trophic condition of each lake. Higher values of the TTSI represent more eutrophic, less desirable conditions. Monitoring efforts have continued since the 1980-1981 Lake Classification Survey with a focus on major lakes (those with a surface area greater than 500 acres), and the TTSI has continued to be employed as a tool to mark trophic state trends. The major lakes in the Oconee basin are listed in Table 5-4 and are ranked according to the TTSI for the period 1984-1993. The monitoring project for major lakes was suspended in 1994 due to a lack of field and laboratory resources. The work on major lakes in the future will be a part of the River Basin Management Planning process.

Table 5-4. Major Lakes in the Oconee River Basin Ranked by Sum of Trophic State Index Values, 1980-1993

1984		1985		1986		1987		1988	
Sinclair	173	Sinclair	188	Oconee	161	Sinclair	<154	Oconee	164
Oconee	154	Oconee	169	Sinclair	152	Oconee	<145	Sinclair	<152
range for state:	120-205	*range for state:*	116-188	*range for state:*	114-177	*range for state:*	<108-184	*range for state:*	111-178
1989		**1990**		**1991**		**1992**		**1993**	
Sinclair	169	Sinclair	182	Oconee	161	Sinclair	172	Sinclair	172
Oconee	165	Oconee	166	Sinclair	150	Oconee	163	Oconee	172
range for state:	123-209	*range for state:*	118-182	*range for state:*	121-193	*range for state:*	131-194	*range for state:*	122-195

Note: Higher values represent more eutrophic conditions.

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 that 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 downstream of urban and/or industrial areas a high priority. In addition, DNR will focus attention on areas which frequented by a large number of anglers.

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

The test results have been used to develop consumption guidelines, that 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 River Basin Management Planning process in the future.

Table 5-5. 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

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 have been conducted on samples from selected trend monitoring stations since 1973. 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. During the recent years, this effort was reduced significantly due to use of limited laboratory resources for different types of analysis. 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 an evaluation of the permittee's sampling and flow monitoring requirements.

More than 270 sampling inspections were conducted by EPD staff statewide in 1996-1997. 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 1996, this work was focused on facilities in the Oconee, Coosa, and Tallapoosa 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 dischargers (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 show 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 lists are 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 to 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 flow) 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.

Assessment of Use Support - Procedures for Specific Data Types

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.

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. Although the standard is based on a geometric mean, most of the data for Georgia and other states is based on once per month sampling since resources are not available to conduct sampling and analysis four times per month. Thus, for the purposes of this report USEPA recommends the use of a review criterion of 400 MPN/100 mL to evaluate once per month sample results.

This density, 400 MPN/100 mL, was used to evaluate data for the months from May through October for all waters. For waters with the water use classification of recreation, this guidance criterion was used to evaluate data for the entire year. For waters classified as drinking water, fishing, or coastal fishing, the maximum Georgia standard for fecal coliform bacteria is 4000 MPN/100 mL (November through April). This standard was used to evaluate data collected during November through April for these waters. Waters were deemed not supporting uses when 25 percent of the samples had fecal coliform bacteria densities greater than the applicable review criterion (400 or 4000 MPN/100 mL) and partially supporting when 11 percent 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 25 percent excursion to indicate nonsupport and 11 percent 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. A number of stream segments were listed based on one data point that exceeded a water quality standard. This approach is in accordance with USEPA guidance, which suggests any single excursion of a metals criterion be listed.

Toxicity Testing/Toxic Substances

Data from EPD toxicity testing of water pollution control plant effluents were used to demonstrate or predict toxicity in the receiving waterbody. Based on the effluent toxicity, receiving waters were considered not supporting when one or more tests gave a clear indication of instream toxicity and as partially supporting when based on predicted instream toxicity. Effluent data for toxic substances were used to designate either partial support or nonsupport based on whether instream corroborating data were available. When instream data were available, the stream was determined to be not supporting; 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 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.

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 Oconee River basin. Most of these results were previously summarized in the report *Water Quality in Georgia, 1996-1997* (Georgia DNR, 1998). A geographic summary of assessment results is provided by HUC in Figures 5-3 and 5-4.

Oconee River and Tributaries above Lake Sinclair (HUC 03070101) - Streams

Appendix E, Table E-1 summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (Georgia DNR, 1998).

Monitoring data was collected from 20 trend monitoring stations located within this subbasin during the 1996 period, two of which were on the mainstem. Historically, five trend monitoring stations have been sampled within this basin. The following assessment is based on data from these trend monitoring stations, as well as data from EPD special studies (e.g., intensive surveys) and samples collected by other agencies.

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

Metals

Violations of water quality standards for metals occurred in one Oconee River mainstem segment and in 17 tributary segments. Metals standards were exceeded in the mainstem due to a water pollution control plant discharge. Lead, copper, zinc, and mercury standards were exceeded in tributary stream segments due primarily to nonpoint sources in eight segments and to urban runoff in six segments, and to water pollution control plant discharges in three segments.

Bacteria

The standard for fecal coliform bacteria was exceeded in two segments and 46 tributary segments. These exceedances were attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources, and 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. Thirteen stream segments in this subbasin are listed as not fully supporting designated uses due to poor fish communities. Erosion and loading of sediment to waterbodies might be a factor influencing fish communities in these areas.

Fish Tissue Quality

Guidelines for eating fish from the Upper Oconee River basin are listed in the following tables. The data shown in these tables are the new guidance published in the 1998-99 Georgia Sport Fishing Regulations and *1998 Guidelines for Eating Fish from Georgia Waters* booklet. This guidance is based on the EPA risk-based management approach and is revised each year if new data collected warrant a change.

Fish tissue quality in the rivers of this basin has been found to be good. No consumption restrictions are recommended for Slab Camp Creek. Consumption limits of one meal per week are recommended for largemouth bass in the Apalachee River and the Oconee River upstream of Barnett Shoals Dam, which also carries the same

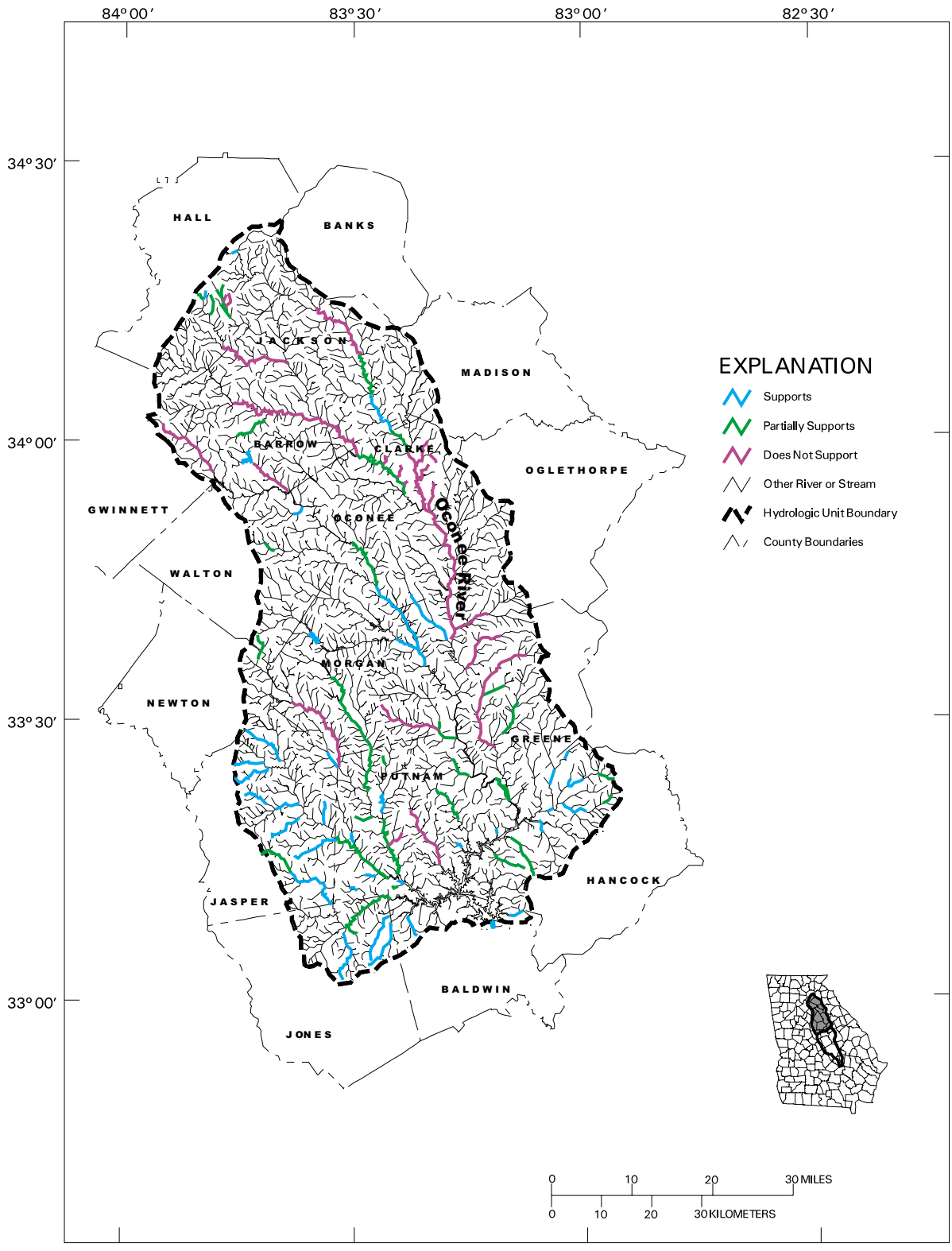

Figure 5-3. Assessment of Water Quality Use Support in the Upper Oconee River Basin, HUC 03070101

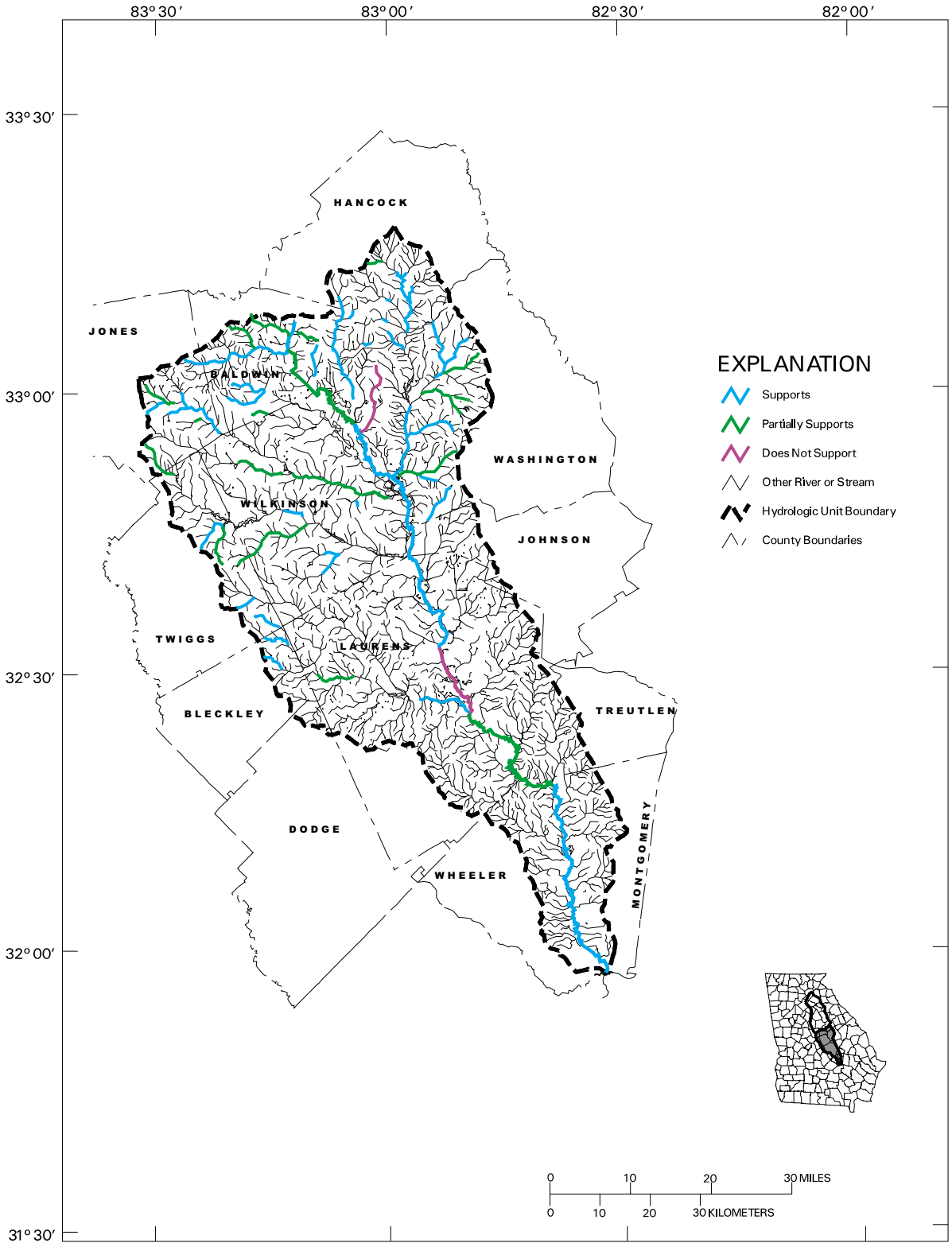

Figure 5-4. Assessment of Water Quality Use Support in the Lower Oconee River Basin, HUC 03070102

recommended consumption limit for silver redhorse. The recommendation for limited consumption in these locations is due to the presence of mercury in the fish flesh.

Fish Consumption Guidelines–Oconee River: Upstream of Barnett Shoals

Species	Site Tested	Recommendation	Chemical
Largemouth bass	Upstream of Barnett Shoals	1 meal per week	Mercury
Silver redhorse	See above	1 meal per week	Mercury

Fish Consumption Guidelines–Apalachee River

Species	Site Tested	Recommendation	Chemical
Largemouth bass	Apalachee Beach	1 meal per week	Mercury
Channel catfish	See above	No restrictions	

Fish Consumption Guidelines–Slab Camp Creek: Oconee County

Species	Site Tested	Recommendation	Chemical
Creek chub	Watson Spring Road	No restrictions	
Greater jumprock	See above	No restrictions	
Redbreast sunfish	See above	No restrictions	

Oconee River and Tributaries above Lake Sinclair (HUC 03070101) - Lakes

Lake Oconee

The Upper Oconee River basin contains Lake Oconee, the largest of the Georgia Power Company impoundments. Lake Oconee is a 21,000-acre hydroelectric reservoir located in Putnam, Morgan, Greene, and Hancock Counties. It was created in 1979 by construction of Wallace Dam on the Oconee River, upstream of Lake Sinclair. The nearest towns are Eatonton, Greensboro, Madison, and Milledgeville. The reservoir has a basin drainage area of 1,830 square miles. Other tributaries include the Apalachee River, Hard Labor Creek, and Richland Creek. At a normal elevation of 435.6 feet above mean sea level (MSL), Lake Oconee has a volume of 470,000 acre-feet, a maximum depth of 107 feet, and a shoreline length of 374 miles. The annual average outflow is 2,000 cfs. The Lake Oconee powerhouse contains six power generation units with a maximum capacity of 321,000 kilowatts.

The designated water use classification for the entire lake is Recreation. Land use in the Lake Oconee basin is primarily agriculture and forest. Point sources in the drainage area include treated municipal wastewater discharges from the cities of Monroe and Athens and treated wastewater discharges from Chicopee Manufacturing Company and Jefferson Mills.

Water quality studies have been performed including the Georgia DNR Clean Lakes Program Lake Classification Survey conducted in 1980 and 1981, the Georgia DNR Major Lake Monitoring Project conducted from 1984 through 1993, and the Georgia DNR Clean Lakes Water Quality Assessment Study conducted in 1989. The Georgia DNR also maintains ambient monitoring stations in the Oconee basin. The data from the Georgia DNR Major Lake Monitoring Project and the Georgia DNR Clean Lakes Water Quality Assessment Study found that the Carlson total trophic state index for this lake

generally ranged between <145 and 175. This indicated that the lake was eutrophic, typical of Georgia Piedmont Region impoundments.

