CONTENTS

ILLUSTRATIONS

(Plates in pocket or included on compact disc)

TABLES

CHOCTAWHATCHEE, PEA, AND YELLOW RIVERS WATERSHED MANAGEMENT PLAN

INTRODUCTION

The purpose of this document is to provide a framework for the protection of water and biological resources in the Choctawhatchee, Pea, and Yellow Rivers watershed (CPYRW). This document will be referred to as the "Choctawhatchee, Pea, and Yellow Rivers Watershed Management Plan" (CPYRWMP). The information included in this document forms the basis for strategic planning required for thoughtful and effective development and protection of the resources of the CPYRW. The plan contains data for development of historic and current perspectives of environmental conditions in the watershed, identification of stakeholders, and ideas and concepts for long-term protection goals and objectives. The CPYRW is an area of diverse land use and economic development. Therefore, an effective watershed plan is vital to perpetuate and protect the treasured natural resources of the area. The Choctawhatchee, Pea, and Yellow Rivers Watershed Clean Water Partnership (CPYRCWP) and the CPYRWMP provide a forum for bringing together watershed stakeholders to develop an understanding of current conditions in the watershed, to take corrective actions to solve problems, to plan for future changes, and to begin an education process about the value and critical role of water resources to the region and state. The geographic scale of a watershed plan is a critical component of the usability of the information contained in the document. Technical watershed data clearly indicates that headwater areas are of critical importance to overall watershed conditions. If the management plan addresses too large an area and is too broad-based, it appears generic and stakeholders struggle to develop a personal stake in watershed planning. If the document addresses only smaller subwatersheds, overall watershed conditions are poorly understood and planning efforts become fragmented. The CPYRWMP is designed in a variable-watershed scale format. Information is organized for development of broad-based stakeholder involvement for multi-county or regional watershed protection strategies (8 digit hydrologic unit codes (HUCs). This regional format promotes a holistic, regional approach to watershed protection. The document is also organized in smaller sub-regional watershed areas (12 digit HUCs) to promote stakeholder interest in local issues and development of local watershed strategies and plans. This variable-watershed scale approach can promote interest and cooperation among stakeholders throughout the CPYRW for water-quality monitoring, best management practice (BMP) implementation, stream and land restoration, citizen education and outreach, efficient water supply development and water use, and protection of the water resources in the watershed.

Cooperation and partnering between private and public interests is essential to the success of this watershed plan. Local citizen input must be a part of decision making at every stage of plan implementation. Decisions made with consensus of stakeholders will facilitate a successful watershed protection strategy tailored to local needs, objectives, and understanding.

ACKNOWLEDGEMENTS

This publication was funded by the U.S. Environmental Protection Agency (EPA) through a Clean Water Act Section 319 (h) nonpoint source grant administered by the Alabama Department of Environmental Management (ADEM) and by the Choctawhatchee, Pea, and Yellow Rivers Watershed Management Authority (CPYRWMA).

Special thanks are extended to the following people for their help in developing the CPYRWMP: Vic Payne, Soil and Water Conservation Committee (SWCC); Mark Sport and Norm Blakey, ADEM; Ms. Barbara Gibson, executive director for the CCPYRWMA, the Board of Directors for the CPYRWMA, and all the members of the CPYRWCWP who volunteered their time towards this project.

WATERSHED MANAGEMENT PLAN GOALS AND OBJECTIVES

The mission objectives of the CPYRCWP are *"To protect, improve and maintain water quality/quantity in Alabama's Choctawhatchee, Pea and Yellow River Basins by meeting the goals of the Clean Water Act through basin-wide public/private partnerships while maintaining the balance between protecting the environment and promoting the economy"*. Thirteen primary goals are identified:

1. Increase citizen awareness and education of watershed protection.
2. Evaluate available physical, chemical and biological data for surface and groundwater to determine if additional data is needed and to utilize data to identify current and potential environmental issues and problems.
3. Reduce pollution from construction and other land disturbance activities.
4. Reduce pollution from domestic onsite sewage disposal systems.
5. Reduce pollution from illegal waste dumping sites and littering.
6. Reduce pollution from agricultural activities.
7. Reduce pollution from forestry activities.
8. Reduce pollution from unimproved roadways.
9. Reduce nonpoint source pollution from urban sources including stormwater runoff and wastewater disposal.
10. Reduce pollution from industrial processes.
11. Protect groundwater resources through conservation and pollution prevention.
12. Protection of wetlands, faunal habitats, and other critical areas.
13. Assess the effectiveness of the CPYWMP.

The goals and objectives of the CPYRWMP are closely tied to the mission of the Alabama Clean Water Partnership (ACWP). These goals and objectives are contained in four categories: (1) Stakeholder participation, (2) Watershed monitoring and scientific assessment, (3) Natural resource impairment prevention and remediation, and (4) Citizen education.

A watershed program will only be successful with active stakeholder participation. Citizen and government agency solidarity and participation are facilitated by adequate communication of watershed protection goals and objectives. These groups will rally to a worthwhile cause if goals and objectives are clearly communicated and if stakeholders are given a significant voice in the process. This document will identify these stakeholders and will provide goals that stakeholder partnerships may consider and accomplish in order to achieve success in the protection and enhancement of the natural resources in the watershed.

The development and implementation of this watershed plan is a joint effort of the CPYRCWP, CPYRWMA, Geological Survey of Alabama (GSA), ADEM, and the EPA. Early on, the Steering Committee of the CPYRCWP recognized the importance of the watershed plan being a "locally driven" project. The CPYRCWP has overseen the project development through the Watershed Management Plan oversight committee and the CPYRCWP facilitator. The CPYRWMA has served as grant administrator for the project. The GSA was contracted to oversee scientific/technical data compilation, interpretation, and presentation, and the CPYRCWP facilitator was contracted to handle stakeholder contacts, public meetings, citizen input, strategy development, etc. Public input was solicited from various sources including: CPYRCWP steering committee meetings, CPYRCWP watershed committee meetings, presentations with civic and school groups, meetings with Soil and Water Conservation Districts (SWCD), meetings with County commissions, city councils, surveys, and news paper articles. A diligent effort has been made to reach the public throughout the watershed. A "non-bound", loose-leaf format for the finished printed document and an electronic digital format on compact disc was chosen so that the watershed plan, considered a living dynamic publication can be economically updated as new data is available. Funding for the watershed plan was provided through a Clean Water Act Section 319 grant from ADEM and EPA.

This watershed plan is based on the full and balanced representation of all participating stakeholders in the CPYRW, with no one interest group dominating. Partnership cooperation is crucial in order to address many complex and interrelated basin issues and to sustain cooperation and trust among stakeholders. The watershed plan will continue to count on stakeholders to mutually pool their knowledge and experience and to challenge and communicate with each other. Respect and cooperation along with well-defined partnership roles and responsibilities will characterize plan development and implementation. In order to achieve the plans goals in the most efficient and effective manner, it will be coordinated with and will become an integral component of the ACWP program.

The ACWP is a statewide nonprofit organization incorporated in 2001. It serves as an umbrella organization for a coalition of public and private individuals, companies, organizations and governing bodies working together to protect and preserve water resources and aquatic ecosystems throughout the State. The purpose of the ACWP is to bring together various groups in order to coordinate their individual efforts, share information and plan more effectively for protection and preservation. The ACWP, administered by a Board of Directors, is organized to allow representatives with diverse interests to develop, support, and coordinate efforts to restore, maintain, and protect the waterways of Alabama. The benefits to all participants are:

- Improved communication
- Data and information consolidation
- Improved coordination
- Opportunity for collaboration

The CPYCWP Steering Committee and watershed subcommittees, comprised of stakeholders with watershed wide interest in water quality and aquatic life, are established and usually meet quarterly. The Steering committee divided the watershed into three sub-committees for ease of meetings. The Choctawhatchee River Basin Committee area extends from the headwaters of the Choctawhatchee River in Barbour County to the Florida State line in Geneva County. The Pea River Basin Committee area extends from the headwaters in Bullock County to the confluence of the Choctawhatchee River in Geneva County. The Yellow River watershed comprises the area for the Yellow River Basin Committee and includes portions of Coffee, Covington and Crenshaw Counties. The purpose of these sub-committees is to facilitate communication and exchange of information at a localized level, and to provide goals for the protection and restoration of surface and groundwaters in the CPYRW.

This watershed management plan is an integral component of the statewide CWP and watershed sub-committees efforts. It provides strategies to resolve “big-picture” water-quality problems across a wide physio-geographic area; while it will help insure that sub-watershed or stream-segment protection activities are well designed and coordinated. It may also be used as a foundation to develop or strengthen other water-quality protection approaches, total maximum daily load (TMDL) implementation plans, or other watershed-based protection plans. This approach will maximize the wise use of limited funding by targeting resources to priority problems and areas and eliminating duplicating of efforts.

The CWP strongly advocates citizen education and outreach. Stakeholder education is an important component of this watershed plan. Education increases public awareness and knowledge about basin issues, provides the skills to make informed decisions, and motivates stakeholders to take responsible actions. Education and outreach will be based on objective and scientifically sound information, and will be more than just “information dissemination” i.e., providing facts or opinions about an environmental issue or problem. Activities will be designed to teach stakeholders how to weigh various sides of an issue through critical thinking, and to enhance their problem-solving and decision-making skills. It will not advocate a particular viewpoint or course of action, but will be consensus driven.

A CWP river basin facilitator for the CPYRW has been appointed to coordinate the development, updating, and implementation of this watershed plan. In order to sustain stakeholder cooperation and trust, this plan strongly encourages a full and balanced representation of all residents in the CPYRW---with no one interest group dominating watershed plan development or implementation.

Watershed plan comments and suggestions can be made at anytime to the CPYRCWP facilitator. A thorough review of the management plan will be conducted at least annually by the CPYRCWP Steering Committee and facilitator to assess new watershed concerns, or to update information and protection practice and information gaps. Modifications or revisions to this plan will be through Steering Committee. Watershed plan corrections, if any, will be determined by the Steering Committee after public input and comments are received. The CPYRCWP facilitator will be responsible for tracking and coordinating stakeholder input, making changes to the document as directed by the Steering Committee, and notifying stakeholders of watershed plan revisions or changes.

Since the CPYRCWP program was formed in April of 2003, a concerted effort has been made to contact anyone with a stake or interest in the water quality of the CPYRW and to keep them informed of CPYRCWP program activities. This effort has continued throughout the planning process as well. Stakeholder lists are continuously updated; news articles have been prepared and distributed throughout the watershed apprising the public of meetings, the planning process, and stakeholder surveys.

In an effort to educate the public regarding a watershed management plan and gauge current water-quality perceptions, a stakeholder survey was distributed at meetings, presentations, and via mail. Surveys were distributed along with stamped, addressed return envelops. Survey results received thus far indicate that 80% of respondents were aware of the ongoing watershed management plan development process. Respondents ranked water quality concerns/problems in the following order: 1) agricultural runoff from farming, 2) sedimentation, 3) agricultural runoff from livestock and poultry operations, 4) urban runoff, and 5) failing onsite septic systems.

Since April 2003, CPYRCWP steering committee members as well as sub-basin committee participants have been compiling the following ongoing list of needs and concerns across the watershed. The following items of concern are not listed in any priority order:

Agricultural Runoff
Agricultural Runoff (livestock, poultry)
Silviculture Runoff
Sedimentation
Urban Runoff
Failing Onsite Septic Systems
Water Related Recreation Activities
Erosion
Unpaved Roads (sedimentation)
Water Supply
Urban Stormwater
Flooding
Excess Nutrients
Trash
Livestock – Stream
Hydrologic Modifications
Endangered and Threatened Species

PROGRAMS FOR NATURAL RESOURCE PROTECTION AND ENHANCEMENT

Numerous programs and systems, both regulatory and non-regulatory, have been created to protect the quality of natural resources in the CPYRW. Some of these programs and systems and their current status in the CPYRW are described below.

REGULATORY PROGRAMS

CLEAN WATER ACT

The Federal Water Pollution Control Act was enacted in 1972 and was amended in 1977 to become the Clean Water Act (CWA). The Act established the basic structure for regulating discharges of pollutants into the waters of the United States.

Point-source discharges such as treated municipal, industrial, and mining wastes and construction sites of more than one acre are regulated by the CWA through a permit process called the National Pollutant Discharge Elimination System (NPDES). The ADEM administers the NPDES program in Alabama. Their records indicate 483 NPDES permits are currently active in the CPYRW. Table 1 lists the number of NPDES permitted sites in each of the 8 digit HUC watersheds and the number of their violations.

Table 1 — NPDES permitted sites in the CPYRW

HUC Name and Number	**NPDES Permitted Sites**	**Number of Violations**
Lower Choctawhatchee River 03140203	5	10
Upper Choctawhatchee River 03140201	304	6
Pea River 03140202	146	6
Yellow River 03140103	28	1
Totals	483	23

Stormwater management regulations are also included in the NPDES permitting process. Phase I stormwater regulations were established in 1990. These regulations covered medium and large municipal separate storm sewer systems (MS4s) for cities or jurisdictional entities serving populations of more than 100,000. Construction activities disturbing more than five acres and 11 categories of industrial activities also were covered by Phase I. Phase II stormwater regulations were enacted in 1999. Phase II covers MS4s with a population of 10,000 or more and construction activities that disturb more than one acre. Phase II requires:

- Mapping of municipal storm sewers
- Development of a municipal stormwater program (MSWP)
    - Institute community-specific BMPs.
    - Reduce the discharge of pollutants.
    - Protect and improve existing water quality.
    - Set measurable goals for tracking success.
    - Define timeframe for implementation.
    - Employ responsible, accountable people.
- Submit annual reports to the USEPA governing agency
- Address the following six minimum functional areas
    - Public education and outreach – Program must teach the public about the impacts of stormwater discharge.
    - Public participation and involvement – Community should be given the opportunity to actually participate in the development and implementation of stormwater program.
    - Elicit discharge detection and elimination – Municipalities must develop a plan to eliminate discharges into storm sewers from sources other than stormwater.
    - Pollution prevention and good housekeeping – The EPA requires municipalities to create a program to prevent or limit pollutants in stormwater runoff.
    - Construction-site runoff control – Governing bodies must employ measures to prevent or reduce pollutants associated with construction activities from entering the stormwater system.
    - Post-construction runoff control – Municipalities must mandate a program to control pollutants from new and redeveloped projects.

There are no municipalities in the watershed that meet the population requirements of Phase I stormwater management guidelines. Four municipalities in the watershed meet the population requirements of Phase II stormwater management guidelines.

NPS pollution is composed of contaminants transported by runoff from diffuse sources. Assessment of NPS pollution is accomplished through Section 319 of the CWA, which is administered by the ADEM in Alabama. Section 319 provides funds for NPS pollution education and demonstration projects. There are no present limitations for NPS pollution discharges. The responsibility of NPS pollution education and control lies within the agencies that oversee the activities of each NPS category.

Impaired waters are listed under Section 303(d) of the CWA. These are waters that do not meet water-quality standards established by ADEM for their particular water-use classification. Section 303(d) requires a priority ranking for waters on the list and development of TMDLs. A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water-quality standards. There are seven streams in the CPYRW listed on the 2002 303(d) list.

SAFE DRINKING WATER ACT

The Safe Drinking Water Act (SDWA), enacted in 1974, is the main federal law that ensures the quality of drinking water in this country. Under SDWA, EPA establishes standards for drinking water quality (see appendix) and oversees the states, localities, and water suppliers who implement those standards for protection of public health. The SDWA was amended in 1996 to contain provisions for consumer involvement, right-to-know, and source-water protection. Requirements for Consumer Confidence Reports were included in the 1996 amendments.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, was enacted by Congress in 1980. This law created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. The law authorizes two kinds of response actions:

- Short-term removals, where actions may be taken to address releases or threatened releases requiring prompt response.
- Long-term remedial response actions, that permanently and significantly reduce the dangers associated with releases or threats of releases of hazardous substances that are serious, but not immediately life threatening. These actions can be conducted only at sites listed on EPA's National Priorities List (NPL).

Currently, there is one National Priorities Listed site in the CPYRW:

The American Brass Inc., (ABI) site is a former secondary brass smelter/foundry facility located on Highway 134, west of Headland, Henry County, Alabama, near the city of Dothan. The ABI site area is approximately 148 acres, 24 acres of which are occupied by the former foundry buildings (the developed portion of the site) in a predominantly rural agricultural area. Industrial operations were conducted at the ABI site from the 1960's until December 1992. From approximately the mid-1980's until the facility closed, ABI found itself the subject of several RCRA enforcement actions, both state and federal, for RCRA violations including the on-site disposal of hazardous waste.

At the request of the ADEM, EPA conducted an emergency removal at the ABI site in 1996-1997. During this removal excavated lead-contaminated soils, heavy metal-laden furnace bricks and heavy metal-laden process waste materials (ball mill residue) found inside the buildings were consolidated into a liner-covered waste pile at the southeast corner of the site. A second EPA removal action to remove the waste pile and dispose of the materials off-site was completed in March 1999.