Fish Consumption Guidelines–Lake Oconee

Species	Less than 12 inches	12-16 inches	Over 16 inches	Chemicals
Largemouth bass	No restrictions *	No restrictions *	1 meal per week	Mercury
Hybrid bass	No restrictions	No restrictions		
Channel catfish	No restrictions	No restrictions	No restrictions	
White catfish	No restrictions			
Black Crappie	No Restrictions			

** Only largemouth bass between 6 and 11 inches and 14 inches and longer may be legally possessed on Lake Oconee.*

Fort Yargo Lake

Fort Yargo Lake is located in Fort Yargo State Park, located just south of the city of Winder in Barrow County, Georgia. The park was opened in 1954 and the 260-acre Fort Yargo Lake was completed in 1967 under the Marbury Creek Watershed Project. Located within the boundaries of Fort Yargo State Park is Will-A-Way Recreation Area, which was specifically designed for a special group, disabled persons. Opened in 1970, it was the first facility of its kind in the United States. The state-designated use classification for Fort Yargo Lake is Fishing.

Fort Yargo Lake was included in the water quality studies performed as part of the Georgia DNR Clean Lakes Program Lake Classification Survey conducted in 1980 and 1981. The Carlson total trophic state index was 141 in 1980 and 138 in 1981. Impairment due to the presence of rooted aquatic macrophytes was listed as a problem in the past. Fecal coliform monitoring was conducted in 1996 and 1997 at the park swimming beach. The state standard of 200/100mL as a geometric mean of a minimum of four samples over a 30-day period (during the months of May through October) was met during both years.

Fish Consumption Guidelines–Fort Yargo Lake

Species	Site Tested	Recommendation	Chemical
Largemouth bass	Fort Yargo Lake	No restrictions	
Carp	See above	No restrictions	

Lakes Brantley and Rutledge

Lakes Brantley and Rutledge are impoundments of Hard Labor Creek, which flows into the Apalachee River 25 miles downstream. The surface area of Lake Brantley is 45 acres and for Lake Rutledge 75 acres. The Lake Brantley impoundment is upstream of Lake Rutledge. Both lakes are located in Hard Labor Creek State Park, located in Morgan and Walton Counties. The park came into being during the Great Depression when the National Park Service acquired 44 individual parcels of land that were joined, forming the 5,805-acre Hard Labor Creek Recreation Demonstration Area. The purpose of the site was to demonstrate the reclamation of marginal farmland for recreation. The task of land stabilization, along with early facility construction, as completed by the Civilian Conservation Corps and the Works Progress Administration. Beginning in 1934, thousands of pine trees were planted, dikes and terraces were built, roads were

constructed, and the lakebeds were cleared. In 1946 the Recreation Demonstration Area was given to the state of Georgia and became known as Hard Labor Creek State Park.

Lakes Brantley and Rutledge were sampled in 1980 and 1981 as part of the Georgia DNR Clean Lakes Program Lake Classification Survey. The Carlson total trophic state index was 192 in 1980 and 209 in 1981 in Lake Brantley, and 172 and 177, respectively, for Lake Rutledge. Impairment due excessive siltation was listed as a problem in Lake Brantley during the survey. The 1994-1995 305(b) report lists Lake Brantley as partially supporting the Fishing classification due to low dissolved oxygen, caused by nonpoint sources.

Fecal coliform monitoring was conducted in 1996 and 1997 at the three park swimming areas located on Lake Rutledge. These areas are Camp Rutledge Beach, Camp Daniel Morgan Beach, and Day Use Camp Beach. The state standard of 200/100 mL as a geometric mean of a minimum of four samples over a 30-day period (during the months of May through October) was met during both years at all three locations.

Fish Consumption Guidelines–Lake Rutledge: Hard Labor Creek State Park

Species	Less than 12 inches	12-16 inches	Over 16 inches	Chemicals
Largemouth bass		No restrictions		
Channel catfish	No restrictions	No restrictions		

Lake Sinclair

The Oconee River basin contains Lake Sinclair, the second largest of the Georgia Power Company impoundments. Lake Sinclair is a 15,330-acre hydroelectric reservoir located in Putnam, Baldwin, and Hancock Counties. It was created in 1953 by impoundment of the Oconee River near Furman Shoals. Lake uses are power generation, power plant cooling water, and recreation. The reservoir has a basin drainage area of 2,910 mi^2, 63 percent of which is from the Oconee basin upstream of Wallace Dam, the upstream boundary of the lake. Other tributaries include Murder Creek, Rooty Creek, Little River, Shoulderbone Creek, and Big Cedar Creek. At normal elevation Lake Sinclair has a lake volume of 330,000 acre-feet, a mean depth of 21.7 feet, a maximum depth of 89.9 feet, and a shoreline length of 417 miles. The annual average outflow is 3,150 ft^3/s. The designated water use classification for the entire lake is Recreation.

An additional feature of Lake Sinclair is a limited warm-water effluent created by Plant Harlee Branch, a multiunit, 1,539,000-kilowatt, coal-fired steam electric generating plant owned by the Georgia Power Company. Reservoir water used in a once-through cooling system is taken from the Little River embayment of Lake Sinclair and discharged into the Beaverdam Creek embayment. In 1991 and 1992 Georgia Power conducted a comprehensive hydrothermal and limnological study of Lake Sinclair to determine the impact of this thermal discharge. Based on this study Georgia Power is constructing an additional water cooling system to mitigate the effects of its discharge. A new permit granting this facility a variance from Georgia's 90 °F maximum temperature limit is currently under public review.

Other water quality studies have been performed including the EPA National Eutrophication Survey conducted in 1973-1974, the Georgia DNR Clean Lakes Program Lake Classification Survey conducted in 1980-1981, the Georgia DNR Major Lake Monitoring Project conducted from 1984 through 1993, and the Georgia DNR Clean Lakes Water Quality Assessment Study conducted in 1989. The EPD also maintains ambient monitoring stations in the Oconee basin, including stations on Little River and Murder Creek.

The 1973-1974 EPA National Eutrophication Survey reports indicated the lake was eutrophic. The 1991-1992 Georgia Power study report indicated the lake continued to be eutrophic, typical of Georgia Piedmont Region impoundments. The Georgia 1996-1997 305(b) report lists the Little River arm of Lake Sinclair as partially supporting the designated use of Recreation due to pH criteria violations. The cause given is nonpoint sources.

Fish Consumption Guidelines–Lake Sinclair

Species	Less than 12 inches	12-16 inches	Over 16 inches	Chemicals
Largemouth bass		No restrictions	No restrictions	
Hybrid bass	No restrictions			
Catfish	No restrictions	No restrictions	No restrictions	
Black crappie	No restrictions			

Lakes Bennett and Shepard

Lakes Bennett and Shepard are a part of the Georgia DNR Marben Public Fishing Area (PFA), located in the Charlie Elliott Wildlife Center in Jasper and Newton Counties. The Charlie Elliot Wildlife Center features 21 managed ponds totaling 295 acres that range in size from 1 to 95 acres.

Bennett Lake is a 69-acre impoundment of Murder Creek. It features a largemouth bass, bluegill, crappie, channel catfish, and yellow perch fishery. Largemouth bass and crappie are the most frequently caught fish. A concrete ramp on the upper end of Lake Bennett provides easy access for boaters. There is unimproved bank access and a picnic area along much of the west side of the lake.

Shepard Pond is an 18-acre impoundment of Shepard Creek and is known for producing large bream (bluegill and redear sunfish). It also has a largemouth bass and channel catfish fishery. Handicapped-accessible facilities, including a picnic area, restroom, and improved boat ramp, are located on Shepard Pond.

Fish Consumption Guidelines–Lake Bennett: Charlie Elliott Wildlife Center

Species	Less than 12 inches	12 - 16 inches	Over 16 inches	Chemical
Largemouth bass		No restrictions	1 meal per week	Mercury

Fish Consumption Guidelines–Shepard Lake: Charlie Elliott Wildlife Center

Species	Less than 12 inches	12 - 16 inches	Over 16 inches	Chemical
Largemouth bass		No restrictions		

Oconee River Basin and Tributaries Below Lake Sinclair (HUC 03070102)

Appendix E, Table E-2, summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (Georgia DNR, 1998).

Monitoring data were collected from 12 trend monitoring stations located within this subbasin during the 1996 period, seven of which were on the Oconee mainstem.

Historically, five trend monitoring stations have been sampled within this basin. The following assessment is based on data from these trend monitoring stations as well as data from EPD special studies (e.g., intensive surveys) and samples collected by other agencies.

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

Metals

No violations of water quality standards for metals occurred in mainstem Oconee River segments. Mercury standards were exceeded in one tributary segment due to nonpoint sources.

Bacteria

The standard for fecal coliform bacteria was not met in two Oconee River mainstem segments and in one tributary segment. These exceedances were attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources, and 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. Fourteen stream segments in this subbasin are listed as not fully supporting designated uses due to poor fish communities. Erosion and loading of sediment to waterbodies might be a factor influencing fish communities in these areas.

Fish Tissue Quality

Guidelines for eating fish from the Lower Oconee River basin are listed in the following tables. The data shown in these tables are the new guidance published in the 1998-99 Georgia Sport Fishing Regulations and *1998 Guidelines for Eating Fish from Georgia Waters* booklet. This guidance is based on the EPA risk-based management approach and is revised each year if new data collected warrant a change.

The fish quality in the lower Oconee River has been found to be excellent. No fish consumption limitations are recommended.

Fish Consumption Guidelines–Oconee River: Baldwin/Wilkinson Counties

Species	Site Tested	Recommendation	Chemical
Flathead catfish	Milledgeville to Dublin	No restrictions	

Fish Consumption Guidelines–Oconee River: Laurens County

Species	Site Tested	Recommendation	Chemical
Largemouth bass	Interstate-16	No restrictions	
Spotted sucker	See above	No restrictions	
Channel catfish	See above	No restrictions	

5.2.5 Assessment of Fish and Wildlife Resources

Detailed, HUC-level assessments of fish and wildlife resources in the Oconee River basin were not available at the time of compilation of the basin plan. However, rough, basin-scale assessments of fish and wildlife resources have been developed as part of the RiverCare 2000 Georgia Rivers Assessment (EPD, 1998). These results are summarized below.

Ecologically Important Fish Resources

Georgia's fishery resources depend on healthy streams and are part of a diverse community of game and non-game species. These communities by definition include vertebrates like fishes and invertebrates like mussels and aquatic insects. A complete community with all species that naturally occurred in a particular river system is irreplaceable. Only a few species can be propagated and restocked into nature. The life found in Georgia's rivers depends absolutely on the integrity of aquatic habitat, which in turn directly reflects the conditions within the rivers' entire upstream watersheds. Healthy aquatic ecosystems can provide sustainable commercial and recreational fisheries which are valuable in their own right. The effects often associated with the pursuit of these fisheries adds even more value to Georgia's local economies.

The Georgia Rivers Assessment work group evaluated river segments and associated tributaries according to the composition of fish and mussel species, the quality of habitat, and the characteristics of the particular fishery. The assessment considered chiefly those river corridors lying downstream of the point at which the rivers attained an average annual discharge of 400 cfs. However, portions of ecologically-valuable rivers that might have a smaller average annual flow than 400 cfs were also evaluated.

The work group established three value classes to rank river segments:

Superior	Non-regulated stream, near wilderness, not immediately influenced by large municipalities, may contain important faunal assemblages.
Outstanding	Non-regulated stream with important faunal assemblages or important habitats.
Significant	Can include regulated stream reaches with important faunal assemblages or important habitats.

Within the Oconee basin, 282 river miles were evaluated. All 282 miles were rated Significant; no segments were rated Superior or Outstanding.

The major threats to ecologically important fish resources come from nonpoint source pollution and the effects of other human activities in the environment. Clearing vegetation, disturbing earth without adequately controlling the movement of sediment, increasing impervious surface, and related activities in a watershed can alter water quality and patterns of stream discharge. Altering river channels, by dredging or by removing snags which furnish many prey organisms for fish, also reduces the quality and quantity of fish habitat. These activities lower the value of streams for fish populations.

Another significant threat to Georgia's fish species is the introduction of exotic, or foreign species. Many introduced species, such as flathead catfish, compete with native fish for food and cover, take them as food, or parasitize them. If the new species are so successful that they reduce or eliminate the native population, they can significantly reduce the river's fishery biodiversity as well.

Recreational and Commercial Fish Resources

The Georgia Rivers Assessment work group also evaluated river segments from the point of view of commercial or sport-fishing uses. To identify the important recreational and commercial fishing resources, the work group averaged scores of fishery demand and uniqueness for segments of major rivers and their associated tributaries. This assessment provides a snapshot of current recreational and fishery conditions within major river segments. Evaluation made use of two criteria, weighted equally:

- Fishery uniqueness: The lack of an alternative commercial or recreational fishery anywhere within the state (3 points), within one of the seven fisheries management regions established by the Georgia DNR (2 points), or locally within a 50-mile radius of the resource under evaluation (1 points).
- Fishery demand: The popularity of the fishery, when compared to a similar fishery elsewhere in the state and measured by standard indicators of fishing pressure such as angler-days or the length of the waiting period for limited-entry fisheries. (Scoring: 1-3 points)

Stream segments were identified as "Qualifying" if at least one of the two scores was at least 2. Of the miles evaluated in the Oconee basin, 275 miles were rated as Qualifying.

Reservoir fisheries are also important within the Oconee basin. Lake Sinclair provides good fishing for largemouth bass, crappie, channel catfish, and other species. Lake Oconee provides a fishery for largemouth bass, crappie, white bass, and other species.

The major threats to recreational and commercial fisheries vary by river segment. In general, however, two of the major threats are nonpoint-source runoff from urban areas and disturbed lands, and the introduction of exotic, non-native aquatic species into Georgia's rivers.

Wildlife Resources

Wildlife is part of the web of life and is necessary for human survival. Its presence enriches humans aesthetically and spiritually. Populations of some species serve as indicators of environmental health. Various species provide food and pollination services and may be a source of pharmaceutical chemicals. Predators, such as hawks and foxes, keep in check populations of mice, rats, and other animals that are considered agricultural pests.

Wildlife also provides recreation to the many people who enjoy watching wildlife or hunting. According to recent surveys, 82 percent of Georgians actively observe wildlife or hunt. These activities generate economic activity from the sale of hunting licenses; of equipment and supplies used to identify, hunt, feed, and watch wildlife; and of services such as food, lodging, outdoor guides, and the maintenance and repair of equipment used in wildlife-oriented recreation.

The Georgia Rivers Assessment Wildlife Resources Work Group evaluated wildlife habitat quality, which it defined to include the expected or observed diversity of wildlife species within the river corridor, and the general condition of terrestrial and wetland habitats within the river corridor. The area under consideration included the stream channel and adjoining lands within 3.1 miles of the river bank. The work group defined high-quality wildlife resource areas as those that provide habitat for a high diversity of wildlife species. These area may include habitat that has declined significantly or is rare, or that supports species of special conservation concern. The assessment was limited to

perennial streams downstream of the point at which the stream reaches an average annual discharge of 400 cfs or greater.

The evaluation criteria placed equal emphasis on four measures of wildlife resource quality, each of which contributed a maximum of 25 points to a river segment's final score. These were as follows:

- Diversity of species and natural habitats in the river corridor
- Habitat value for species of special concern
- Percentage of river corridor in natural vegetation
- Habitat fragmentation in the river corridor

Segments were rated as Superior (80-100 points), Outstanding (61-79 points), Significant (41-60 points), and Other (less than 41 points). Within the Oconee River basin, 290 miles of river corridor were rated as Outstanding and 50 miles as Significant. No segments were rated as Superior.