The Remedial Investigation (RI) has been conducted and a Draft Final Report is available. The RI reveals impacts to onsite soils and sediments primarily from heavy metals, boron and polychlorinated biphenyls (PCBs). Impacts by these constituents were also noted to the surface waters and sediments of Cedar Creek leading away from the old ball mill residue pile location, as well as to the area of Dunham Creek just north of Highway 134 due to runoff from the site.

More sampling was scheduled for February 2002 to determine the extent of contamination offsite in these creeks. The groundwater at the site has been impacted with boron, nitrate and ammonia. The residential drinking water wells adjacent to the eastern boundary of the site have not been impacted by the site and will continue to be monitored. The Feasibility Study (FS) as well as the Human Health and Ecological Baseline Risk Assessment processes were conducted.

As part of the Ecological Risk Assessment process, an Ecological Study Plan was prepared in Spring 2002 to evaluate the impacts of these constituents on the ecological system at the site and in the creek watersheds. Community interest reported by EPA has been low, although interest was expressed in redeveloping the site for some other use. The last public meeting, which was held to present the RI work plan to the public, occurred on September 28, 1999.

The site was proposed for the NPL in January 1999, and became final on the NPL on May 10, 1999. EPA conducted a potentially responsible party (PRP) search to determine who will pay for past and future cleanup costs at the site.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

The RCRA was enacted by Congress in 1976 and gave the EPA the authority to control hazardous waste from the “cradle-to-grave.” This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous wastes.

The 1986 amendments to RCRA enabled EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances. RCRA focuses only on active and future facilities and does not address abandoned or historical sites. RCRA’s goals are to:

- Protect us from the hazards of waste disposal
- Conserve energy and natural resources by recycling and recovery
- Reduce or eliminate waste, and
- Clean up waste, which may have spilled, leaked, or been improperly disposed.

The state of Alabama has thousands of RCRA identified sites; only a small number of which are considered priority. The U.S. EPA maintains a list of RCRA sites at: http://www.epa.gov/epaoswer/hazwaste/data/brs01/list.pdf. Based on 2001 data, there are 14 RCRA facilities in the CPYRW area.

ENDANGERED SPECIES ACT

The Endangered Species Act (ESA) was enacted by Congress in 1973. The purpose of the ESA is to conserve "the ecosystems on which threatened and endangered species depend" and to conserve and recover listed species. Under the law, species may be listed as either "endangered" or "threatened". An endangered listing means that a species is in danger of extinction throughout a significant portion of its range. A threatened listing means that a species is likely to become endangered sometime in the foreseeable future. The list covers mammals, reptiles, amphibians, fishes, snails, clams/mussels, crustaceans, insects, arachnids, and plants.

Five endangered species and five threatened species have all or a portion of their range in the CPYRW. Seven species are candidates for federal protection. For a detailed discussion of listed species, go to page 104.

U. S. ARMY CORPS OF ENGINEERS REGULATIONS

The U.S. Army Corps of Engineers (COE) has regulatory authority related to the protection of the waters of the United States. Chapter 21-1 of The COE Policy Digest establishes regulatory authority for the "Protection of the public interest in the waters of the United States". This regulatory authority covers the following activities:

- Dams and dikes in navigable waters of the United States;
- Other structures or work including excavation, dredging, and/or disposal activities in navigable waters of the United States;
- Activities that alter or modify the course, condition, location, or physical capacity of a navigable water of the United States; Construction of fixed structures, artificial islands, and other devices on the outer continental shelf;
- Discharges of dredged or fill material into the waters of the United States, including incidental discharges associated with mechanized land clearing, channelization, dredging and other excavation activities.

ALABAMA WATER RESOURCES ACT

The Alabama Water Resources Act establishes the Alabama Water Resources Commission and mandates it to adopt rules and regulations governing the development and use of water in the State. The Alabama Office of Water Resources (OWR) (a division of the Alabama Department of Economic and Community Affairs (ADECA)) administers the Water Resources Act provisions. Currently, OWR is researching the potential for surface and groundwater withdrawal regulations and is investigating a number of existing and potential future cases of interbasin transfer of water.

STATE OF ALABAMA COUNTY HEALTH DEPARTMENT SEPTIC TANK PERMITS

Many rural homeowners use septic tanks as onsite domestic wastewater disposal systems. Septic tanks must conform to the regulations of the Alabama Department of Public Health (ADPH) or County Health Departments. Currently, 24,692 domestic wastewater systems are permitted in the CPYRW. Table 2 lists the number of onsite waste disposal systems by major HUC and provides an estimate of failure rates.

Table 2 — Domestic wastewater systems in the CPYRW
(Alabama SWCC, Watershed Assessments, 1998-99; ADPH)

HUC Name and Number	Estimated no. of septic tanks	Estimated no. of failing septic tanks	Estimated % failure	Estimated no. of alternative systems*
Lower Choctawhatchee 03140203	1,189	59.45	5.0%	0
Upper Choctawhatchee 03140201	10,821	313.87	2.9%	3
Pea 03140202	9,162	348.4	3.8%	527
Yellow 03140103	3,520	346.05	9.8%	21
Totals	24,692	1067.77	5.4% average	551

*Alternative treatment systems include mound systems, constructed wetlands, etc.

ANIMAL FEEDING OPERATION/CONCENTRATED ANIMAL FEEDING OPERATION PROGRAM

The Animal Feeding Operation (AFO) and Concentrated Animal Feeding Operation (CAFO) program is administered by ADEM and sets requirements on the construction, operation, and closure of AFO and CAFOs. The program was enacted in 1999 and defined the requirements AFOs must meet to protect water quality, established an AFO compliance assistance and assurance program, and established a CAFO NPDES registration by rule process requiring all CAFOs to register with ADEM. All AFO and CAFOs are required to implement and maintain effective BMPs for animal waste production, storage, treatment, transport, and proper disposal or land application that meet or exceed USDA – Natural Resources Conservation Service (NRCS) technical standards and guidelines. Currently, there are 127 CAFOs in the CPYRW. Table 3 lists animal units and CAFOs by HUC.

Table 3 — Animal information for the CPYRW
(Animal Unit information from AL SWCC, Watershed Assessments, 1998-1999; Confined Animal Feeding Operation (CAFO) information from AL SWCC, June 15, 2004)

HUC Name and Number	**No. of cattle**	**No. of dairy cows**	**No. of swine**	**No. of broilers**	**No. of layers**	**No. of acres of catfish pond**	**No. of CAFO's**
Lower Choctawhatchee 03140203	825,924	0	1127	8,372	77	69	1
Upper Choctawhatchee 03140201	64,730	850	8,465	11,152,938	35,185	0	55
Pea 03140202	63,167	0	0	3,711,380	244,826	379	63
Yellow 03140103	25,636	454	775	2,831,812	203,856	20	8
Totals	979,457	1304	10367	17,704,502	483,944	468	127

NON-REGULATORY PROGRAMS

NATURAL RESOURCES CONSERVATION SERVICE, FARM SERVICE AGENCY, AND SOIL AND WATER CONSERVATION DISTRICTS

The Natural Resources Conservation Service (NRCS) administers five programs related to environmental protection and enhancement. The programs offer incentives to implement projects and practices that remediate problems and prevent future damage to the environment. The programs are described in the following sections.

The Grassland Reserve Program (GRP) is a voluntary program offering landowners the opportunity to protect, restore, and enhance grasslands on their property.

The Environmental Quality Incentives Program (EQIP) is a USDA program that provides cost-sharing assistance to landowners/users to address significant natural resource concerns on agricultural lands. The NRCS manages EQIP with input from the State Technical Committee and assistance from the Farm Service Agency (FSA), SWCD, and FSA County Committees. Forty-five percent of the EQIP funds will be distributed equally to the 67 counties to maintain a base conservation program to treat the resource concerns in each county. Forty-five percent of the funds will be distributed to the 67 counties based upon a formula that computes the county's percentage of the state's resource concerns. The resource concerns measure erosion, water quality, number of animals within the county, grazing lands, and acreage of long-term wildlife with potential to impact at-risk species.

The Wildlife Habitat Incentives Program (WHIP) is voluntary program for developing and enhancing habitat for fish and wildlife on private lands. WHIP provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from 5 to 10 years from the date the agreement is signed.

The Wetlands Reserve Program (WRP) is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The NRCS provides technical and financial support to help landowners with their wetland restoration efforts. Average project cost per acre nationally is approximately $1,100 for financial assistance and $75.00 for technical assistance. Average project size is approximately 185 acres.

The Emergency Watershed Protection Program (EWP) is used to assist in relieving hazards to life and property from floods and the products of erosion created by natural disasters that cause a sudden impairment of a watershed. A sudden watershed impairment results from a single natural occurrence or a short-term combination of occurrences. For the watershed to be eligible for assistance, the impairment must significantly exceed that which existed before the disaster. Almost $33 million has been made available to Alabama through the EWP program during the past five years.

The Forestry Incentive Program (FIP) offers landowners incentives to plant and maintain forests. The principal goal of FIP is to build or restore the productive capacity of non-industrial forestlands. FIP is designed to benefit the environment while meeting future demands for wood production.

U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service (FWS) works with others through the Partners for Fish and Wildlife program to conserve, protect, and enhance fish and wildlife and their habitats. This program offers technical and financial assistance to private (non-federal) landowners to voluntarily restore wetlands and other fish and wildlife habitats on their land. Partners for Fish and Wildlife Restoration Projects may include, but are not limited to:

- Restoring wetland hydrology by plugging drainage ditches, breaking tile drainage systems, installing water control structures, dike construction, and re-establishing old connections with waterways.
- Planting native trees and shrubs in formerly forested wetlands and other habitats.
- Planting native grasslands and other vegetation.
- Installing fencing and off-stream livestock watering facilities to allow for restoration of stream and riparian areas.
- Removal of exotic plants and animals which compete with native fish and wildlife and alter their natural habitats.
- Prescribed burning as a method of removing exotic species and to restore natural disturbance regimes necessary for some species survival.
- Reconstruction of in-stream aquatic habitat through bioengineering techniques.
- Reestablishing fish passage for migratory fish by removing barriers to movement.

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

The Department of Conservation and Natural Resources (DCNR) is an executive and administrative department of the State of Alabama created by statute. The Commissioner, appointed by the governor as a member of his cabinet, advises the Governor and Legislature on management of freshwater fish, wildlife, marine resources, waterway safety, state lands, state parks, and other natural resources. The Department's scope of operations includes the administration, management, and maintenance of 22 state parks, 23 public fishing lakes, three freshwater fish hatcheries, 34 wildlife management areas, two waterfowl refuges, two wildlife sanctuaries, a mariculture center with 35 ponds, and 645,000 acres of trust lands managed for the benefit of several state agencies, the General Fund, and Alabama Trust Fund. Other departmental functions include maintenance of a State Land Resource Information Center and administration of the Forever Wild land acquisition program.

NATURE CONSERVACY

The Nature Conservancy, founded in 1951, mission is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. They have developed a strategic, science-based planning process, called Conservation by Design, which helps identify the highest-priority places—landscapes and seascapes that, if conserved, promise to ensure biodiversity over the long term. The Conservancy has five priority conservation initiatives to address the principal threats to conservation at the sites where we work, focusing on fire, climate change, freshwater, marine, and invasive species. But by joining together with communities, businesses, governments, partner organizations, indigenous people and communities, and others, we can preserve our lands and waters for future generations to use and enjoy.

GEOLOGICAL SURVEY OF ALABAMA

The GSA, established in 1848, provides service and information to Alabama and its citizens as a natural resource data gathering and research agency. As part of its mission, GSA explores and evaluates the mineral, water, energy, biological, and other natural resources of the State of Alabama and conducts basic and applied research in these fields.

CHOCTAWHATCHEE, PEA AND YELLOW RIVERS WATERSHED MANAGEMENT AUTHORITY

The CPYRWMA, established in 1991, protects and manages the watersheds in the ten southeastern counties of the State of Alabama. The total area of land in the management authority is approximately 2,328,000 acres and encompasses all or portions of the counties of Barbour, Bullock, Coffee, Covington, Crenshaw, Dale, Geneva, Henry, Houston, and Pike. A Board of Directors composed of sixteen volunteer directors (one Resident Director from each county and six At-Large Directors) governs the affairs of the Watershed Management Authority and each Director serves a four-year term.

ALABAMA RURAL WATER ASSOCIATION

The Alabama Rural Water Association is a non-profit organization representing water and wastewater systems serving rural communities and towns and those commercial firms which support these systems. The purpose of the Association is to provide assistance to these systems in complying with State and Federal regulations, to help them with management and operational problems, and to provide or stimulate training initiatives which will promote personnel development and efficiency.

The ARWA is governed by a Board of ten Directors elected from the membership. Elections are held each year at an Annual Meeting of the members. An Associate Advisor to the Board is also elected from current Associate Members who represent suppliers of goods and services to the water and wastewater industry.

The ARWA is a member of the National Rural Water Association which has member affiliates in 45 states and maintains legal counsel in Washington D.C. to help represent utility interests with the U.S. Congress and the White House. The ARWA is also an active participant in other organizations including The Alabama Water and Pollution Control Association and the American Water Works Association. Committee activities include the Safe Drinking Water Advisory Committee and the Alabama Operator Training Advisory Committee.

U.S. GEOLOGICAL SURVEY

The U.S. Geological Survey (USGS) was created by an act of Congress in 1879; the USGS has evolved over the ensuing 120 years and today, stands as the sole science agency for the Department of the Interior.

As the Nation's largest water, earth, and biological science and civilian mapping agency, the U.S. Geological Survey collects, monitors, analyzes, and provides scientific understanding about natural resource conditions, issues, and problems. The USGS serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

PREVIOUS INVESTIGATIONS

Natural resource investigations have been carried out in the watershed by various state and federal agencies. Geologic, stratigraphic, hydrologic, water availability, water-quality, and biological studies have been conducted by the GSA, ADEM, Troy University Center for Environmental Research and Service, USDA NRCS, US Geological Survey, COE, and US Fish and Wildlife Service.

The GSA established a partnership with the CPYRWMA in 1995 to provide technical assistance for the assessment of the water resources of the Choctawhatchee, Pea, and Yellow Rivers watershed. Ten investigations have been performed by the GSA since 1995 to determine the hydrogeologic and geochemical characteristics and conditions of surface- and ground-water resources in the area. These data have been utilized to protect and develop the water resources of the area and to educate the residents of the watershed concerning this most precious natural resource. A list of GSA investigations and reports prepared by other agencies are included in table 4.

Table 4.— Natural resource investigations and reports performed in the CPYRW.

Investigation or report title	Date	Agency or group
Floods in Alabama	1973	United States Geological Survey and Alabama Highway Department
Hydrology Study- Phase I &II for Dothan, Alabama	1975	Wainwright Engineering Company, Inc.
Northeast Gulf River Basins Cooperative Survey	1977	Soil Conservation Service – USDA, State of Alabama Development Office
Watershed Plan for Watershed Protection and Flood Protection, Harrison Mill and Panther Creeks	1982	Soil Conservation Service – USDA
Results of Surface-Water Sampling: September, 1988	1988	Geological Survey of Alabama
Results of Surface-Water Sampling: June, July, October, 1991	1991	Geological Survey of Alabama
Reconnaissance Report – Choctawhatchee and Pea River Basins Study	1992	U. S. Army Corps of Engineers, Mobile District
Groundwater Monitoring for Pesticides in Alabama: A Compilation of Studies 1989-1993	1993	ADEM, Alabama Department of Agriculture and Industries, Geological Survey of Alabama
Choctawhatchee-Pea River Basin Cooperative Study – Reconnaissance Report	1993	Soil Conservation Service – USDA
Double Bridges Creek Water Quality Incentive Project	1994	Soil Conservation Service – USDA, U. S. Army Corps of Engineers, Mobile District
Hydrologic Characterization of the Water Resources of the Choctawhatchee-Pea Rivers Watershed—Phase I	1996	Geological Survey of Alabama

Hydrologic Characterization of the Water Resources of the Choctawhatchee-Pea Rivers Watershed—Phase II	1997	Geological Survey of Alabama
Water Quality in the Alabama Portion of the Choctawhatchee-Pea River Watershed Measurements made from 1993 to 1997	1997	Center for Environmental Research and Service, Troy State University
Implementation Assessment for Water Resource Availability, Protection, and Utilization for the Choctawhatchee, Pea and Yellow Rivers Watersheds	2001	Geological Survey of Alabama
Surface Water Assessment for the Yellow River Watershed	2002	Geological Survey of Alabama
An Isotopic and Geochemical Assessment of Water from the Aquifers of Cretaceous Age	2002	Geological Survey of Alabama
Needs Assessment	2002	U. S. Army Corps of Engineers, Mobile District
Wetlands Assessment of Five Proposed Reservoir Sites	2002	U. S. Army Corps of Engineers, Mobile District
Agricultural Water Demand	2002	Natural Resources Conservation Service
Critical Habitat for the Gulf Sturgeon	2003	US Fish and Wildlife Service
Water Supply Alternatives Study for Southeast Alabama	2004	U. S. Army Corps of Engineers, Mobile District
Surface Water Assessment for Lightwood Knot Creek and Lake Frank Jackson, Northern Covington County	2004	Geological Survey of Alabama
Water Quality Assessment for Little Choctawhatchee River and Blackwood Creek	2005	Geological Survey of Alabama
Lake Jackson Hydrogeologic Assessment	2005	Geological Survey of Alabama

The table above is not an inclusive literature list. The reader is encouraged to contact agencies listed and those responsible for programs discussed above for specific reports not included in table 4.