The major threats to wildlife resources are a variety of land-use changes, including residential, industrial, silvicultural, and agricultural development. The effects on wildlife resources vary, both quantitatively and qualitatively, depending on the types of land use in a region, the types of natural habitats present, and the amount of development. Changes to native wildlife populations resulting from the conversion of natural forest habitat to short-rotation silvicultural stands are perhaps less obvious than those resulting from conversion to intensive agricultural or industrial use, but are nonetheless significant. Overall, the trends for wildlife habitat quality in Georgia's river corridors include continued fragmentation of natural habitats, loss of forested riparian buffers, and increasing prevalence of disturbed and early-successional plant and animal communities.

Within the Oconee River basin, some land area is controlled by the Oconee National Forest. The Oconee National Forest publishes and regularly updates a Land and Resource Management Plan which documents specific objectives and strategies for the management of wildlife habitat.

References

EPD. 1998. Georgia Rivers: An Initial Assessment. Environmental Protection Division, Georgia Department of Natural Resources, Atlanta, GA.

Georgia DNR. 1998. Water Quality in Georgia, 1996-1997. Georgia Department of Natural Resources, Atlanta, GA.

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 Oconee River basin. This section aggregates the assessment data to identify priority issues for development of management strategies. Water quality and quantity issues are discussed separately, although the connection between quantity and quality should not be overlooked.

6.1 Identified Basin Planning and Management Concerns

Section 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 *Water Quality in Georgia, 1996-1997* as a contributor to non-supporting or partially-supporting status was fecal coliform bacteria (345 out of 893 miles, or 39 percent of the stream miles which were assessed within the basin), followed by impaired fish communities as measured by the Index of Biotic Integrity (134 out of 893 miles, or 15 percent of the stream miles which were assessed within the basin), followed by the metals zinc, copper, mercury, and lead (66 out of 893 miles, or 7 percent of assessed stream miles). Note that some segments are assessed as not fully supporting as a result of multiple criteria, so there is some overlap in the figures stated above. Non-support due to the criteria discussed above is most often attributed to "urban runoff" as a primary source or one among several sources (150 miles for fecal coliforms, 9 miles for impaired fish communities, 38 miles for metals) or "nonpoint or unknown" sources (210 miles for fecal coliforms, 134 miles for impaired fish communities, 36 miles for metals). Within some individual stream reaches, other sources may be of greater importance; however, urban runoff and general nonpoint sources represent a basin-wide concern.

Major water quality and quantity concerns for the Oconee 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 relationship between specific designated uses and stressors causing lack of full support for those uses. Ongoing control strategies are expected to result in support of designated uses in a number of waters. In other waters, however, the

Table 6-1. Summary of Concerns in the Oconee River Basin

	Source of the Stressor by HUC	
Stressors of Concern	**Above Lake Sinclair Dam HUC 03070101**	**Below Lake Sinclair Dam HUC 03070102**
Metals	Urban and rural NPS, Industrial effluent	Nonpoint sources
Fecal Coliform Bacteria	Urban and rural NPS, WPCP effluent	Urban and rural NPS
Erosion and Sedimentation	Urban and rural NPS	Urban and rural NPS
Fish Consumption Guidelines	Nonpoint mercury	
Nutrients	Point and nonpoint phosphorus load	
Dissolved Oxygen	Urban and rural NPS WPCP effluent	Nonpoint sources
Water Temperature	Effluent from power plant	
Threatened and Endangered Species	Listed species	Listed species
Flooding		Floodplain management
Source Water Protection	Surface water sources in need of protection	Surface water sources in need of protection

Table 6-2. Summary of Stressors Contributing to Lack of Full Support for Classified Uses in the Oconee River Basin

	Geographic Area	
Use Classification of Waterbody Segments	**Above Lake Sinclair Dam HUC 03070101**	**Below Lake Sinclair Dam HUC 03070102**
Fishing (Support for Aquatic Life)	Metals, pH, temperature, DO, impaired fish community	Mercury, DO, toxicity, impaired fish community
Fishing (Fish Consumption)	Mercury	
Fishing (Secondary Contact Recreation)	Fecal coliform bacteria	Fecal coliform bacteria
Drinking Water	Fecal coliform bacteria	

development of additional management strategies might be required or implemented in order to achieve water quality standards.

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" that summarizes the linkage between stressor sources and water quality impacts. The order in which concerns are listed 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. Priorities for addressing water quantity issues within the Oconee basin are summarized in Section 6.3.

6.1.1 Problem Statements

Oconee River Above Sinclair Dam (HUC 03070101)

Metals

The water use classification of fishing or drinking water was not fully supported in one Oconee River mainstem segment and in seventeen tributary stream segments due to exceedances of the water quality standards for metals. Lead standards were exceeded in the river due to a water pollution control plant discharge; lead, copper, zinc, and/or mercury were exceeded in tributary streams due primarily to nonpoint sources in eight segments, urban runoff in six segments, and to water pollution control plant discharges in three segments.

Fecal Coliform Bacteria

The water use classification of fishing or drinking water was not fully supported in two Oconee River mainstem segments and 46 tributary stream segments due to exceedances 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 classification of fishing is potentially threatened in many segments by erosion and loading of sediment, which can alter stream morphology, impact habitat, and reduce water clarity. Sediment may be a factor influencing fish communities in these areas. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are 12 stream segements listed in this subbasin as partially supporting and one segment listed as not supporting designated uses due to poor fish communities.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in one Oconee River mainstem segment (from Athens to Barnett Shoals Dam, one tributary stream segment (Apalachee River), and Lake Oconee due to the presence of fish consumption guidelines. The guidelines were put in place as a result of mercury detected in fish tissues in these segments. The guidelines are for largemouth bass and silver redhorse in the mainstem segment and largemouth bass in the tributary and lake.

Nutrients

The water use classifications of fishing, drinking water, or recreation are potentially threatened in Lake Oconee, Lake Sinclair, Lake Brantley, and Rock Eagle Lake due to inputs of nutrients which may cause excess algal growths in the lakes. Nutrient sources include water pollution control plant discharges, lake fertilization and nonpoint sources from urban and agricultural areas.

Low Dissolved Oxygen

The fishing water use classification was not fully supported in five tributary stream segments due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the tributaries was due to nonpoint sources, urban runoff and water pollution control plant discharges.

Elevated Water Temperature

The water use classification of fishing and recreation was not fully supported in Lake Sinclair due to exceedances of the temperature water quality standard. The elevated water temperature is associated with the discharge of cooling process water from a power plant operation.

Protection of Threatened and Endangered Species

The Oconee basin is home to a number of aquatic species which have been listed as threatened or endangered and require protection.

Source Water Protection for Drinking Water Sources

All streams with municipal water intakes need to have watershed assessments and protection plans developed, and implemented. All streams and existing lakes with plans being considered for public water supply should have a source water assessment made early in the planning process.

Oconee River Below Sinclair Dam (HUC 03070102)

Metals

The water use classification of fishing was not fully supported in one tributary stream segment due to exceedances of the water quality standards for metals. Mecury standards were exceeded in the tributary segment due to nonpoint sources.

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in two Oconee River mainstem segments and in one tributary stream segment due to exceedances 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 animal wastes.

Erosion and Sedimentation

The water use classification of fishing is potentially threatened in many segments by erosion and loading of sediment, which can alter stream morphology, affect habitat, and reduce water clarity. Sediment may be a factor influencing fish communities in these areas. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are 14 stream segements listed in this basin as partially supporting designated uses due to poor fish communities.

Low Dissolved Oxygen

The fishing water use classification was not fully supported in one tributary stream segment due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the tributary was due to nonpoint sources.

Protection of Threatened and Endangered Species

The Oconee basin is home to a number of aquatic species which have been listed as threatened or endangered and require protection.

Source Water Protection for Drinking Water Sources

All streams with municipal water intakes need to have watershed assessments and protection plans developed, and implemented. All streams and existing lakes with plans being considered for public water supply should have a source water assessment made early in the planning process.

Flooding

Flooding in Dublin continues to be a major factor associated with property loss in the basin.

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. 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 (1998) 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 February 1998. In addition, these priorities were presented to the public in a stakeholder meeting in Athens and Dublin in February 1998. The priorities were also public noticed and approved by the USEPA as part of the Georgia CWA 303(d) listing process in 1998 and discussed in the report, *Water Quality in Georgia, 1996-1997*.

Table 6-3. EPD's Short-Term Priorities for Addressing Waters Not Fully Supporting 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 metals or fecal coliform bacteria.

Assigning Priorities for Stream Segments

For many waters in the Oconee River basin, currently planned control strategies are expected to result in attainment of designated uses. The majority of EPD resources will be directed to ensure that the ongoing pollution control strategies are implemented as planned and water quality improvements are achieved. These waters (see Appendix E) 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 (see Table 6-3).

Second priority was allocated to segments with multiple data points that showed metals concentrations from nonpoint sources in excess of water quality standards and to segments in which dissolved oxygen concentration was an issue (see Table 6-3).

Third priority was assigned to waters where urban runoff and general nonpoint sources caused 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 loading (see Table 6-3).

Several issues helped forge the rationale for priorities. First, strategies are currently in place to address the significant water quality problems in the Oconee 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 as impaired as a result of exceedance of the criteria for metals or fecal coliform bacteria due to urban runoff or nonpoint sources. At the present time, the viability of the standards for metals and the efficacy of the fecal coliform bacteria standard are in question in the scientific community, as described in Section 4.2. Also, in many cases, the metals database was minimal with as few as one data point showing a concentration in excess of standards placing a stream reach or area of a lake on the partial support lists.

6.2.2 General Long-Term Priorities for Water Quality Concerns

Long-term priorities for water quality management in the Oconee 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 and streams 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 also identified a number of concerns for water quantity in the Oconee basin, including existing problems with minimum instream flows and potential future problems for competing demands on water quantity.

6.3.1 Priorities for Competing Demands

With regard to the priority to be placed on meeting competing demands for future water use, EPD (in conjunction with a broad group of stakeholders from north, central, and southwest Georgia) has established a set of "guiding principles". 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) cannot be met under conditions of water shortage, efforts will be made to optimize the mix of economic and environmental values.

Although 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/Apalachicola-Chattahoochee-Flint 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.

6.3.2 Regional Water Supply Options

In managing Georgia's surface waters, EPD's approach is to meet as many of the identified water needs to the highest extent practicable, while minimizing adverse impacts associated with meeting those needs. Of foremost importance in meeting those needs is maximizing use of already developed water resources along with aggressive water conservation.

Expected population growth in the Oconee basin over the next several decades is likely to result in exhaustion of the water supplies available from already developed sources, even with the employment of very aggressive water conservation measures. New sources will have to be identified and developed. As the population of county and sub-county political jurisdictions in the Oconee River basin continues to expand, the need for water resources is likely to grow beyond the capability of single political jurisdictions to meet demand from the water resources within their political boundaries. Currently available regional sources in the Oconee basin will also likely be found to have real limits in providing the water resources to meet portions of the expected increases in water demand. Economic growth may be limited by the capabilities of existing local and regional water resources. An alternative strategy is to form cooperative efforts among adjoining political jurisdictions to plan and construct larger water resources projects. This type of approach would minimize the number of smaller water resources projects, and encourage development of new regional water resources in a more cost-effective and

environmentally sensitive manner. Such an approach will require much more inter-jurisdictional cooperation on water supply issues than has been evident to date. Failure to pursue such increased cooperation might very well result in unacceptable water supply-based restrictions on regional growth.

In This Section

- "Big Picture" Overview for the Oconee 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 Oconee 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 that emphasize coordinated planning to meet all applicable local, state, and federal laws, rules, and regulations, and provide for water quality, habitat, and recreation. For the Oconee 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 Oconee River basin. Section 7.2 describes the general and basinwide implementation strategies most relevant to the Oconee River Basin Management Plan. Targeted strategies for specific priority concerns within each subbasin, as identified in Section 6, are then presented in Section 7.3.

7.1 "Big Picture" Overview for the Oconee River Basin

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

- Protecting water quality in lakes, rivers and streams 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; minimizing risk from contaminated fish tissue, and reducing risks from flooding.

- 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 Oconee 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 7.3. This section provides an overview of the key "big picture" issues and planning opportunities in the Oconee River basin.

7.1.1 Water Quality Overview

As discussed in Section 5, water quality in the Oconee 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 20 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 Oconee River basin results from nonpoint sources. Key types of nonpoint source pollution impairing or threatening water quality in the Oconee River basin include erosion and sedimentation, bacteria from urban and rural nonpoint sources, metals from urban and rural sources, and excess nutrient loads to reservoirs. 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 Oconee 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 Oconee River basin.

Key Actions by EPD

The Georgia EPD's Water Protection Branch has responsibility for the establishing of water quality standards, water quality monitoring, river basin planning, water quality modeling, permitting and enforcement of point source NPDES permits, and development of 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 Oconee 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**. Where water quality sampling has documented standards violations and ongoing actions are not sufficient to achieve water quality standards in a 2-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.
- **Source Water Protection**. Most of the public water supply in the Oconee 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. 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.

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 Oconee River basin is a mixture of livestock and poultry operations and commodity production. About 20 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, 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 Oconee basin, and commercial forest lands represent about 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. 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.

Additional requirements are imposed within the National Forest areas of the Oconee basin. Each National Forest produces and regularly updates a Land and Resource Management Plan to guide timber harvest and other activities. These plans establish long-range goals and objectives, specific management practices and the vicinity in which they will occur, standards and guidelines on how best management practices will be applied, and monitoring procedures to ensure the plan is followed.

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.

It is the responsibility of local governments to implement planning for future development that 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 Oconee River basin. The Georgia EPD's 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 on 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, as well as regulation of dams for compliance with the Safe Dams Act.

There are several water quantity concerns in the Oconee basin that are of significance to decision makers. One of the major water quantity concerns in the Oconee River basin is the fairly rapid growth being experienced in the counties in the headwater region on the basin (i.e., Hall, Barrow, Clarke, and Oconee counties), and the additional water needs associated with this growth. This growth is expected to accelerate somewhat as the metropolitan Athens and metropolitan Atlanta regions begin to have more of a synergistic effect on each other.

One major in-progress project in the basin is the 52 million gallon per day Bear Creek reservoir project which is being cooperatively developed by Jackson, Barrow, Clarke, and Oconee counties under the auspices of the Upper Oconee Water Authority. The counties will share the waters of this reservoir under terms agreed upon in May 1996. The reservoir is expected to satisfy water needs for the four-county region through 2050. This joint project is a model of the sort of regional cooperation which is effective in addressing water supply concerns in water-limited areas.

Another project currently under investigation is a regional project being lead by Walton County which would conceivably supply some quantity of water to Walton, Gwinnett, and Oconee counties. Preliminary conversations are being conducted between Walton County and adjoining political jurisdictions before decisions are made regarding completing the proper federal and state environmental applications. Local officials are expected to make the necessary decisions during calendar year 1998.

Water resources within the political boundaries of singular counties in the region are not expected to generally be sufficient to meet longer-term "in-county" needs; therefore, regional cooperation to develop water supply options will become ever more important to continue growth in the region. Interbasin diversion of water to meet the growing needs in the region is another option that will likely get more intensive attention.

Interbasin diversions are not prohibited within Georgia, the Rules for Water Quality Control do require EPD to proceed in the following manner before making decisions regarding such transfers:

1. Give due consideration to existing competing uses that might be affected by such transfers.
2. Issue a press release which describes the proposed transfer.
3. If the public interest expressed in reaction to the press release is sufficient to warrant a public hearing, EPD will hold a hearing to receive comments on the proposed transfer prior to making a final decision.

Growth in agricultural production (including turf production) in the central and southern regions of the basin are expected to increase the demand for both surface water and groundwater supplies during the growing season of each year.

During normal years this should not present a concern, but the impact on stream flows during dryer years could become an issue of some concern. As more information becomes available on the impact of such withdrawals on stream flows, decisions will have to be made regarding limiting such future withdrawals.

In cases where there is competition for water across water use categories (i.e., water held in lakes for recreation vs. withdrawal for potable uses), Georgia law requires that priority be given to water for human consumption. However, it is far more likely that the competition for scarce water will not be across water use categories so much as between adjoining jurisdictions. In such instances, EPD currently does (and will continue to) encourage cooperative efforts to develop and effectively use limited water resources. Although cooperative intergovernmental approaches are much preferred in addressing such competition, the fact that the Director of EPD has the statutory authority to make final decisions regarding water withdrawal applications means that EPD will assist in resolving such matters if other efforts fail.

7.2 General Basinwide Management Strategies

Many statewide programs and strategies play an important role in the maintenance and protection of water quality in the Oconee 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 waters 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 CFR 131.12, will be achieved before lowering of water quality is allowed for high-quality water.

The antidegradation review process is triggered when a new or expanded point source discharge that might have some effect on surface water quality is proposed. 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 be considered only 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 must be maintained and protected.

Water Supply Watershed Protection Strategy

As population continues to increase within the Oconee 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" that define, among other things, measures local governments are encouraged to take to protect drinking water sources. The "guidelines" are entitled Rules for Environmental Planning Criteria, and they 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 on 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 a 7-mile radius of the intake and 50/75 feet outside the 7-mile radius.
- A reservoir management plan (including a 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) will have no specified minimum criteria.
- An intake with a water supply reservoir will have a minimum of 100 feet natural buffer within a 7-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 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 on EPD's other assessment and prevention programs, including the Well Head Protection Program, and the Vulnerability Assessment and Waiver Program, by soliciting active public participation from the local communities and will 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 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 US EPA 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 1998. Georgia submitted a draft 303(d) list to EPA in February 1998. EPA reviewed the Georgia submittal and provided comments in March 1998. Georgia submitted a final 303(d) listing to EPA on April 1, 1998.

Georgia's 1998 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, 1996-1997*. 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 Oconee 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.

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 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.

X Waters with active 303(d) status. These segments are assessed as not supporting or partially supporting designated uses and might require additional controls to achieve designated uses. These segments make up the Georgia 303(d) list.

NA Waters assessed as supporting designated uses.

Georgia will address a number of the listed waters in the 1999-2000 time period; however, the majority of work on segments in the Oconee River will be addressed in the second round of basin planning. The second round of basin planning will begin in 1998, and the Oconee River will be the focus of monitoring in the year 1999. Significant efforts will be made to assess the condition of the listed 303(d) waters at that time and results of the assessments will dictate the areas where TMDLs will be developed. TMDLs will be publicly noticed for appropriate segments in June 2001.

7.2.2 Management of Permitted Point Sources

The strategies in this section strive to minimize adverse effects from municipal, industrial, and concentrated storm water 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) toxics identified with point source discharges. Permits associated with identified problems will be evaluated to determine whether 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.) affect 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 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 10 years, various upgrades and improvements have been made to industrial and municipal treatment systems throughout the Oconee River basin. The funding for these projects has come from state and federal construction grants 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 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 NPDES program and meet all the NPDES requirements. In Georgia, with very few exceptions, surface discharge permits will be issued only 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 since this is deemed to be an operationally achievable number even if a facility does not have dechlorination equipment installed. Facilities that are given a limitation more stringent than 0.5 mg/L that do not already have dechlorination equipment installed are given up to a 2-year schedule in which to meet the limitation. All discharging facilities that 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 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 are assessed in accordance with the Georgia Rules and Regulations for Water Quality Control. The results of the assessment can be used to trigger 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 must be free from material related to discharges that 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. Point source control of phosphorus typically involves stringent limits on phosphorus concentrations in municipal NPDES facility effluents. At this time, the needs for phosphorus control strategies in the Oconee River basin have not been determined.

Temperature

Permits issued for facilities that discharge to waters of the state include temperature monitoring requirements and discharge limitations.

Storm Water Permitting

The 1987 Amendments to the federal Clean Water Act require permits to be issued for certain types of storm water discharges, with primary focus on storm water runoff from industrial operations and large urban areas. EPA promulgated Storm Water Regulations on November 16, 1990. EPD subsequently received delegation from EPA in January 1991 to issue General Permits and regulate storm water in Georgia. EPD has developed and implemented a storm water strategy that ensures 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 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 that 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 Storm water Rule addresses only municipalities with populations of more than 100,000 people and construction sites larger than 5 acres. EPA is proposing a Phase II Storm water Rule for municipalities with populations of fewer than 100,000 people and construction sites smaller than 5 acres. This rule is not expected to be finalized until at least March 1999. The Phase II rule will eventually affect 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 11th 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 of 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 that 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

EPD has produced the *Georgia Nonpoint Source Management Program*, 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. Brief descriptions of these agencies and functions and programs are provided below.

Soil and Water Conservation Districts

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 (BMPs).

Currently there are 40 active SWCDs in Georgia, eight of which are in the Oconee River basin—Broad River Soil and Water Conservation District, Central Georgia Soil and Water Conservation District, Hall County Soil and Water Conservation District, Oconee River Soil and Water Conservation District, Ohoopee River Soil and Water Conservation District, Piedmont Soil and Water Conservation District, Upper Ocmulgee River Soil and Water Conservation District, and Walton County Soil and Water Conservation District.

At the county level, each SWCD receives technical assistance, through an existing Memorandum of Agreement, from the U.S. Department of Agriculture's Natural Resources Conservation Service to work with landowners on implementing agricultural BMPs. Through these partnerships applying a voluntary approach to conservation, 15 million acres have received conservation treatment in Georgia.

Georgia Soil and Water Conservation Commission

Georgia's SWCDs receive no annual appropriations and are not regulatory or enforcement agencies. Therefore, the Georgia Soil and Water Conservation Commission (GSWCC) was also formed in 1937 to support the SWCDs. GSWCC has been designated as the administering or lead agency for agricultural nonpoint source pollution prevention in the state. The GSWCC develops nonpoint source 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.

A number of other agricultural agencies administer 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, that are involved in programs 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. The Georgia 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 ground water. 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 its individual members regularly applies for and receives funds under section 319(h) of the Clean Water Act to fund 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 address resource concerns related to agricultural land uses in a coordinated fashion over the next 5 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's 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, composed 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, filterstrips, 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. During the 1998 federal fiscal year, Georgia has 18 priority areas, two of which are located in the Oconee River basin.

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 three major conservation programs from USDA 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. 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 that recommended a voluntary approach to the implementation of 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 BMPs.

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, and 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 BMPs 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 violations of state water quality or federal wetlands requirements.

Additional requirements are imposed within the National Forest areas of Georgia. Each National Forest produces and regularly updates a 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 ensure 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 waterbodies. The first is the division between statutory responsibilities for management of water quality, (granted to EPD) and local government's constitutional responsibility for management of the land activities that affect urban waterbodies. The second impediment is the widespread nature of the nonpoint sources and the variety of activities that can 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 it is responsible for administering and enforcing a variety of permit programs, including permitting of storm water 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 nonpoint 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 nonregulatory 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 that 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:

- Implementing local nonpoint source management programs, streambank and stream restoration activities, and community Adopt-A-Stream programs.
- Developing and disseminating local watershed planning and management procedures.
- Implementing state and local erosion and sedimentation control programs.
- Preparing and disseminating technical information on best management practices and nonpoint source monitoring and assessment.
- Implementing nonpoint source education programs for kindergarten through grade 12 through Project WET (Water Education for Teachers), as described in Section 7.3.6.
- Implementing the Georgia Adopt-A-Stream Program, as described in Section 7.3.6.
- Identifying and evaluating 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 statutes are in Title 44 of the *Code of Federal Regulations,* Parts 59 to 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 exercises no land use regulatory authority; regulation of flood hazard areas is accomplished at the local level by participating jurisdictions.

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 governments 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 in maintaining 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 federally 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 that Governor Zell 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 protect natural and historic resources by acquiring and managing land in the river corridor; Significant Sites, which are tracts of land the Department of Natural Resources (DNR) will acquire and operate as traditional state public-use facilities—such as wildlife management or public fishing areas, parks or historic sites, natural areas, and greenways; and Restoration Sites, which are tracts of land 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

Although the 1993 Federal Administration Wetlands Plan calls for a concerted effort by EPA and other federal agencies to work cooperatively toward achieving 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

DNR's Wildlife Resources Division 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 and 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 through 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, lay the groundwork for behavioral change and are often important prerequisites for effective implementation of BMPs and comprehensive watershed management programs.

General goals for stakeholder involvement and stewardship strategies are as follows:

- Generate local support for nonpoint source management through public involvement and through monitoring of streams and other waterbodies and of results of management actions.
- Increase individuals' awareness of how they contribute to nonpoint source pollution problems and implement appropriate strategies to motivate behavioral 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 cleanups.

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 nonpoint source pollution (especially where land use is largely agricultural crop production). Examples of such pollution (e.g., excess fertilizer and animal waste) are presented in workshops, videos, and manuals. In northern 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 nonpoint source pollution from construction and urban runoff. Workshops and training sessions emphasize the connection between land use, storm water 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 education and an action component on a local stream. Volunteers commit for a minimum of a 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 participating in 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 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. "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 more than 1,000 volunteers cleaning up river segments in over 50 locations. In addition, the Georgia Adopt-A-Stream Program conducts numerous presentations around the state.

Nonpoint Source Education: Project WET (Water Education for Teachers)

A report outlining a plan for nonpoint source education in Georgia was completed in 1994. Titled Georgia Urban Waterbody Education Plan and Program, the report 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 and students in grades K to 12. To reach this target audience, EPD has focused on implementing Project WET, a water resources education curriculum that focuses on nonpoint source pollution. Covering impacts on ground water and surface water, the curriculum addresses the following nonpoint sources: agriculture, forestry, urban, and construction. It is recognized nationally and internationally and is readily adaptable to fit the state's Quality Core Curriculum requirements. To date, nonpoint source concerns have not received significant emphasis in water resources education efforts in Georgia. Implementation of Project WET is addressing this gap, providing educators and students with an understanding of the problems caused by nonpoint source pollution and the tools that can be used to prevent, control, or abate nonpoint source impacts.

EPD began implementing Project WET in December 1996. In 1997 Project WET Facilitator Training Workshops were successfully completed in Alpharetta, Macon, and Savannah, Georgia. Currently there are 86 Project WET Facilitators in Georgia.

In 1997, 32 Project WET Educator Workshops were successfully completed in Georgia statewide, with more than 500 educators receiving certified Project WET training and implementing the Project WET curriculum in classrooms. In addition to Project WET Facilitator Training and Educator Workshops, 40 Project WET Demonstration Workshops were presented to teachers and environmental educators throughout Georgia. A newsletter is published and distributed quarterly with program updates, workshop schedules, information about available resources, reports about classroom activities, and success stories. After 3 years, it is expected that a cooperating agency will assume responsibility for ongoing Project WET activities. At that time, the focus of the state's NPS education activities will be reevaluated and, depending on the focus of education efforts undertaken by other entities, another of the audiences identified in the 1994 education plan might be targeted.

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 USEPA 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 occurs. 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 into 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 DNR) that 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, and disposal facilities.
- Municipal and industrial land treatment facilities for waste and wastewater sludge.
- Municipal and industrial discharges to rivers and streams.
- Storage, concentration, or 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 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.

Moreover, 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, the Department of Community Affairs; and on-site sewage disposal, the Department of Human Resources. EPD has established formal Memoranda of Understanding with these agencies. The Georgia Groundwater Protection Coordinating Committee was established in 1992 to coordinate ground water 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 targeted toward the concerns and priority issues for the Oconee River basin described in Section 6. Strategies are presented for each issue of concern, with divisions by geographic area as appropriate. For each of the concerns identified, the management strategy statement 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 sub-basin to work together and implement strategies to address each priority concern. In some cases, a

strategy might simply consist of increased monitoring; in other situations, the stakeholders in the sub-basin will need to develop innovative solutions to these water quality issues. Although EPD will continue to provide technical oversight, conduct monitoring surveys, and evaluate data on a basinwide scale, locally-led efforts in the sub-basins will be required to help to monitor, assess, restore, and maintain the water quality throughout the Oconee River basin.

7.3.1 Metals

Problem Statement

Water use classifications were not fully supported in several waterbody segments due to exceedances of the water quality standards for metals. These water quality exceedances are primarily attributed to nonpoint sources, both rural and urban (for a complete listing of affected stream segments see Appendix E). A common strategy is proposed for addressing metals throughout the basin. However, achieving standards for metals in individual stream segments will depend on the development of site-specific local management plans.

Oconee River Above Sinclair Dam (HUC 03070101)

The water use classification of fishing or drinking water was not fully supported in one Oconee River mainstem segment, and in 17 tributary stream segments, due to exceedances of the water quality standards for metals. Lead standards were exceeded in the river due to a water pollution control plant discharge; lead, copper, zinc and/or mercury were exceeded in tributary streams due primarily to nonpoint sources in eight segments, urban runoff in six segments, and to water pollution control plant discharges in three segments.

Oconee River Below Sinclair Dam (HUC 03070102)

The water use classification of fishing was not fully supported in one tributary stream segment due to exceedances of the water quality standards for metals. Mercury standards were exceeded in the tributary segment due to nonpoint sources.

General Goals

Meet water quality standards to support designated water uses.

Ongoing Efforts

The primary contributor of metals to streams are nonpoint sources. In cases where a water pollution control plant was the likely cause of the elevated metals concentration, EPD has taken enforcement action through the NPDES permitting process to require compliance with NPDES permit limits for metals.

Identified Gaps and Needs

The EPD is concerned with the accuracy of many of the stream assessments showing criteria violations for metals because in many cases the metals database was minimal, with as little as one data point showing a concentration in excess of stream standards. Further, there are quality assurance concerns with much of the earlier metals data since it is now evident that clean and ultra clean techniques for sample collection and laboratory testing are necessary to produce data of ensured quality. Thus, the first step to address this issue will be to collect additional samples using clean techniques to determine whether water quality standards are actually being exceeded.

It is also unclear how occasional standards violations translate into actual risk to aquatic life. Georgia standards for metals might need to be reevaluated in light of recent EPA guidance on use of the dissolved fraction of total metal concentrations to calculate risk to aquatic life. Additional biological monitoring might be appropriate to measure impacts along with concentrations of metals. Restoration goals for urban streams are not clearly defined. Consideration should be given to the interaction of metals and habitat degradation: mitigation of metals may have little beneficial impact unless habitat issues are also addressed. It is probable, however, that streams with highly urbanized watersheds cannot be restored to pristine "natural" conditions.

Strategies for Action

Addressing metals from nonpoint sources will be a complex task. An initial task will be to conduct additional monitoring to determine whether water quality standards are actually being exceeded.

Key Participants and Roles

- EPD will monitor and assess use support in listed waters, continue to enforce point source compliance with metal limits through the NPDES permitting program, and conduct additional monitoring to document metals concentrations in segments affected by nonpoint sources of metals.
- Other participants would be identified contingent on further analysis to confirm metal concentrations and on identification of potential sources.

Specific Management Objectives

Encourage and facilitate local government watershed planning and management to ensure that designated water uses are supported.

Management Option Evaluation

EPD will take the lead in conducting additional monitoring to confirm that water quality standards are being exceeded. If violations are documented, EPD will develop a plan to assess sources and identify alternative solutions.

Action Plan

- EPD will complete a review of existing metals data in listed segments by September 1998, in accordance with the statewide RBMP management cycle.
- EPD will propose a plan for resampling of streams identified as not supporting or partially supporting designated uses and complete sampling by December 1999, in accordance with the statewide RBMP management cycle.
- The basin team will re-evaluate stream status and management strategies during the next basin cycle.

Methods for Tracking Performance

To be proposed as strategies are refined.

7.3.2 Fecal Coliform Bacteria

Problem Statement

Water use classifications for fishing or drinking water were not fully supported in several waterbody segments due to exceedances of the water quality standards for fecal coliform bacteria. These water quality excursions are primarily attributed to nonpoint sources, both rural and urban. 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.

Oconee River Above Sinclair Dam (HUC 03070101)

The water use classifications of fishing or drinking water were not fully supported in two Oconee River mainstem segments and 46 tributary stream segments due to exceedances 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 animal wastes.

Oconee River Below Sinclair Dam (HUC 03070102)

The water use classification of fishing was not fully supported in two Oconee River mainstem segments and in one tributary stream segment due to exceedances 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 animal wastes.