STUDY AREA DESCRIPTION

LOCATION AND EXTENT

The CPYRW study area encompasses approximately 3,635.9 square miles (mi^2) in parts of 10 counties of southeast Alabama. Table 5 lists each county, and its land area within the watershed study area (Soil Conservation Service, 1984). Plate 1 illustrates the study area within Alabama and relative to adjacent states and the hydrologic sub-region boundaries.

Table 5— Land area by county in the CPYRW study area

County	Sq. Miles	Acres
Barbour	436.3	279,224.6
Bullock	156.9	100,359.5
Coffee	678.2	434,021.0
Covington	600.9	384,555.5
Crenshaw	27.4	17,549.0
Dale	562.5	359,997.4
Geneva	571.8	365,933.7
Henry	171.1	109,524.1
Houston	97.2	62,204.5
Pike	333.6	213,515.1
TOTALS	**3,635.9**	**2,326,884.40**

The northern boundary of the watershed area is near Union Springs in central Bullock County. The western boundary follows the eastern boundary of the Conecuh River basin through Pike and Crenshaw Counties. The southwestern boundary includes the Yellow River watershed is portions of Covington and Crenshaw Counties. The southern study area boundary is the Alabama-Florida state line from near Florala in Covington County eastward to central Houston County. The eastern boundary extends from central Houston and Henry Counties.

COUNTY, MUNICIPAL, AND POPULATION DATA

An estimated 245,321 people resided in the watershed during 2004 according to the U.S. Census Bureau. Population growth greater than 1 percent occurred in all counties except Crenshaw during the period 1990 to 2004. Population data and general housing information is provided in Table 6 and municipal information is provided in table 7.

Table 6 — County population profile information for CPYRW counties.

(U.S. Census Bureau, 2004 Population Estimates, Census 2000)

County	Estimated Total Population, 2004	Estimated population within watershed, 2004	Percent change since 1990	Median household income	Housing Units
Barbour	28.557	21,000	12.4%	$25,101	12,461
Bullock	11,229	4,500	1.7%	$20,605	4,727
Coffee	45,041	44,000	11.9%	$33,664	19,837
Covington	36,875	18,000	1.1%	$26,336	18,578
Crenshaw	13,610	600	0.2%	$26,054	6,644
Dale	49,122	49,122	1.0%	$31,998	21,779
Geneva	25,599	25,599	8.3%	$26,448	16,544
Henry	16,699	6,000	8.6%	$30,353	5,801
Houston	92,947	61,000	14.3%	$34,431	11,343
Pike	29396	15,500	6.5%	$25,551	13,981
TOTAL	**471,465**	**245,321**	**---------**	**$280,541**	**131,695**

Table 7 – Municipalities within the CPYRW boundary.

County	Municipalities
Barbour	Clayton, Clio, Blue Springs, Louisville
Bullock	Midway
Coffee	Elba, Enterprise, Kinston, New Brockton
Covington	Andalusia, Opp
Crenshaw	No incorporated communities
Dale	Ariton, Clayhatchee, Daleville, Midland City, Ozark, Newton
Geneva	Black, Coffee Springs, Geneva, Hartford, Malvern, Samson, Slocomb
Henry	Abbeville, Headland, Newville
Houston	Dothan, Taylor
Pike	Troy, Banks, Brundidge

PHYSIOGRAPHIC DISTRICTS

Lying within the East Gulf Coastal Plain physiographic section of Alabama, the CPYRW study area is characterized by gently rolling hills, sharp ridges, prairies, and alluvial flood plains (figure 1). Geologic units underlying the Coastal Plain are of sedimentary origin and consist of sand, gravel, porous limestone, chalk, marl, and clay. These strata dip underground to the south-southwest at approximately 35 to 40 feet per mile and strike generally in east-west belts. Some of the strata are more resistant to erosion and underlie broad saw-toothed ridges known as cuestas that slope gently to the south with steep north-facing slopes. Eight physiographic districts are delineated in the East Gulf Coastal Plain of Alabama including the Fall Line Hills, Black Belt, Chunnenuggee Hills, Southern Red Hills, Lime Hills, Dougherty Plain, Southern Pine Hills, and Coastal Lowlands (Sapp and Emplaincourt, 1975). Four of these districts including Chunnenuggee Hills, Southern Red Hills, Dougherty Plain, and Southern Pine Hills are present in the study area (fig. 1).

The Chunnenuggee Hills (CH) district consists of a series of pine-forested sand hills developed on hardened beds of clay, sandstone, siltstone, and chalk. The northern management plan area boundary closely follows the Enon Cuesta. The headwaters of the Pea River originate in this district on the south side of the Enon Cuesta.

The Southern Red Hills district extends in a belt more than 60 miles wide across the study area. The Southern Red Hills is characterized by cuesta type ridges with steep, serrate north slopes and gentle back slopes. Topographic relief in the Southern Red Hills is some of the greatest in the Coastal Plain of Alabama. Streams in this area acquire upland characteristics with high gradient, hard-rock bottoms, and swifter flows. The headwaters of the Choctawhatchee River originate on the southern slope of the Ripley Cuesta in the Southern Red Hills.

The Dougherty Plain district or “wiregrass region” of the management plan area includes portions of Henry, Dale, Houston, Geneva, Coffee, Crenshaw, and Covington Counties. It is composed of limestone, sand, and clay. Active solution of the underlying limestone produces many shallow, flat-bottomed depressions that dot the landscape. Small headwater streams are noticeably absent from the Dougherty Plain because active solution transfers many of the drainages to underground channels. The name “wiregrass” originates from the common occurrence of needlerush in the wet, shallow depressions. The confluence of the Choctawhatchee and Pea Rivers occurs in the Dougherty Plain in southern Geneva County.

The Southern Pine Hills (SPH) district in the management plan area includes extreme southern Covington County. Topography is low-relief with broad, rounded ridges and V-shaped valleys with sand and clay sediments. The portion of the region in Covington County has thin sand and clay sediments overlying limestone. In this area, active solutions features similar to the Dougherty Plain are common. The most prominent of these features is Lake Jackson in Florala. Flat uplands with shallow ponds, bogs, and marshes occur throughout the district and many of the valleys are saucer-like perpetually wetted by seepage from nearby hills. The abundance of warm summer rains is a major factor in leaching fertility from the soil and favoring the growth of pines in this region. The Yellow River drains the Southern Pine Hills in the management plan area.

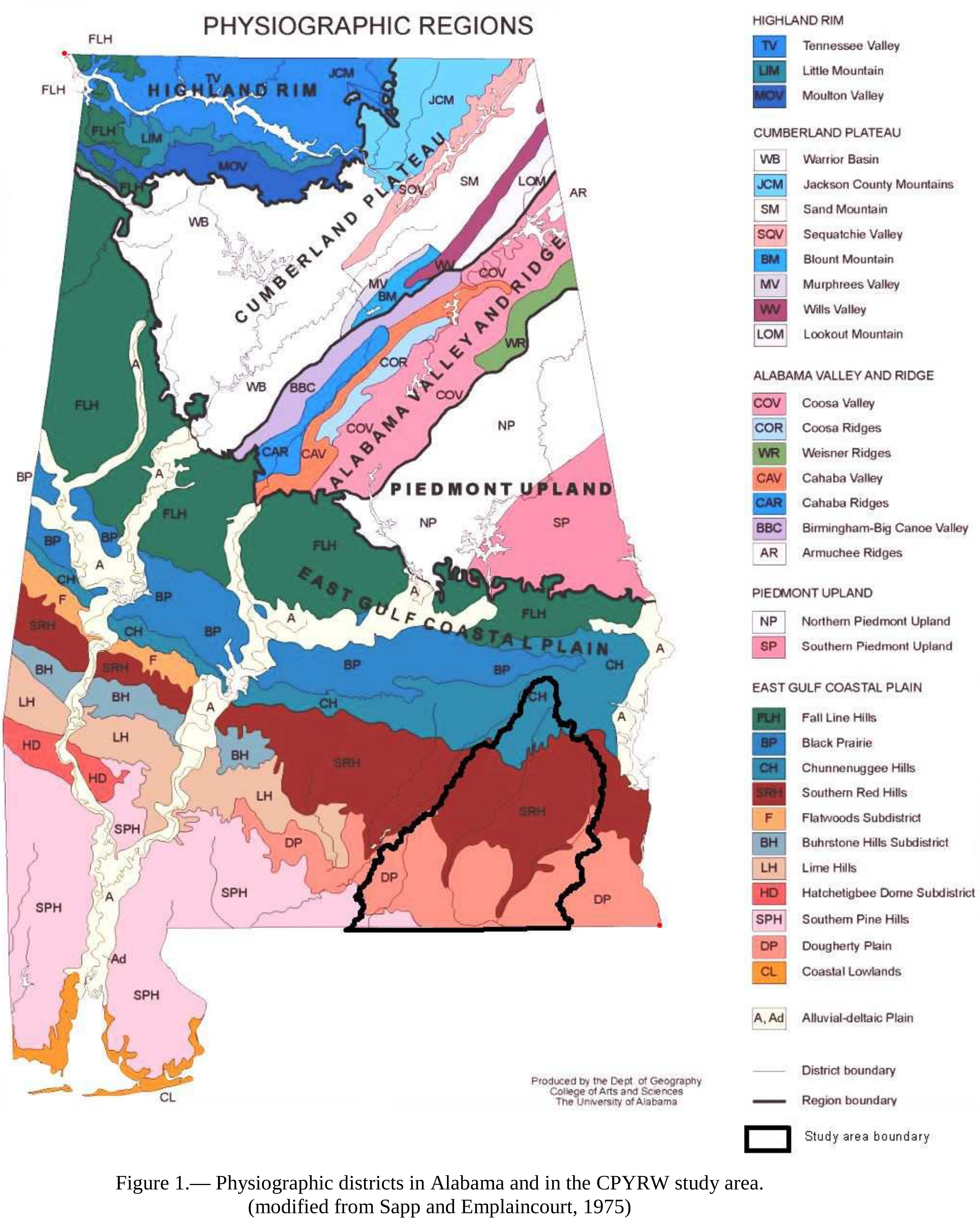


Figure 1.— Physiographic districts in Alabama and in the CPYRW study area.
(modified from Sapp and Emplaincourt, 1975)

ECOREGIONS

Ecoregions have been defined as areas of similarity in ecosystems and in type, quality, and quantity of environmental resources. They can serve as the spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components (USGS, 2001). Ecoregions in the CPYRW study area shown on figure 2 are very similar in geographic extent to the physiographic districts discussed previously (fig. 1). The Southern Hilly Gulf Coastal Plain ecoregion corresponds to the Chunnenuggee Hills (CH) and Southern Red Hills (SRH) districts. This area is described as dissected irregular plains, northward facing cuestas, and low hills with broad tops. Various wide floodplains are present with broad level undulating terraces. The Southern Pine Plains and Hills ecoregion corresponds to the Dougherty Plain (DP) and Southern Pine Hills (SPH) districts. It is characterized by southward sloping dissected irregular plains with some open low hills. Additionally, mostly board gently sloping ridgetops are found with steeper side slopes near drainages. The Dougherty Plain ecoregion refers to the same name in the physiographic districts and is described by lightly dissected irregular plains containing various flat plains. The gradient is mostly low with some areas of moderate relief.

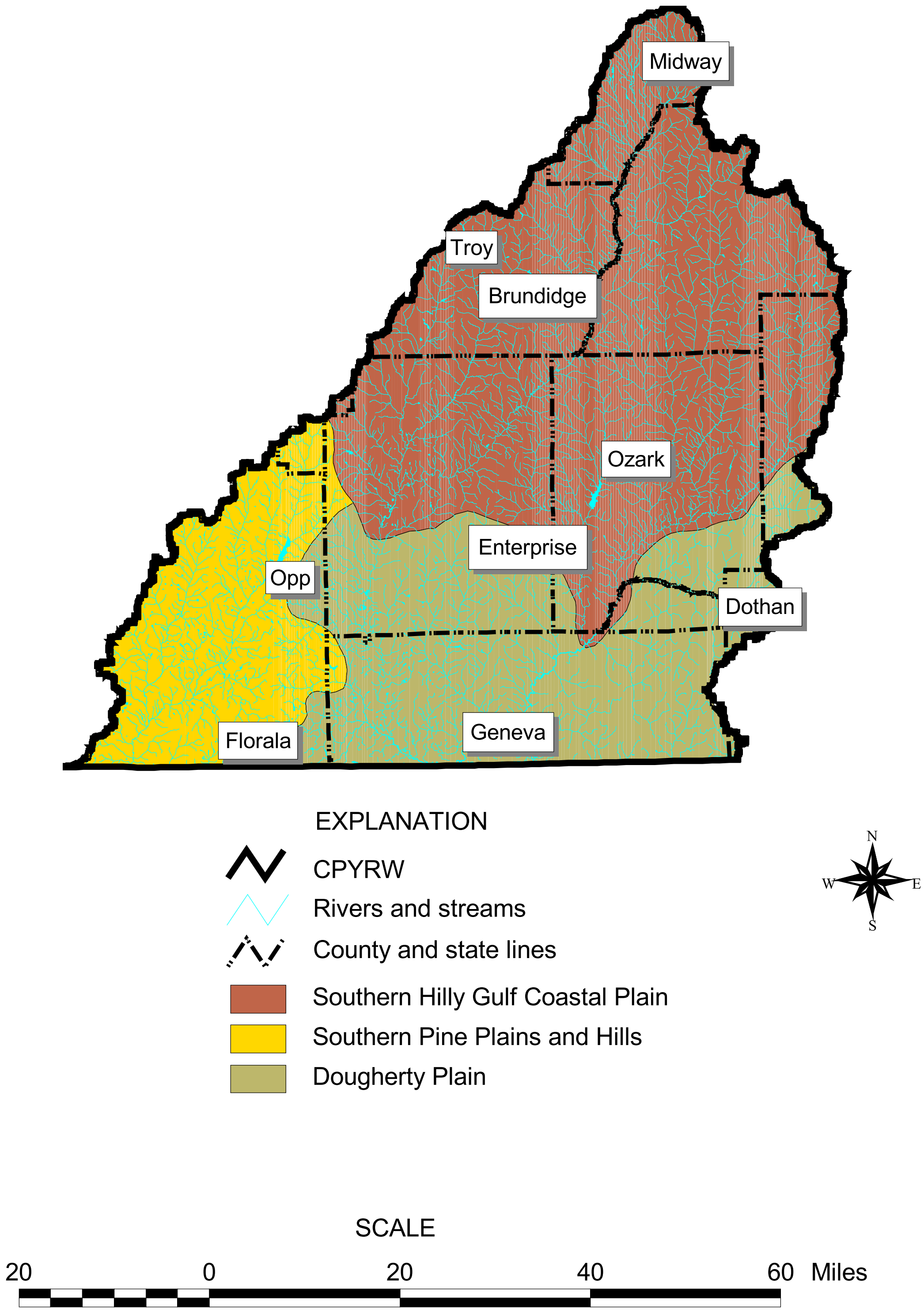


Figure 2— Ecoregions in the CPYRW study area.
(modified from USGS, 2001)

CLIMATE

Alabama, including the CPYRW area, is classified climatically as humid sub-tropical with mild winters and hot summers. Average annual temperature in the watershed is about 65 degrees Fahrenheit (°F) and annual precipitation ranges from about 51 inches in the northern portion of the watershed to more than 59 inches in the area near the Florida state line (Southeastern Regional Climatic Center, 2005). Figure 3 shows the location of selected rainfall stations within the watershed along with 2005 long-term average rainfall values.

Rainfall in the watershed is generally well distributed throughout the year, with the driest portion of the year, on average, in September and October. However, periods of drought and years of excessive precipitation do occur. Drought conditions prevailed in the basin during 1954 and 2000 and 1975 was clearly a year of high rainfall. Single precipitation events may be excessive. On March 8, 1998 Elba received a one day precipitation total of 10.04 inches. Variability of precipitation on an annual basis is clearly evident in the values for the city of Troy where 1953 saw the highest annual recorded rainfall and 1954 the lowest. Table 8 provides a summary of precipitation values for selected stations in the basin (Southeastern Regional Climatic Center, 2005).