General Goals

Meet water quality standards to support designated water uses.

Ongoing Efforts

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. Training was held in march of 1998 in the basin. The UGA and ARS have submitted proposals for assessing nutrient- and coliform-reducing BMPs on 10 farms, which will have statewide implications. Soil and Water Conservation Districts annually convene Local Work Groups, composed of resource professionals from a variety of disciplines and interested stakeholders at the local level, to identify resource concerns in their respective areas. These Local Work Groups develop proposals for USDA or other funding to address identified resource concerns.

There are special agricultural BMP demonstrations in nine counties in the basin, most of which deal with reducing pollutants associated with animal waste. There are also special initiatives above Lake Sinclair on Little River and Rooty Creek in association with EPA, UGA-CES, NRCS, and Georgia Power. CES has had a rural groundwater-testing program ongoing for several years. DHR is adopting new regulations for septic systems. In addition, EPA and NRCS, in cooperation with the agricultural community in Georgia, are conducting field inventories to verify agricultural contributions to water quality impairments on streams for which a TMDL has been established.

Identified Gaps and Needs

Sources of fecal coliform bacteria in many stream segments are not clearly defined. In some cases, fecal bacterial loads might be attributable to natural sources (e.g.,

wildlife); alternative bacteriological sampling methods might be useful to distinguish between human, other mammalian, and avian fecal coliform sources. Sanitary sewer leaks and overflows could be a source of fecal coliforms. In addition, 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 might be to collect an adequate number of samples (four over a 30-day period) to support geometric mean calculations to determine whether water quality standards are actually being exceeded.

Many coliform-reducing practices are expensive, and the percentage of reduction is often unknown. Many landowners are reluctant to spend today's dollars for long-term amortization in uncertain futures markets. Agricultural BMPs, cost-share dollars (Farm Bill and section 319 funds) and loans need to be concentrated in priority watersheds with a sufficient technical workforce to implement enough BMPs through long-term agreements or contracts to reduce sediment loading by 70 to 80 percent.

Strategies for Action

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

A. 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 5-year phase of the basin management cycle, management will concentrate on source control and planning. The efficacy of this approach will be evaluated during the next basin cycle.

Key Participants and Roles

- EPD will monitor and assess use support in listed stream segments and will encourage local efforts to address nonpoint source pollution.
- Local governments will continue to operate and maintain their sewer systems and wastewater treatment plants; monitor land application systems; and develop and implement storm water regulations, zoning and land use planning, local watershed initiatives, and monitoring programs.
- Local municipalities should work with local health departments to identify locations of septic systems and educate owners about the proper care and maintenance of septic systems.
- Citizen groups will implement Adopt-A-Stream programs and work with local governments in implementing watershed initiatives.

Specific Management Objectives

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

Management Option Evaluation

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

Action Plan

- EPD will continue to ensure that all permitted point sources remain in compliance with permitted effluent limitations for fecal coliform bacteria. EPD will also request a comprehensive watershed assessment, looking at both point and nonpoint sources, from localities applying for new or expanded NPDES point source discharge permits. The intent is to direct localities' attention to current and future nonpoint source issues in their watershed 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 storm water program and encourage local planning to address storm water management.
- 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 jurisdictions.
- EPD will encourage citizen involvement through Adopt-A-Stream groups to address restoration of urban streams.
- 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. Sampling will be completed by December, 1999, in accordance with the statewide RBMP management cycle.

Method for Tracking Performance

EPD tracks point source discharges through inspections and evaluations of self-monitoring data. The status of listed waterbodies will be evaluated coincident with the next iteration of the RBMP management cycle for the Oconee River basin.

B. Strategies for Rural Sources

Agricultural cost-share dollars (Farm Bill and section 319 funds) and loans need to be concentrated in priority watersheds with sufficient technical workforce to implement enough BMPs through long-term agreements or contracts.

Key Participants and Roles

- EPD will monitor and assess use support in listed streams, encourage local planning efforts, and regulate point sources under the NPDES program.
- GSWCC and local SWCDs and RC&D Councils, with assistance from NRCS, will promote implementation of agricultural management practices. Local SWCDs will convene Local Work Groups to identify local resource concerns and develop proposals for funding to address these concerns.
- County and municipal governments will develop septic system regulations, and develop and implement land use planning guidelines.
- Citizen groups will implement Adopt-A-Stream programs, and work with local governments in implementing watershed initiatives.

Specific Management Objectives

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

Management Option Evaluation

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

Action Plan

- EPD will continue to ensure that all permitted point sources remain in compliance with fecal coliform bacteria limits.
- EPD will continue monitoring and assessment of Land Application Systems.
- GSWCC and local agricultural agencies will continue to support adoption of BMPs for animal waste handling and will follow up on complaints related to coliform bacteria derived from 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 sustain excessive fecal coliform loads from animal operations.
- DHR is in the process of developing new regulations for septic systems. DHR will work to educate local governments and citizen groups about the need for adequate regulation and maintenance of septic systems to protect water quality. DHR will also use the criteria presented in the Growth Planning Act for septic system setbacks from high-value waters.

Method for Tracking Performance

Agricultural agencies will track rates of BMP implementation for animal operations. The status of listed waterbodies will be evaluated coincident with the next iteration of the RBMP management cycle for the Oconee River basin.

7.3.3 Erosion and Sedimentation

Problem Statement

The water use classification of fishing is potentially threatened in many waterbody segments by erosion and loading of sediment, which can alter stream morphology, affect habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, stream erosion (including headcutting, bank erosion, and shifting of the bedload), forestry practices, and agriculture. Threats from sediment load are possible throughout the Oconee River basin. 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.

General Goals

Control erosion and sedimentation from land-disturbing activities to meet water quality standards for turbidity and support designated uses.

Ongoing Efforts

Forestry and agriculture have voluntary erosion and sediment control (E&SC) programs built around implementation of BMPs. Both forestry and agriculture have a water quality complaint resolution procedure in place. GSWCC recently updated and is distributing *Manual for Erosion and Sediment Control in Georgia* and *Field Manual for Erosion and Sediment Control in Georgia*. The GSWCC and its agricultural partners have produced and distributed three E&SC pamphlets—*Guidelines for Streambank Restoration, A Guide to Controlling Erosion with Vegetation, and Agricultural Best Management Practices*. These and numerous other 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, composed of resource professionals from a variety of disciplines and interested stakeholders at the local level, to identify resource concerns in their area. 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 through local talks, workshops, and demonstrations including the Master Timber Harvesters Workshop sponsored by the Georgia Forestry Association and the American Forest and Paper Association. The workshop's goal is to train 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. The new Forestry BMPs, scheduled for printing in June 1998, will result in additional sedimentation reductions and create more riparian tree cover over perennial and intermittent streams when they become standard within the industry.

EPD serves as an "Issuing Authority" in those localities across the state that do not have a local erosion and sedimentation control ordinance or program. EPD provides permitting, inspection, compliance, and enforcement services in these areas.

There are several urban-focused erosion educational initiatives underway. 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 to from 8 to 11 units of government each year. A task force established by the Lieutenant Governor, the Erosion and Sediment Control Technical Study Committee, also 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 PASS, which deals with vegetative plantings to reduce erosion from streambanks.

A portion of HUC 03070101 is managed by the US Forest Service as part of the Oconee National Forest. Management of the National Forest is prescribed in a Land and Resource Management Plan, which specifies the standards and guidelines and appropriate timing and vicinity of allowed practices. Seven management areas are of particular significance to the Oconee River basin:

- Management Area 6: Archaelogical, cultural, or historical sites, these are generally areas of relatively small acreage. Timber management is allowed only to enhance cultural values or provide for public safety; timber yields from these areas are non-chargeable yields. Roads are permitted to provide for public access.
- Management Area 9: Developed recreation areas. Timber management is allowed only to enhance cultural values or provide for public safety; timer yields from these areas are non-chargeable yields. Roads are permitted to provide for public access.

- Management Area 10: Murder Creek Research Natural Areas (996 acres), used for non-manipulative research of undisturbed ecosystems. No timber production is allowed, and new roads are prohibited unless necessary to meet RNA objectives.
- Management Area 12: Major lakes, vistas, and scenic areas. The management goal is to maintain a visually appealing landscape. Timber harvesting is permitted, but clearcutting is subject to strict limitations.
- Management Area 14: Scull Shoals Experimental Forest, provides and area for study of silvicultural problems. Timber production and road maintenance are allowed.
- Management Area 16: The general forest area, which contains the majority of the National Forest and is managed in compliance with the Multiple-Use Sustained Yield Act of 1960. Although the primary focus is on renewable resource production, special protection is provided for unique and delicate resources. General prescriptions for road and skid trail construction and maintenance, vegetation management, timbering and reforestation, watershed improvement, and erosion protection apply.

In addition, there are two known red-cockaded woodpecker populations within the Oconee National Forest. Forest within 3/4 mile of these populations receives special protection in order to encourage survival of this endangered species.

Oconee River Above Sinclair Dam (HUC 03070101)

GSWCC estimates that there are 376,200 agricultural acres within this HUC and that 52,400 acres are eroding above the soil loss tolerance. NRCS has recently completed a River Basin Assessment of the Upper Oconee basin. Sugar Creek Watershed and Mulberry River Watershed are designated USDA-EQIP 1997 priority areas with $183,200 and $175,200 allocated, respectfully. The majority of the funds are directed toward livestock water quality concerns. Also within the HUC, Hard Labor Creek Watershed has been designated a 1998 USDA-EQIP number 1 priority area and North Oconee River and Upper Middle Oconee River selected as secondary priority areas. There are also a number of ongoing special agricultural BMP demonstrations in Jackson, Jasper, Morgan, Putnam, and Baldwin counties.

GFC conducted statewide forestry BMP Compliance Surveys in 1991 and again in 1992 and is conducting one in 1998. During the 1992 survey, GFC evaluated 2,875 acres in the Upper Oconee basin and determined that, of the activities, 96 percent of the roads and 93 percent of the harvested acres were in compliance with BMPs. No site-prepared acres or regenerated acres were evaluated.

Oconee River Below Sinclair Dam (HUC 03070102)

GSWCC estimates that there are 318,750 agricultural acres within the Basin and that 117,500 of those acres are eroding above the soil loss tolerance. There are special agricultural BMP demonstration ongoing in Bleckley, Laurens, Washington, and Baldwin counties.

GFC conducted statewide forestry BMP Compliance Surveys in 1991 and again in 1992 and is conducting one in 1998. During the 1992 survey, GFC evaluated 843 acres in the Lower Oconee Basin and determined that, of the activities, 94 percent of the roads and 98 percent of the harvested acres, 98 percent of site prepared acres and 100 percent of regenerated acres were in compliance with BMPs.

Identified Gaps and Needs

Adverse impacts of excess sediment loading include degradation of habitat and reduction in species diversity. These types of impacts are best addressed 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 include habitat assessment. The WRD is working with the Index of Biotic Integrity (IBI) 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.

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

Many privately owned sawmills are not members of the American Forest and Paper Association, and there is no good way of requiring these mills and their producers to come to the Master Timber Harvesters Workshops. The GFC, UGA, GFA, and Southeastern Wood Producers Association are working on a solution. Education of private landowners who are selling timber for the last time prior to land development is still needed. They obviously want to receive all the timber's worth, sometimes at the expense of BMPs.

Much of the sediment being produced and adversely impacting streams and lakes is associated with road development and maintenance. In many instances E&SC plans, implementation, inspection and enforcement are not adequate on DOT and county sponsored road projects. Without aggressive inspection and enforcement contractors sometimes tend to let erosion problems happen and attempt to mitigate 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. Further monitoring might be needed to quantify the impact of unpaved rural roads as a source of sedimentation into streams.

Strategies for Action

Understanding of the role of erosion and sedimentation in urban streams is incomplete at this time. Most of these streams are affected by a variety of stressors. An incremental or phased approach is needed to address these issues.

Most agricultural sediment reduction practices are 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 Act State Revolving Fund) need to be concentrated in priority watersheds with sufficient technical workforce to implement enough BMPs through long term agreements or contracts to reduce sediment loading by 70 to 80 percent.

Key Participants and Roles

- EPD will encourage local government water quality improvement efforts.
- EPD and WRD will monitor and assess use support in the basin, and continue development of biomonitoring methods.
- Local governments will enforce erosion controls for construction practices and implement land use planning.

- GSSWC and local SWCDs and RC&D Councils, with assistance from NRCS, will encourage the implementation of BMPs to control erosion of agricultural lands. Local SWCDs will convene Local Work Groups to identify local resource concerns and develop proposals for funding to address these concerns.
- GFC will encourage compliance with forestry BMP guidelines.
- Citizen groups will implement Adopt-A-Stream programs and work with local governments in implementing watershed initiatives.

Specific Management Objectives

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

Management Option Evaluation

During this iteration of the basin cycle, management will focus on source control BMPs. Evaluation will be on a site-by-site basis. For agricultural BMP support, existing prioritization methods of the agricultural agencies will be used.

Action Plan

- GSSWC and local SWCDs and RC&D Councils, with assistance from NRCS, will encourage the implementation of BMPs to control erosion of agricultural lands.
- GFC will target landowner and user groups for BMP education to encourage compliance with forestry BMP guidelines.
- EPD will work with local governments with 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.
- EPD will encourage citizen involvement through Adopt-A-Stream groups to address restoration of urban streams.
- EPD and WRD will continue to develop biological monitoring capabilities designed to assess aquatic life.
- The basin team will re-evaluate listed stream status and management strategies during the next basin cycle.

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 and through surveillance for any noncompliance and the conduct of necessary compliance and enforcement activities. NRCS will track BMP implementation through its NIMS reporting system.

7.3.4 Fish Consumption Guidelines - Upper Oconee (HUC 03070101)

Problem Statement

The water use classification of fishing was not fully supported in one Oconee River mainstem segment from Athens to Barnett Shoals Dam), one tributary stream segment

(Apalachee River), and Lake Oconee based on fish consumption guidelines due to the presence of mercury. The guidelines are for largemouth bass and silver redhorse in the mainstem segment and largemouth bass in the tributary and lake.

General Goals

Work to protect human health by providing guidelines for consumption of fish.

Ongoing Efforts

DNR has monitored fish in and upstream of Lake Oconee and issued fish consumption guidelines. There are no known point source discharges of mercury in the watershed. However, mercury is a naturally occurring metal that recycles between land, water, and air. As mercury cycles through the environment, it is absorbed and ingested by plants and animals. Most of the mercury absorbed will be returned to the environment but some will remain in the plant and animal tissues. It is not known where the mercury in fish originated. Mercury may be present in fish due to mercury content in the soils, from municipal and industrial sources, or from fossil fuel use. It is also possible that the mercury is related to global atmospheric transport.

Identified Gaps and Needs

The sources of mercury within the watershed are not well quantified. Mercury in the area is likely derived from natural sources or from atmospheric deposition.

Strategies for Action

Because the loads of mercury are not originating from any known point sources, the strategy is to keep the fishing public notified of risks associated with fish consumption.

Key Participants Roles

- EPD and WRD to sample the fish tissue and issue the fish consumption guidelines as appropriate.

Specific Management Objectives

EPD and WRD will work to protect 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 basin will be considered in 1999 in accordance with the river basin monitoring cycle.
- EPD will evaluate the need for additional sampling (*e.g.*, sediment sampling) to determine sources of mercury during the next iteration of the Oconee River basin management cycle.

Method of Tracking Performance

Trends in fish tissue concentration; number of fish consumption guidelines required.

7.3.5 Nutrients - Upper Oconee (HUC 03070101)

Problem Statement

The water use classifications of fishing, drinking water, or recreation are potentially threatened in Lake Oconee, Lake Sinclair, Lake Brantley, and Rock Eagle Lake due to inputs of nutrients that might cause excess algal growths in the lakes. Nutrient sources include water pollution control plant discharges, lake fertilization and nonpoint sources from urban and agricultural areas.

Excess nutrient loads are a 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 smaller rivers and streams. For this iteration of the Oconee basin plan, nutrients have been identified as a significant issue in the upper Oconee HUC due to loading of nutrients to reservoirs. These nutrients derive from the entire watershed upstream, and protection of water quality will require basin-wide strategies to control nutrient loads.