Table 8.— Precipitation values for selected stations in the CPYRW

	Precipitation (inches)			
Station name/number	**Mean**	**Min./Year**	**Max./Year**	**Period of record**
Abbeville/010008	55.36	37.86/1986	75.65/1975	1948-2005
Andalusia/010252	58.49	29.50/1954	92.90/1975	1948-2005
Brundidge/011178	53.69	29.20/1954	76.22/1975	1948-2005
Clayton/011725	50.68	24.52/1954	71.95/1975	1948-2005
Dothan/012327	50.86	28.96/1954	76.38/1964	1930-2005
Elba/012577	56.43	26.12/1954	87.08/1975	1948-2005
Enterprise/012675	57.30	38.48/1968	89.24/1973	1966-2005
Geneva/013255	55.08	26.13/1954	88.47/1975	1948-1976
Headland/013761	55.39	31.99/1954	79.02/1964	1950-2005
Kinston/014431	59.73	41.62/1968	92.98/1975	1956-2005
Ozark/016218	55.17	25.62/1954	81.23/1975	1956-2003
Troy/018323	53.00	24.41/1954	73.40/1953	1930-2005

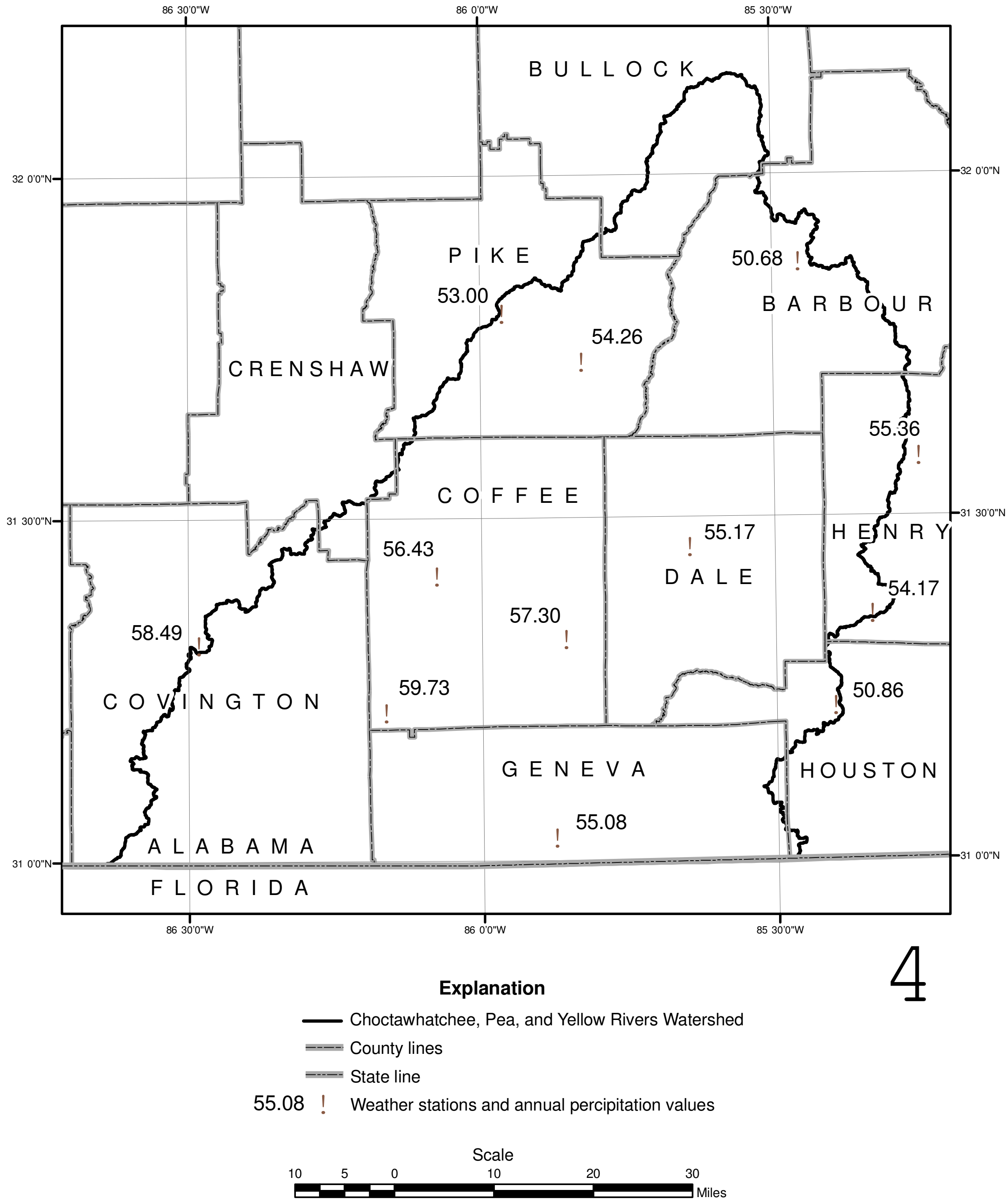


Figure 3.— Precipitation in the CPYRW.

GEOLOGY

Geologic units that crop out in the CPYRW include Quaternary alluvial and terrace deposits, Tertiary clays, sands, and gravels, and Cretaceous clays, sands, and marl (Osborne and others, 1988). With the exception of terrace and alluvial deposits geologic units in the study area dip south-southwestward about 35 to 40 feet per mile. Figure 4 shows the basin geology and table 9 lists area stratigraphy. Much of the stratigraphic information in this watershed management plan was taken from the *Implementation Assessment for Water Resource Availability, Protection, and Utilization for the Choctawhatchee, Pea, and Yellow Rivers Watersheds: Hydrogeology* (Smith, 2001). Individual units are discussed below.

CRETACEOUS SYSTEM

UPPER CRETACEOUS SERIES

The Upper Cretaceous Series is composed of the Tuscaloosa Group, Eutaw Formation, Selma Group, and Ripley Formation. The Tuscaloosa Group and Eutaw Formation outcrop north of the management plan area but are included in the following geologic text due to their importance as aquifers in the subsurface of the area.

TUSCALOOSA GROUP

The Tuscaloosa Group consists of sand, gravel, and varicolored clay which, in the outcrop belt, ranges from about 900 feet thick in western Alabama thins to about 300 feet in the eastern part of the state. The Tuscaloosa Group was named from exposures near the city of Tuscaloosa and from river bluffs along the Tuscaloosa (or Black Warrior) River in northwestern Hale County. Sediments assigned to the Tuscaloosa Group are exposed across Alabama in a broad arcuate band extending from the northwestern part of the state southward and southeastward through Tuscaloosa and further eastward through northern Macon County, northern Russell, and southern Lee Counties to the Chattahoochee River. From Macon County westward, the Tuscaloosa Group in outcrop is subdivided into a lower Coker Formation and an upper Gordo Formation, yet in the eastern Alabama outcrop this subdivision of the Tuscaloosa cannot be recognized and the unit is mapped as the Tuscaloosa Group undifferentiated. However, in the subsurface toward the south from Macon, Lee, and Russell Counties to the Alabama-Florida State Line, a 3-part subdivision of the Tuscaloosa Group is recognized, consisting of the lower Coker Formation, a middle informal “middle marine shale”, and the upper Gordo Formation (Smith, 2001).