General Goals

Meet water quality standards and maintain nutrient loading at levels sufficient to support designated water uses.

Ongoing Efforts

Sediment and agricultural chemical and nutrient loadings will be used to assess nonpoint source pollution from agricultural, forested and other rural sources. A GIS data base will be developed that delineates potential areas of nonpoint source pollution to be used by the Georgia Soil and Water Conservation Districts to prioritize technical and financial assistance.

Agriculture is making progress. Use of minimum tillage and nitrogen building cover crops has increased and considerable effort has been directed toward reducing runoff from animal confinement areas. Georgia Universities and agricultural agencies or groups are conducting several agricultural efforts with statewide implementations. In the Upper Oconee Basin Sustainable Agriculture and Farm*A*Syst. Training was held in March of 1998 and UGA and ARS have proposals in for assessing nutrient and coliform reducing BMPs on 10 farms. There are special agricultural BMP demonstrations in nine counties in the Oconee basin. Most deal with reducing pollutants associated with animal waste. There are also special initiatives above Lake Sinclair in the Little River and Rooty Creek watersheds association with EPA, UGA-CES, NRCS, and Georgia Power. All agricultural agencies and many interest groups continually distribute rural water quality information and education materials. DHR is adopting new regulations for septic systems.

Identified Gaps and Needs

Additional effort is needed in assessing the fate of nutrients associated with storage and application of animal waste. Many nutrient reducing practices are expensive and landowners are reluctant to spend today's dollars for long term amortization in uncertain futures markets. Additional cost share dollars and perhaps revolving loans are needed.

Strategies for Action

Agricultural cost share dollars (Farm Bill and Section 319 funds) and loans need to be concentrated in priority watersheds with sufficient technical workforce to implement enough BMPs through long term agreements or contracts to reduce sediment loading by 70 to 80 percent.

Key Participants and Roles

- EPD will monitor and assess use support in area waters as a part of the river basin monitoring process; coordinate and encourage voluntary nonpoint source control strategies; regulate wastewater treatment plants and other point sources of nutrient load.
- GSWCC and local S&WCDs and RC&D Councils with assistance from NRCS will continue to promote implementation of agricultural management practices to reduce erosion and nutrient export.
- Georgia Forestry Commission will encourage implementation of forestry BMPs.
- County and municipal governments will regulate septic systems, enforce of erosion controls for construction, and implement land use planning.
- Forest owners, farmers, ranchers, agricultural agencies, legislators and EPA.

Action Plan

- Nonpoint loading of phosphorus is largely associated with the movement of sediment. Therefore, all the actions for nonpoint sediment and erosion control to be undertaken by agricultural and forestry organizations and local governments and described under Section 7.3.3 are relevant to nutrient loading.

7.3.6 Low Dissolved Oxygen

Problem Statement

The fishing water use classification was not fully supported in a number of stream segments due to dissolved oxygen concentrations less than water quality standards.

Oconee River Above Sinclair Dam (HUC 03070101)

The fishing water use classification was not fully supported in five tributary stream segments due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the tributaries was due to nonpoint sources, urban runoff and water pollution control plant discharges.

Oconee River Below Sinclair Dam (HUC 03070102)

The fishing water use classification was not fully supported in one tributary stream segment due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the tributary was due to nonpoint sources.

General Goals

Meet water quality standards to support designated water uses.

Ongoing Efforts

In cases where a water pollution control plant was the likely cause of the depressed dissolved oxygen concentration, EPD has taken enforcement action through the NPDES permitting process to require compliance with NPDES permit limits for oxygen-demanding waste and nutrients. If the problem cannot be resolved completely through point source controls, it will be dealt with as part of the TMDL schedule for the Oconee basin.

Strategies for Action

Ensure that permit limits are being met for municipal and industrial discharges and implement additional nonpoint source controls to reduce the amount of oxygen-demanding waste entering the listed waterbody. EPD will reevaluate dissolved oxygen conditions in the Oconee River basin.

Key Participants and Roles

- EPD will monitor and assess use support in listed waters, administer storm water regulations, and regulate point sources under the NPDES program.

Action Plan

- EPD will review alternatives in the next basin planning cycle for maintenance of compliance with the dissolved oxygen standard.
- Local governments will implement storm water management strategies and manage operations of water pollution control plants.
- WRD will continue work to study habitat requirements of fish populations.

Methods for Tracking Performance

A reevaluation of the dissolved oxygen issues will be made coincident with the next iteration of the RBMP management cycle for the Oconee River basin.

7.3.7 Elevated Water Temperature - Upper Oconee (HUC 03070101)

Problem Statement

The water use classification of fishing and recreation was not fully supported in Lake Sinclair due to exceedances of the temperature water quality standard. The elevated water temperature is associated with the discharge of cooling-process water from a power plant operation.

General Goals

Control the thermal discharge from the power plant sufficiently to support designated water uses within Lake Sinclair.

Ongoing Efforts

Engineering and permitting solutions are currently being explored by Georgia Power (owner of the power plant), Georgia EPD, and USEPA. Georgia Power has carried out special studies of the biological resources in the affected portion of Lake Sinclair, and has proposed the construction of cooling towers that would reduce the heat input from the

cooling water into the lake. EPD and EPA are in the process of reviewing the studies and the proposal, and are conducting meetings with Georgia Power to arrive at a final agreement. The power plant's NPDES permit has been extended while the specific details of the new permit are worked out.

Strategies for Action

EPD, EPA and Georgia Power will continue to explore engineering and permitting solutions that will ensure that designated water uses within Lake Sinclair are protected. When agreement is reached, a new NPDES permit will be issued.

Key Participants and Roles

- EPD monitors and assesses use support and regulates point sources under the NPDES program.
- USEPA reviews major NPDES permit applications.
- Georgia Power controls and operates the Lake Sinclair Dam, the Lake Oconee Dam, and the Plant Branch power plant, and is responsible for building plant upgrades needed to meet permit requirements.

Action Plan

- EPD, EPA, and Georgia Power will agree on an engineering and permitting solution that is expected to protect designated water uses of Lake Sinclair.
- EPD will issue a new NPDES permit that includes effluent temperature limitations, and that takes into account the expected schedule of construction of cooling towers or other engineering structures.
- Georgia Power will construct the cooling towers or other engineering structures agreed upon with EPD and EPA.
- The basin team will re-evaluate stream status and management strategies during the next basin cycle, scheduled for 1998.

Method for Tracking Performance

Monitoring of water temperature at strategic locations.

7.3.8 Protection of Threatened and Endangered Species

Problem Statement

The Oconee basin is home to a number of aquatic species that have been listed as threatened or endangered and require protection.

General Goals

To provide aquatic habitat and management to support the survival and propagation of threatened and endangered species; to meet or exceed state and federal laws, rules, and regulations for the protection of endangered species; and to incorporate planning for protection of threatened and endangered species into all aspects of basin planning.

Ongoing Efforts

Information on ongoing efforts to protect threatened and endangered species in the Oconee River basin was not available at the time of the preparation of this draft plan.

7.3.9 Source Water Protection for Drinking Water Sources

Problem Statement

Many public water suppliers have no control over their source watersheds and have to spend additional treatment dollars to ensure a high-quality water supply. All streams with municipal water intakes need to have watershed assessments and protection plans developed, and implemented. All streams and existing lakes with plans being considered for public water supply should have a source water assessment made early in the planning process.

General Goals

EPD will establish proactive planning and management to maintain safety and high quality of drinking water sources.

Ongoing Efforts

Georgia EPD is developing a Source Water Assessment Program (SWAP) in alignment with EPA's initiatives. EPD is working with USGS on some program elements and beginning to work with some water authorities in starting the process. Some water authorities and local governments have adopted source water protection measures in conjunction with Growth Strategies Initiatives. Other local groups have taken an interest in promoting source water protection in the basin.

Identified Gaps and Needs

This is a new and more comprehensive initiative, and neither EPD nor many local authorities have much experience in performing the assessments and the protection plans. The Implementation Plan is still under development by EPD.

There are complexities in developing an assessment that would be general to all watersheds because of the varying land uses. Therefore, EPD has the task of deriving a number of approaches that can be applied to a watershed depending upon the development and land uses within it. EPD must derive these approaches with the assistance of advisory committees and the public prior to submitting the SWAP Implementation Plan to EPD.

EPD must also find effective measures to promote and encourage local communities to adopt source water protection programs using the assessment results.

Strategies for Action

EPD will develop and submit to the Environmental Protection Agency a SWAP Implementation Plan by February 6, 1999. EPD will describe in the SWAP Implementation Plan methods and approaches for (1) delineating the source water protection areas for all public water supply sources within the state (the outer management zone for ground water sources); (2) inventorying potential contaminants within the delineated protection zone; (3) determining water supply susceptibility to significant potential contaminants within the protection zone; and (4) involving the public in developing SWAPs and make assessments available to the public.

Key Participants and Roles

- EPD, local governments, water authorities, federal, state, and local agencies, and special interest groups.

Specific Management Objectives

The EPD is actively working toward the national goal of 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.

Management Option Evaluation

Formulation will be on a site by site basis and be updated with each planning cycle in the basin.

Action Plan

- EPD will submit a SWAP Implementation Plan by February 6, 1999.
- Identify water intakes and authorities.
- Delineate watersheds contributing to intakes.
- Establish criteria and guidelines for assessments and protection plans.
- Provide support to water authorities and local governments.
- Review and approve source water protection plans.

Methods for Tracking Performance

To be determined.

7.3.10 Flooding and Floodplain Management - Lower Oconee (HUC 03070102)

Problem Statement

Flooding in Laurens County and the city of Dublin continues to be a major factor associated with property loss in the basin.

General Goals

Increase awareness and knowledge of floodplain management. Enhance the floodplain management capabilities of communities participating in the National Flood Insurance Program (NFIP).

Ongoing Efforts

The Floodplain Management Office will continue to provide workshops, technical assistance, and data to participating communities and other parties involved in floodplain determinations.

Identified Gaps and Needs

Communities participating in the NFIP need to become more aware of the necessity for implementing more stringent floodplain management measures and developing multi-objective management strategies to address issues related to flooding.

Strategies for Action

Strengthen "partnerships" with Regional Development Centers (RDCs), Georgia Municipal Association, and Association of County Commissioners of Georgia to maintain compliance and increase the number of NFIP communities within the basin. Continue to develop partnerships with Georgia Board of Realtors as well as the local Boards of Realtors, and other agencies and organizations involved in floodplain determinations. Agencies such as the Natural Resources Conservation Service and U.S. Army Corps of Engineers are potential resources for technical data and information.

Key Participants and Roles

- Federal government (FEMA): Identify and map communities flood hazard areas; provide technical assistance to communities; establish insurance rates based on identified risk.
- State government (Floodplain Management Office): Provide guidance and technical assistance to participating communities; evaluate and document communities' and state agencies' floodplain management capabilities; provide information and training to the private sector.
- Local governments: Administer and enforce local floodplain management regulations in compliance with federal standards; issue or deny development/building permits; notify property owners of flood risk; maintain community flood maps for public inspection; apply for participation in the National Flood Insurance Program.

Specific Management Objectives

- Increase the public and private sectors awareness and understanding of floodplain management.
- Enhance the effectiveness of floodplain management at the state and local level.
- Maintain compliance of participating communities; increase the number of local communities participating in the NFIP.

Action Plan

The following activities will be implemented by the Georgia Floodplain Management Office:

- Expand the use of information technology to improve the level of awareness regarding floodplain management.
- Continue to establish public and private partnerships to promote understanding of floodplain management.
- Increase opportunities for delivery of floodplain management training and technical workshops.
- Identify target communities for participation in the NFIP.

- Identify target communities with the possible capabilities of enacting stronger measures to further reduce flood damages.

Method for Tracking Performance

The Floodplain Management Staff will conduct quarterly reviews of the action plan and prepare semi-annual reports summarizing performance activities along with needed updates. (Semi-annual report based on Federal Fiscal Year.)

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 Oconee River basin, but not the final step. It is important for all to understand 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

For the past few decades, management efforts have resulted in substantial improvements in water quality, and reduction in pollutant loading for many waters (see examples in Section 4). Many of these improvements stem from increased wastewater treatment by municipalities and industries, and from landowners' implementation of best management practices that help reduce soil and contaminant runoff. Indeed, many of the waterbodies in the basin are fully supporting their designated uses. The assessments summarized in this plan show, however, that not all waters are at the level of quality deemed necessary to support designated uses. There are waters still in need of restoration and attention.

Participation by Many Different Stakeholders

The current and proposed strategies summarized in this plan do not "solve" all existing problems. Many of the unsolved problems will require actions by stakeholders other than those that have been involved in planning to date. For example, resolution of fecal coliform bacteria problems will typically require local government actions (e.g., dealing with urban storm water issues and leaking and overflowing sanitary sewers) and

private landowner actions (e.g., correcting failed septic systems, using best management practices in animal operations and land application of waste residuals). Other issues will require significant additional time and effort before they are addressed sufficiently (e.g., restoration of riparian zones and aquatic habitat). Some of these issues might require making trial management efforts and adapting those efforts over time based on observations of what works well, particularly where there is no 100 percent effective solution evident at the time of strategy development. Future management should focus on the priorities among these continuing needs, as determined by communities and partners in management.

In addition, continued growth in population is expected in the Oconee basin (see Section 2). This growth will place additional demands on water resources and require corresponding responses in management. More people means more water use (drinking water, industrial consumption, irrigation), more storm water runoff (from impervious surfaces of new houses, roads, industries, businesses, and parking lots), and more contamination (sediment; nutrients; organic material; pesticides, herbicides, and other toxics). Therefore, it is essential that stakeholders continue to work together to plan and implement the most cost-effective ways of restoring and protecting water resources.

Blending Regulatory and Voluntary Approaches

Although the regulatory authorities of agencies such as EPD are important for the 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 will 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 lifestyles and operations accordingly. Experience indicates that people are much more likely to buy into proposed management solutions in which they have a say and control over how they spend their 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 resources 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 basin management success for the Oconee 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 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.
- 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.

There are many areas, however, where 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 (landowners and Georgia Forestry Commission).
- 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, there are other agencies and organizations that assist planning and implementation in many of these areas—regional development centers; federal, state, and local technical assistance programs; citizens groups; and business associations. As stakeholders become more familiar with one another's responsibilities and capabilities, they will more frequently become aware of appropriate partners with whom they can work to address 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 that support two-way communication. For example, Basin Technical Planning Team meetings provide opportunities for partners to share information on their responsibilities and capabilities with one another. Similarly, Local Advisory Committee meetings and stakeholder meetings provide opportunities for citizens, businesses, government agencies, associations, and others to share information and learn from one another. Although often requiring considerable time, these interactions 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 within 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

To address the impacts from anticipated population growth and increased land development in the basin, management will need to build on the increased understanding of roles and to 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 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 resolve 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 Regional Development Centers (RDCs) to work out consistent methods to conduct watershed assessments in developing areas and for improving 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, and 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 implementing this plan, the Oconee River basin will enter into its second iteration of the basin management cycle (scheduled for mid-1998). The next cycle will provide an opportunity to review issues that were not fully addressed during the first cycle and to reassess and 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.

Providing a Historical Reference for the Next Basin Plan

Partners will not have to "start from scratch" during the next iteration of the basin planning cycle. The information in this document provides a historical account of what is known and planned to date. Stakeholders in the Oconee basin will know what was accomplished in the first iteration and therefore will be able to 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.

8.5 Priorities for Additional Data Collection

In 1996, monitoring efforts were focused on the Coosa, Oconee, and Tallapoosa River basins in accordance with the EPD basin planning schedule. Intensive monitoring will return to the Oconee basin in support of the next iteration of the basin planning cycle in 1999. Prior to that time, EPD and partners will develop a strategic monitoring plan for the Oconee. 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
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 Oconee basin is summarized in the following table:

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1955	Texfi Blends WTF in Jefferson activated sludge system.
mid 60's	City of Winder Barber Creek 0.02 MGD oxidation pond.
mid 60's	City of Winder Cedar Creek 0.4 MGD secondary treatment system.
1966	Rock Eagle 4-H Center Oxidation Pond.
1967	City of Monticello built two oxidation ponds.
1968	City of Rutledge built an oxidation pond $135,000.
1970	Universal - Rundle Corporation in Monroe built treatment system $2,350,000.
1971	Smoke Rise Travel Trailer Park in Commerce built a wastewater stabilization pond.
1971	Trailwood Acres Mobile Home Park in Hall County built an oxidation pond.
1972	City of Madison constructed two extended aeration activated sludge treatment system for $1,000,000. The North Facility capacity is 0.5 MGD. South Facility has a capacity of 0.1 MGD.
1972	City of Winder Marburg WPCP 0.6 MGD secondary treatment.
1977	City of Statham 0.065 MGD extended aeration system $300,000.
1982	City of Hoschton built a collection system and stabilization pond for $667,000.
1982	City of Rutledge pond upgraded with baffles and aerators $25,000.
1984	Universal - Rundle Corporation in Monroe constructed three lagoons $105,000.
1987	Oconee County Utility Department constructed the Calls Creek WTF, a 0.163 MGD activated sludge system for $3,500,000.
1988	City of Mansfield built a 0.06 MGD activated sludge system $1,335,000.
1988	City of Winder constructed Cedar Creek Land Application System 1.65 MGD.
1991	Universal - Rundle Corporation in Monroe constructed three additional lagoons and polymer addition $187,000.

1994	City of Madison South Plant upgraded $300,000.
1995	Oconee County Utility Department expanded Calls Creek WTF to 0.4 MGD $1,250,000.

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early 50's	Thiele Kaolin Company Sandersville plant settling pond.
early 60's	Lynn Haven Nursing Home 0.0243 MGD wastewater treatment pond.
1964	City of Mount Vernon built collection system and oxidation pond $900,000.
1970	City of Soperton 0.4 MGD extended aeration system $1,019,000.
1970	City of Glenwood 0.04 MGD oxidation pond $386,278.
1970	Laurens County Board of Education built a 0.052 MGD treatment pond for West Laurens High School. East Laurens High School treatment pond construction date unknown.
1982	City of Mount Vernon upgraded the wastewater treatment system $1,700,000.
1985	Laurens County Board of Education built additional treatment pond at West Laurens High School to serve Heart of Georgia Institute.
mid 80's	Thiele Kaolin Company added additional settling pond and filtrate recovery clarifiers $300,000.
1991	City of Sandersville WTF upgraded $400,000.
1996	Oconee Health Care Center added aeration to treatment pond $2,000.

NPDES Permits for Discharges in the Oconee River Basin

Facility Name	NPDES #	Permitted Flow	Major?	County	Receiving Stream
HUC 03070101					
Athens, Cedar Creek	GA0034584	2.000	Y	Clarke	Cedar Creek to Oconee River
Athens, Middle	GA0021733	6.000	Y	Clarke	Middle Oconee River
Athens, North	GA0021725	10.720	Y	Clarke	North Oconee River
Blue Circle, Hall Co.	GA0049387	N/A		Hall	Mitchell Creek
Chestnut Mtn. Elementary	GA0034835	0.008		Hall	Unnamed tributary to Mulberry Creek
Colonial Pipeline Company	GA0047741	N/A		Clarke	Unnamed tributary to North Oconee River
Country Corners K-15 MHP	GA0023060	0.058		Clarke	West Fork Trail Creek
Crawford, West	GA0033707	0.037		Oglethorpe	Barrow Creek to Oconee River
DNR Hard Labor Creek	GA0050008	0.006		Morgan	Lake Brantley tributary
East Hall High School	GA0034878	0.028		Hall	North Oconee River
Eatonton East WPCP	GA0032271	0.275		Putnam	Rooty Creek tributary
Eatonton West WPCP	GA0032263	0.390		Putnam	Unnamed tributary to Little River
Feldspar Corporation	GA0035611	N/A		Greene	Bowdon Creek
Georgia Pacific Corp.	GA0047988	N/A		Morgan	
Georgia Power, Barnett Shoals	GA0004138	N/A		Oconee	Oconee river
Georgia Power, Plant Branch	GA0026051	N/A	Y	Putnam	Lake Sinclair
Georgia Power, Wallace Dam	GA0035581	N/A		Putnam	Lake Sinclair
Greensboro North	GA0021342	0.100		Greene	Richland Creek tributary
Greensboro, South	GA0021351	0.450		Greene	Town Creek tributary
Guardian Products, Inc.	GA0002917	N/A		Oconee	Oconee River
Hallmark Mobile Home Est.	GA0030236	0.058		Clarke	East Fork Trail Creek
Heartwood MHP	GA0049875	0.090		Oconee	McNutt Creek
Jasper Co. Board of Comm.	GA0034142	0.012		Jasper	Pearson Creek
Jefferson Pond	GA0023132	0.290		Jackson	Big Curry Creek
Madison Northside	GA0023159	0.660		Morgan	Mile bridge to Hard Labor Creek

Facility Name	NPDES #	Permitted Flow	Major?	County	Receiving Stream
Madison Southside	GA0023141	0.660		Morgan	Horse Bridge to No. Sugar River
Maysville Pond	GA0032905	0.060		Banks	Unnamed tributary to North Oconee River
Monticello Pearson Creek	GA0020141	0.170		Jasper	Parson Creek to Shoal Creek
Monticello White Oak	GA0020150	0.115		Jasper	White Oak Creek to Murder Creek
Pinewood South MHP	GA0034215	0.026		Oconee	McNutt Creek
Pinewoods Estates	GA0034233	0.044		Clarke	West Fork Trail Creek
Reliance Electric, Athens	GA0032875	N/A		Clarke	West Fork Trail Creek
Rock Eagle 4-H Center	GA0022233	0.155		Putnam	Glady Creek
Rutledge Pond	GA0025895	0.050		Morgan	Indian Creek
Social Circle	GA0026107	0.450		Walton	Little River tributary
Statham WPCP	GA0020044	0.150		Barrow	Barber Creek
TEXFI Industries, Inc.	GA0002712	N/A	Y	Jackson	Middle Oconee River
Watkinsville / Oconee Co.	GA0050211	0.160		Oconee	Calls Creek to Oconee River
Winder, Barber Creek	GA0023205	0.020		Barrow	Barber Creek to Mulberry River
Winder, Marburg Creek	GA0023191	0.600		Barrow	Marburg Creek to Apalachee River
HUC 03070102					
Ailey WPCP	GA0049247	0.080		Montgomery	Flat Creek
Dexter WPCP	GA0048682	0.075		Laurens	Stitchihatchie Creek
Dublin WPCP	GA0025569	4.000	Y	Laurens	Oconee River
Dudley WPCP	GA0023957	0.115		Laurens	Trukey Creek
East Laurens Elementary	GA00226915	0.034		Laurens	Shaddock Creek
ECC International, Bluff Creek	GA0002780	N/A		Washington	Bluff Creek / Panthar Run
ECC International, Keg Creek	GA0002135	N/A		Washington	Keg Creek
Engelhard Corp., Wilkinson	GA0003131	N/A		Wilkinson	Commissioner Creek / Little Commissioner Creek
Engelhard Kaolin Corp	GA0003271	N/A		Wilkinson	Little Commissioner Creek
Englehard Corporation	GA0050067	N/A		Washington	Bluff Creek
Forstmann & Company	GA0003760	N/A	Y	Laurens	Oconee River
GA College, Lake Laurel	GA0031593	0.002		Baldwin	Champion Creek
Georgia Power Sinclair	GA0004359	N/A		Baldwin	Oconee river
Glenwood WPCP	GA0032051	0.110		Wheeler	Tanyard Creek to Limestone Creek
Gordon WPCP	GA0020397	0.400		Wilkinson	Commission Creek

Facility Name	NPDES #	Permitted Flow	Major?	County	Receiving Stream
H&H Mobile Home Part	GA0022438	0.009		Baldwin	Lake Sinclair
Jeffersonville WPCP	GA0020940	0.250		Twiggs	Turkey Creek
Kentucky-Tennessee Corp.	GA003387	N/A		Washington	Limestone Creek
Lapp Insulator Company	GA0003123	N/A		Washington	Unnamed tributary to Limestone Creek
Middle GA Correctional Inst	GA0022110	0.030		Baldwin	Reedy Creek
Milledgeville WPCP	GA0030775	7.000	Y	Baldwin	Oconee River
Mohawk Commercial Carpets	GA0003697	N/A		Laurens	Oconee River
Mount Vernon WPCP	GA0033758	0.270		Montgomery	Limestone Creek
Nord Kaolin	GA0003395	N/A		Twiggs	Ugly Creek
Oconee Health Care Center	GA0035238	0.001		Washington	Oconee River tributary
Sandersville WPCP	GA0032051	1.700	Y	Washington	Tanyard Creek Tributary to Limestone Creek
SE Paper Manuf..	GA0032620	N/A	Y	Laurens	Oconee River
Soperton WPCP	GA0020826	0.400		Treutlen	Little Red bluff Creek
Sparta Pond	GA0025593	0.088		Hancock	Unnamed trubutary to Buffalo Creek
Thiele Kaolin Company	GA0002453	N/A		Washington	Limestone Creek
West Laurens High School	GA0022705	0.052		Laurens	Spring Creek
Wilkinson Co. High School	GA0031291	0.022		Wilkinson	Big Sandy Creek
Woodland Trails MHP	GA0033880	0.012		Laurens	Strawberry Creek

Support of Designated Uses for Rivers, Streams, and Lakes in the Oconee River Basin, 1996-1997

Data Source Codes (Column 1)

1 = EPD Watershed Planning and Monitoring Program
2 = EPD Permitting Compliance and Enforcement Program (Municipal)
4 = Wildlife Resources Division
7 = Gainesville College
8 = Georgia Institute of Technology
9 U.S. Environmental Protection Division
10 = U.S. Geologic Survey
11 = U.S. Army Corps of Engineers
14 = Cobb County
15 = DeKalb County
16 = Douglas County Water & Sewer Authority
17 = Fulton County
18 = Gwinnett County
20 = City of Gainesville
22 = Georgia Mountains, R.D.C.
25 = Lake Blackshear (Lake Blackshear Watershed Association)
26 = Lake Lanier (University of Georgia)
27 = West Point (LaGrange College/Auburn University
28 = Georgia Power Company
32 = Jones Ecological Resource Center
33 = Alabama DEM
34 = City of College Park
36 = University of Georgia
38 = Columbus Unified Government

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
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

Table E-I. Support of Designated Uses for Rivers and Streams in Hydrologic Unit 03070101 of the Oconee River Basin, 1996-1997

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
Rivers And Streams Supporting Designated Uses										
Bay Branch (4)	Tributary to Oconee River - Putnam County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Beaverdam Creek (4)	Putnam County	Fishing	S	N/A	N/A	N/A	2	N/A	N/A	N/A
Beaverdam Creek (4)	Hancock County	Fishing	S	N/A	N/A	N/A	4	N/A	N/A	N/A
Cedar Creek (4)	Jasper County	Fishing	S	N/A	N/A	N/A	8	N/A	N/A	N/A
Copeland Creek (4)	Hancock County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Ford Creek (4)	Hancock County	Fishing	S	N/A	N/A	N/A	2	N/A	N/A	N/A
Gap Creek (4)	Jasper County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Glady Creek (4)	Putnam County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Greenbriar Creek (28)	Salem Scull Shoals Road to Lake Oconee	Fishing	S	N/A	N/A	N/A	8	N/A	N/A	N/A
Hard Labor Creek (28)	Big Sandy Creek to Apalachee River - Morgan County	Fishing	S	N/A	N/A	N/A	4	N/A	N/A	N/A
Hitchcock Branch (4)	Putnam County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Hog Creek (4)	Tributary to Big Cedar Creek - Jones County	Fishing	S	N/A	N/A	N/A	7	N/A	N/A	N/A
Jenkins Branch (4)	Tributary to Oconee River - Putnam County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Little Cedar Creek (4)	Tributary to Lake Sinclair - Jones County	Fishing	S	N/A	N/A	N/A	6	N/A	N/A	N/A
Lowry Branch (4)	Jasper County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Lundy Creek (4)	Hancock County	Fishing	S	N/A	N/A	N/A	2	N/A	N/A	N/A
North Oconee River (10)	Little Curry Creek to Clarke County	Fishing/Drinking Water	S	N/A	N/A	N/A	7	N/A	N/A	N/A

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
Pittman Creek (4)	Jasper County	Fishing	S	N/A	N/A	N/A	7	N/A	N/A	N/A
Plunkett Creek (4)	Tributary to Whitten Creek - Hancock County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Robinson Creek (4)	Jasper County	Fishing	S	N/A	N/A	N/A	4	N/A	N/A	N/A
Rock Creek (4)	Putnam County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Rocky Creek (4)	Tributary to Lake Sinclair - Baldwin County	Fishing	S	N/A	N/A	N/A	2	N/A	N/A	N/A
Sand Creek (4)	Tributary to Lake Sinclair - Baldwin County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Sandy Run Creek (4)	Tributary to Buffalo Creek - Hancock County	Fishing	S	N/A	N/A	N/A	2	N/A	N/A	N/A
Sheppard Creek (4)	Jasper County	Fishing	S	N/A	N/A	N/A	5	N/A	N/A	N/A
Shoal Creek (1)	Little Shoal Creek to Apalachee River - Walton County	Fishing	S	N/A	N/A	N/A	2	N/A	N/A	N/A
Shoal Creek (4)	Jasper County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Shoulderbone Creek (4)	Tributary to Oconee River - Hancock County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Smokey Hollow Creek (20)	Gainesville	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
South Fork Wolf Creek (4)	Jasper County	Fishing	S	N/A	N/A	N/A	6	N/A	N/A	N/A
Taylor Creek (4)	Jones County	Fishing	S	N/A	N/A	N/A	7	N/A	N/A	N/A
Tributary to North Oconee River (20)	Gainesville	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Whitehouse Branch (4)	Jasper County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Whiteoak Creek (4)	Jasper County	Fishing	S	N/A	N/A	N/A	4	N/A	N/A	N/A

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
Whitten Creek (4)	Hancock County	Fishing	S	N/A	N/A	N/A	2	N/A	N/A	N/A
Will Hunter Branch (2)	Tributary to North Oconee River - Athens	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Rivers and Streams Partially Supporting Designated Uses										
Allen Creek (20)	Gainesville	Fishing	PS	FC,Pb*	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	7	X	X	3
Apalachee River (1)	Hwy. 186 to Lake Oconee	Fishing	PS	FC,FCG	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	21	X	X	3
Beaverdam Creek (28)	Oliver Creek to Lake Oconee (S of Greensboro)	Fishing	PS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	5	X	X	3
Beaverdam Creek (4)	Hancock County Northwest of Smyrna Church	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	2	X	X	3
Big Cedar Creek (1)	Cedar Creek to Lake Sinclair	Fishing	PS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	9	X	X	3
Big Indian Creek (1)	I-20 to Little River	Fishing	PS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	18	X	X	3
Bottoms Branch (20)	Tributary 5 to North Walnut Creek - Gainesville	Fishing	PS	Hg*, DO	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	1	X	X	2
Cedar Creek (4)	Jasper County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	5	X	X	3
Cedar Creek (1)	Winder	Fishing	PS	Pb*	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	4	X	X	3
Commissioner Creek (1)	Little Commissioner Creek to Upstream Oconee River	Fishing	PS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	14	X	X	3
Crooked Creek (4)	Putnam County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	9	X	X	3

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
E. T. Creek (20)	Tributary to North Walnut Creek - Gainesville	Fishing	PS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	1	X	3	3
Glady Creek Tributary (4)	Putnam County near Reids Crossroads	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	1	X	X	3
Jacks Creek (2)	Downstream Monroe Jacks Creek WPCP	Fishing	PS	Cu	M	Monroe WPCP in compliance with copper limits. Limits removed when permit reissued 3/13/98 because it wasn't present at levels of concern.	2	X	2	1
Lake Sinclair Tributary (4)	Putnam County near Putnam Beach	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	1	X	X	3
Lake Sinclair Tributary (4)	Putnam County North of Key Cemetery	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	1	X	X	3
Lick Creek (4)	Upstream Lake Oconee - Putnam County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	4	X	X	3
Little River (1,10)	Glady Creek to Lake Sinclair	Fishing	PS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	9	X	X	3
Little River (2)	Social Circle	Fishing	PS	FC	M	Social Circle in compliance with fecal coliform limits.	3	X	2	1
Little River Tributary (4)	Putnam County near Martin's Mill Road	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	3	X	X	3
Log Dam Creek (4)	Tributary to Oconee River - Hancock County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	5	X	X	3
Middle Oconee River (1,2,10)	Bear Creek to McNutt Creek	Fishing	PS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	10	X	X	3
Miller Creek (4)	Jones County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	1	X	X	3

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
Murder Creek (1,4,10)	So. Fork Wolf Creek to Lake Sinclair	Fishing	PS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	12	X	X	3
North Oconee River (1)	Bordens Creek to Little Curry Creek	Fishing	PS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	6	X	X	3
North Oconee River (1,2)	Jackson County to Sandy Creek	Fishing/Drinking Water	PS	FC,Cu	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	5	X	X	2
North Walnut Creek (20)	Gainesville (Upstream Hall County Camp)	Fishing	PS	FC,Hg*	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	2	X	X	3
North Walnut Creek (20)	Gainesville (Downstream Hall County Camp)	Fishing	PS	FC,Hg*	M,UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	1	X	X	3
Sandy Run Creek (4)	Hancock County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	5	X	X	3
Sugar Creek (28)	Upstream Lake Oconee	Fishing	PS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	4	X	3	3
Town Creek (1,2)	Hwy. 15 to I-20 - Greensboro	Fishing	PS	DO,FC,Pb *,Tox	M,UR	Greensboro to eliminate toxicity by 5/22/98. EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	4	X	2,X	1,3
Tributary 5 to Allen Creek (1,20)	Gainesville	Fishing	PS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	1	X	X	2
Tributary 2 to Allen Creek (1,20)	Gainesville-Downstream Old Landfill	Fishing	PS	FC,Pb	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	1	X	X	2
Tributary 9 to Allen Creek (1,9,20)	Gainesville	Fishing	PS	Cu,Pb	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	2	X	X	2
Tributary to North Walnut Creek (20)	Gainesville	Fishing	PS	FC,Hg*	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	1	X	X	3

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
Tributary to Whitten Creek (4)	Hancock County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	3	X	X	3
Rivers and Streams Not Supporting Designated Uses										
Anne Court Branch (2)	Athens	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	1	X	3	3
Apalachee River (18)	Gwinnett/Barrow Counties	Fishing	NS	Pb	UR,NP	Urban runoff is being addressed in the EPD Stormwater Management Strategy for metropolitan Atlanta. An areawide stormwater permit was issued on 6/15/94. EPD will address nonpoint sources in Barrow County through a watershed protection strategy for the basin.	10	X	2,X	1,2
Brooklyn Creek (1,2)	Athens	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	2	X	3	3
Carr Creek (1)	Athens	Fishing	NS	Cu,Zn,pH, Tox	I1,UR	Consent Order issued to Vigoro, Inc. Remediation plan completed 6/94. EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	3	X	2,X	1,2
Carver Branch (2)	Tributary to Trail Creek - Athens	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	1	X	3	3
Cedar Creek (2)	Athens	Fishing	NS	FC,Tox	UR,M	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin. EPD reassessed available information and determined facility discharge not toxic.	4	X	X,1	3,NA
Cloverhurst Branch (2)	Athens	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	2	X	3	3
Fishing Creek (28)	McWhorter Creek to Lake Oconee	Fishing	NS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	5	X	3	3

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
Kingswood Branch (2)	Tributary to McNutt Creek - Athens	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	1	X	3	3
Little River (1)	Shoal Creek to Gap Creek	Fishing	NS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	12	X	X	3
Little Sugar Creek (28)	Upstream Lake Oconee	Fishing	NS	FC,Pb	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	7	X	X	2
Marburg Creek (1)	Hwy. 11 to Apalachee River	Fishing	NS	FC, Tox	UR, M	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin. Toxicity to be addressed in the NPDES permitting process and will be evaluated for repermitting within the next 12 months.	6	X	X,2	3,1
Middle Oconee River (1)	Mulberry River to Bear Creek	Fishing	NS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	10	X	X	3
Mitchell Bridge Branch (2)	Tributary to Middle Oconee River - Athens	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	1	X	3	3
Mulberry River (1)	Little Mulberry River to Middle Oconee River	Fishing	NS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	14	X	X	3
N. Oconee River (1)	Candler Creek to Borders Creek	Fishing	NS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	9	X	X	3
N. Oconee River (1,2)	Sandy Creek to Alt. 15 (129/441 bypass)	Fishing/Drinking Water	NS	FC,Cu	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	4	X	X	2
N. Oconee River (1)	Alt. 15 (129/441 bypass) to Oconee River	Fishing	NS	FC,DO	UR,M	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin. Athens facilities in compliance with permit limits. Model predicts dissolved oxygen violations at low flows. Model calibration study planned.	8	X	X	2

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
N. Bypass Branch (2)	Tributary to Middle Oconee River - Athens	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	2	X	3	3
Oconee River (1)	Athens to Barnett Shoals Dam	Fishing	NS	FC,Pb,FC G	UR,M	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin. North Oconee WPCP in compliance with lead limits and they were removed from the permit 11/97 as they were no longer present at levels of concern.	4	X	X,2	3,1
Oconee River (1,28)	Barnett Shoals to Lake Oconee	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	16	X	X	3
Richland Creek (1)	Upstream Greensboro to Interstate 20	Fishing	NS	DO,FC	NP,UR	EPD will address through a watershed protection strategy for the basin.	9	X	X,3	2,3
Richland Creek (1)	Interstate 20 to Beaverdam Creek	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	8	X	X	3
Rooty Creek (1,4)	Putnam County	Fishing	NS	FC,Bio	NP,UR	EPD will address through a watershed protection strategy for the basin.	9	X	X	3
Town Creek (28)	Penfield to Lake Oconee	Fishing	NS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	7	X	3	3
Trail Creek (2)	Athens	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	2	X	3	3
Tributary 7 to Allen Creek (1,20)	Gainesville-West Side of New Landfill	Fishing	NS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	1	X	X	3
Tributary 8 to Allen Creek (1,20)	Gainesville-East Side of New Landfill	Fishing	NS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	1	X	X	3
Tributary 4 to Allen Creek (1,20)	Gainesville	Fishing	NS	Pb	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	1	X	X	2

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
Tributary 1 to Allen Creek (1,20)	Gainesville	Fishing	NS	Pb	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	1	X	X	2
Tributary to Little River (9)	Putnam County	Fishing	NS	DO,Tox	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	3	X	X	2
Walnut Creek (1)	Caney Fork to Middle Oconee River	Fishing	NS	FC	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	11	X	X	3
West Fork Trail Creek (2)	Athens	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	3	X	3	3

Table E-2. Support of Designated Uses for Rivers and Streams in Hydrologic Unit 03070102 of the Oconee River Basin, 1996-1997

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
Rivers and Streams Supporting Designated Uses										
Big Sandy Creek (4)	Wilkinson County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Buck Creek (4)	Tributary to Oconee River - Baldwin County	Fishing	S	N/A	N/A	N/A	4	N/A	N/A	N/A
Buffalo Creek (1,4)	Keg Creek to Oconee River - Washington County	Fishing	S	N/A	N/A	N/A	10	N/A	N/A	N/A
Buffalo Creek (4)	St. Road 787 to Swift Creek - Hancock County	Fishing	S	N/A	N/A	N/A	9	N/A	N/A	N/A
Camp Creek (4)	Tributary to Oconee River - Baldwin County	Fishing	S	N/A	N/A	N/A	7	N/A	N/A	N/A
Cedar Creek (4)	Wilkinson County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Commissioner Creek (4)	Jones County	Fishing	S	N/A	N/A	N/A	9	N/A	N/A	N/A
Crooked Creek (4)	Bleckley County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Deep Creek (4)	Washington County	Fishing	S	N/A	N/A	N/A	5	N/A	N/A	N/A
Fishing Creek (4)	Tributary to Oconee River - Baldwin County	Fishing	S	N/A	N/A	N/A	12	N/A	N/A	N/A
Keg Creek (4)	Washington County	Fishing	S	N/A	N/A	N/A	8	N/A	N/A	N/A
Lamars Creek (4)	Washington County	Fishing	S	N/A	N/A	N/A	8	N/A	N/A	N/A
Little Buffalo Creek (4)	Hancock County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Little Camp Creek (4)	Tributary to Camp Creek - Baldwin County	Fishing	S	N/A	N/A	N/A	4	N/A	N/A	N/A
Little Creek (4)	Jones County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Little Creek (4)	Tributary to Town Creek - Hancock County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Little Keg Creek (4)	Washington County	Fishing	S	N/A	N/A	N/A	5	N/A	N/A	N/A

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
Little Rocky Creek (4)	Twiggs County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Little Sandy Hill Creek (4)	Washington County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Long Creek (4)	Hancock County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Maiden Creek (4)	Wilkinson County	Fishing	S	N/A	N/A	N/A	2	N/A	N/A	N/A
Moore Creek (4)	Tributary to Fishing Creek - Jones/Baldwin Counties	Fishing	S	N/A	N/A	N/A	6	N/A	N/A	N/A
Oconee River (1,27)	Lake Sinclair to Fishing Creek	Drinking Water	S	N/A	N/A	N/A	5	N/A	N/A	N/A
Oconee River (1)	Gumm Creek to US Hwy 319/80	Fishing/Drinking Water	S	N/A	N/A	N/A	52	N/A	N/A	N/A
Oconee River (1)	Red Bluff Creek to Altamaha River	Fishing	S	N/A	N/A	N/A	37	N/A	N/A	N/A
Pinkston Creek (4)	Tributary to Buffalo Creek - Hancock County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Rocky Creek (4)	Bleckley County	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Swift Creek (4)	Tributary to Buffalo Creek - Hancock County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A
Tiger Creek (4)	Washington County	Fishing	S	N/A	N/A	N/A	4	N/A	N/A	N/A
Town Creek (1,4)	Peavy Branch to Gumm Creek - Hancock/ Baldwin Counties	Fishing	S	N/A	N/A	N/A	16	N/A	N/A	N/A
Tributary to Turkey Creek (4)	Twiggs County	Fishing	S	N/A	N/A	N/A	2	N/A	N/A	N/A
Turkey Creek (1)	Bluewater Creek to Oconee River - Laurens County	Fishing	S	N/A	N/A	N/A	9	N/A	N/A	N/A
Ugly Creek (4)	Twiggs County	Fishing	S	N/A	N/A	N/A	4	N/A	N/A	N/A
Wildcat Branch (4)	Wilkinson County	Fishing	S	N/A	N/A	N/A	1	N/A	N/A	N/A

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
Wolf Creek (1,4)	Gray	Fishing	S	N/A	N/A	N/A	3	N/A	N/A	N/A
Rivers and Streams Partially Supporting Designated Uses										
Alligator Creek (4)	Twiggs County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	6	X	X	3
Black Creek (4)	Baldwin County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	2	X	X	3
Black Spring Branch (4)	Baldwin County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	4	X	X	3
Carter's Mill Creek (4)	Washington County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	6	X	X	3
Crooked Creek (4)	Jones County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	5	X	X	3
Limestone Creek (4)	Washington County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	8	X	X	3
Little Commissioner Creek (4)	Wilkinson County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	6	X	X	3
Little Fishing Creek (4)	Baldwin County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	5	X	X	3
Milsap Creek (4)	Jones County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	5	X	X	3
Oconee River (1)	Turkey Creek to Red Bluff Creek	Fishing	PS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	31	X	X	3
Oconee River (1)	Fishing Creek to Gumm Creek	Fishing	PS	Tox	M	Whole effluent toxicity limit placed in Milledgeville permit. Facility is currently not toxic according to tests conducted April and June, 1997.	20	X	2	1

Basin/stream (Data Source)	Location	Water Use Classification	Status	Criterion Violated	Evaluated Cause(s)	Actions to Alleviate	Miles	305(b)	303(d)	Priority
Porter Creek (4)	Wilkinson County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	12	X	X	3
Rocky Creek (10)	Laurens County	Fishing	PS	Hg*	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	6	X	X	3
Sandy Creek (4)	Jones County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	6	X	X	3
Sandy Hill Creek (4)	Washington County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	9	X	X	3
Tanyard Branch (1)	Tributary to Limestone Creek - Sandersville	Fishing	PS	Tox	M	Toxicity issue resolved. Sandersville WPCP was found to not be toxic by EPD testing performed February 1996 and testing the City performed 12/96.	1	X	2	1
Tobler Creek (4)	Baldwin County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	8	X	X	3
Zoie Brown Creek (4)	Tributary to Buffalo Creek - Hancock County	Fishing	PS	Bio	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	3	X	X	3
Rivers and Streams Not Supporting Designated Uses										
Bluff Creek (1)	Headwaters to Oconee River	Fishing	NS	FC,DO	NP	EPD will address nonpoint sources through a watershed protection strategy for the basin.	10	X	X	2
Oconee River (1)	US Hwy 319/80 to Turkey Creek	Fishing	NS	FC	UR	EPD will address nonpoint source (urban runoff) through a watershed protection strategy for the basin.	10	X	X	3

Table E-3. Support of Designated Uses for Lakes and Reservoirs in the Oconee River Basin, 1996-1997

Lake Name	Location	Support Category	Water Use Classification	Criterion Violated	Potential Cause(s)	Acres Affected	305(b)	303(d)	Priority
Lake Oconee (1)	Morgan, Greene and Putnam Counties	Partial Support	Fishing	FCG	NP	19,007	X	X	3
Lake Sinclair (12,28)	Little River Arm	Partial Support	Recreation	pH	NP	3,000	X	X	3
Lake Sinclair (1,3)	Putnam, Baldwin, and Hancock Counties	Partial Support	Recreation	Temp	I1	650	X	2	1
Rock Eagle Lake (9)	Putnam County	Partial Support	Fishing	pH	Lake Fertilization	110	X	X	3

Georgia Adopt-A-Stream Program

Current Groups List January 1998

Oconee River Basin

Stream:
Name: Neil Bird
Kevin Crabb
George Walton Academy

Stream: Athens Area (Clarke)
Name: Svea Bogue
Athens Clarke County
Clean & Beautiful Commission

Stream: Athens Country Club Stream & Brickyard Creek (Clarke)
Name: Lee Carruba

Stream: Calls Creek (Oconee)
Name: Vicki Soutar
Youth Environmental Action Team

Stream: Carr's Creek
Name: Hans Stigter
UGA American Water Resources Assn.
Student Chapter

Stream: Cedar Creek near Cedar Shoals (Clarke)
Name: Dava Coleman
Cedar Shoals Science and Ecology Club

Stream: E. Sandy Creek (Clarke)
Name: Kimberly Powers
Environmental Health Science Club-UGA

Stream: McNutt Creek (Clarke)
Name: Steve Williams
Upper Oconee Stream Watch

Stream: Oconee River (Clarke)
Name: David Nichols
University of Georgia
School of Environmental Design

Stream: Oconee River (Wheeler)
Name: Mike Hayes
Wheeler County 4-H Clubs

Stream: Oconee River, Lake Sinclair (Baldwin)
Name: Lee Wheeler
Baldwin HS

Stream: Orange Trail Creekat Botanical Gardens (Clarke)
Name: Wade Seymour

Stream: Poss Creek (Clarke)
Name: Bill Brown
Oconee Audobon Society

Stream: Tanyard Creek (Clarke)
Name: Dana Davis
Students for Environmental Awareness

Stream: Trail Creek (Clarke)
Name: Jim Anderson
BSA Troop 22

Stream: stream south of Tate Center (Clarke)
Name: Ryan Bartlett
SEA/UGA