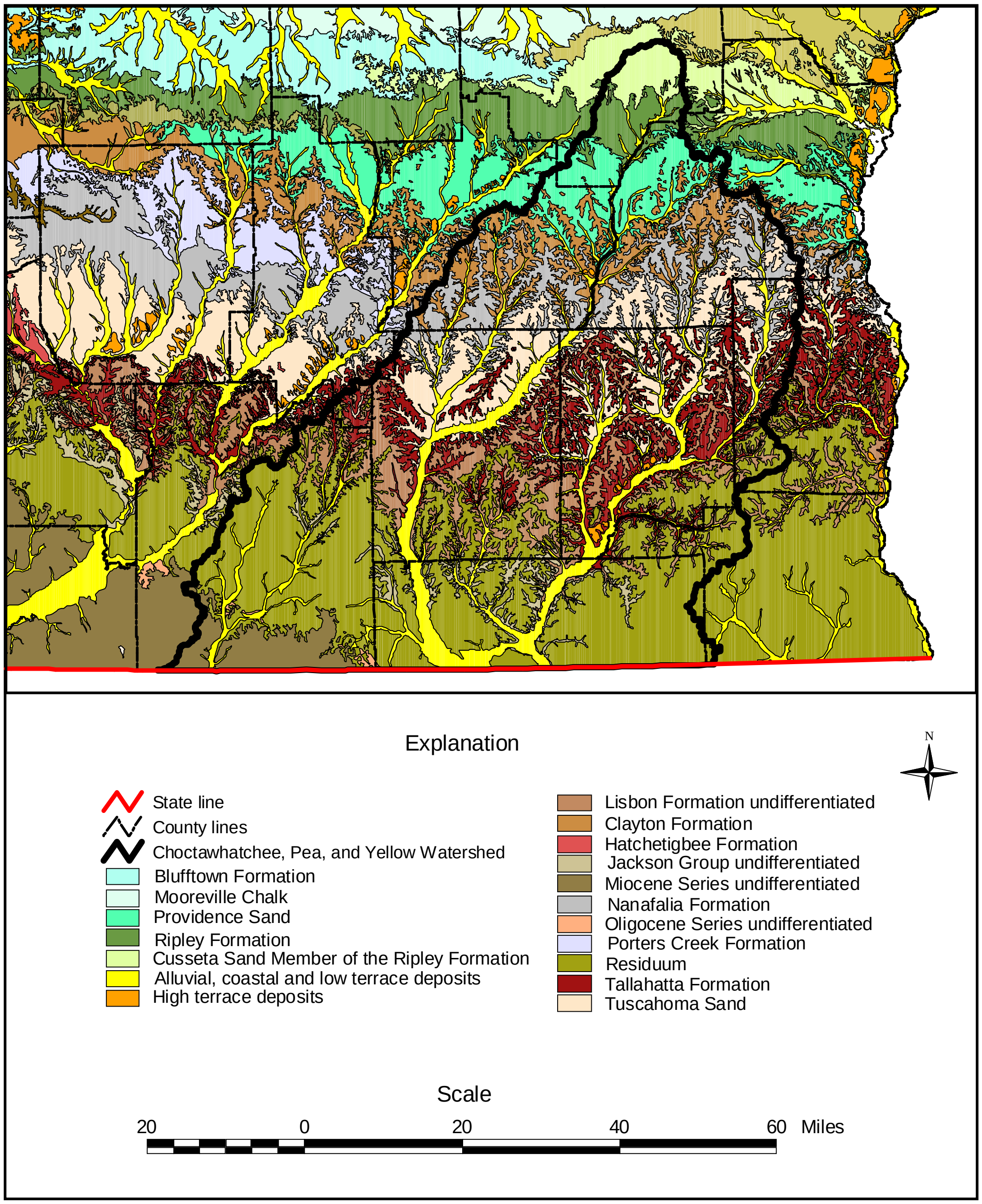


Figure 4.—Generalized geology in the CPYRW. (modified from Osborne and others, 1988)

Table 9.— Generalized stratigraphy of the CPYRW
(modified from Smith, 2001)

SYSTEM	SERIES	GROUP	GEOLOGIC UNIT	THICKNESS (feet)
Quaternary	Holocene/Pleistocene		Alluvial and Terrace deposits	0-50
	Miocene		Miocene undiff.	20-120
	Oligocene		Chickasawhay Limestone	20-175
	Eocene/Oligocene		Residuum and Crystal River Formation	0-? 100-150
Tertiary	Eocene	Jackson	Yazoo Clay and Moodys Branch Formation.	15-90 10-25
		Claiborne	Lisbon Fm.	75-110
			Tallahatta Fm.	75-100
		Wilcox	Hatchetigbee Fm.	35-100
	Paleocene		Tuscahoma Sand	80-125
			Nanafalia Fm.	100-200
			Salt Mountain Limestone	100-250
		Midway	Porters Creek Fm.	0-35
			Clayton Fm.	70-125
Cretaceous	Upper Cretaceous	Selma	Providence Sand	90-300
			Ripley Fm.	135
			Cusseta Sand	200
			Blufftown Fm.	30-600
		Tuscaloosa	Eutaw Fm.	100-300
			Gordo Fm.	400-550
			middle marine shale	50-150
			Coker Fm.	400-450

COKER FORMATION

Tuscaloosa sediments exposed within Macon, Lee, and Russell Counties are undifferentiated and are mapped as the Tuscaloosa Group undifferentiated. In outcrop exposures, these sediments consist of white, yellowish-orange, and gray sand and gravel interbedded with gray and varicolored clay and sandy clay containing thin lenses of sandstone (Scott, 1962). Limited available data suggests that the top of the Coker Formation ranges in depth from about -600 feet relative to mean sea level (MSL) in the northern part of Bullock County to perhaps -2,200 to -2,300 feet MSL in southern Pike and Barbour Counties (Smith, 2001).

MIDDLE MARINE SHALE

Within the subsurface of eastern and southeastern Alabama, the Tuscaloosa Group can be divided into three formal and informal formations. The informal “middle marine shale” is a thin yet widespread unit that occurs throughout the subsurface of

Alabama. Although not recognized at the surface, its occurrence in the subsurface permits the identification, differentiation, and mapping of the lower Tuscaloosa Coker Formation from the overlying upper Tuscaloosa Gordo Formation.

Throughout east-central and southeastern Alabama, the subsurface "middle marine shale" consists of medium-gray to olive-gray, massive-bedded to thinly-laminated, finely muscovitic and lignitic, quartzose silty clay and shale which in part is moderately calcareous and contains common to abundant thin-walled pelecypod shell fragments (Smith, 2001).

GORDO FORMATION

The Gordo Formation represents the upper formal stratigraphic unit within the Tuscaloosa Group. The outcrop extends through Macon County and extends eastward to the Chattachoochee River. In this area, the Gordo Formation in its outcrop is not differentiated from the underlying Coker, and both units are mapped as the Tuscaloosa Group undifferentiated. Within the subsurface of Bullock, Pike, and Barbour Counties, the base of the Gordo Formation is marked by the abrupt change from coarse sands and gravels of the basal Gordo and the massive gray clay of the underlying "middle marine shale" (Smith, 2001).

EUTAW FORMATION

Outcrop exposures of the Eutaw Formation extend through northern Montgomery and northern Russell Counties to the Chattachoochee River. Southward from the outcrop, the Eutaw Formation is recognized throughout the subsurface of southeastern Alabama to the Florida State Line. The Eutaw Formation consists predominantly of light-gray to light-greenish-gray, glauconitic, muscovitic, fossiliferous, well-sorted, fine- to medium-grained quartzose sand with subordinate beds of thinly laminated to massive dark-gray, micaceous, lignitic and carbonaceous silty clay and clay (Smith, 2001).

BLUFFTOWN FORMATION

In western and central Alabama, sediments overlying the Eutaw Formation and assignable to the lower Selma Group consist of a lower Mooreville Chalk and an upper Demopolis Chalk. These beds are made up of a series of massive impure chalks and chalky marls with a thin limestone bed, the Arcola Limestone, separating the underlying Mooreville Chalk from the overlying Demopolis Chalk. From Montgomery County eastward, the Mooreville Chalk thins to about 100 feet in southeastern Macon and northeastern Bullock Counties. Further eastward, in western and west-central Russell County, the Mooreville Chalk grades into the lower part of the Blufftown Formation and cannot be mapped.

In far eastern Alabama, these chalky marls interfinger with and are eventually replaced entirely by the Blufftown Formation which consists predominantly of marl, calcareous clay, and subordinate thin beds of very fine quartzose sand (Smith, 2001).

CUSSETA SAND MEMBER OF THE RIPLEY FORMATION

The Cusseta crops out near Union Springs in Bullock County (fig. 4) in the management plan area. Occurring near the base of the Ripley Formation, the Cusseta is primarily composed of fine- to coarse-grained sand and dark-gray carbonaceous clay (Osborne and others, 1988).

RIPLEY FORMATION

In north-central Barbour, southern Bullock, and far northern Pike Counties, the exposed upper member of the Ripley generally consists of massive-bedded to cross-bedded, glauconitic fine sands and sandy clay with thin indurated beds of fossiliferous sandstone having a total thickness of about 135 feet. (Osborne and others, 1988).

PROVIDENCE SAND

In the outcrop of eastern Alabama, the Providence Sand is subdivided into a lower Perote Member and an upper unnamed member. The lower Perote Member ranges from less than 10 to perhaps 150 feet in thickness and consists of dark-gray, highly micaceous and carbonaceous, laminated to thin-bedded, silty clay and fine quartzose sand. The upper part of the Providence ranges from 80 to 150 feet in thickness and consists of thinly laminated sand and clayey silt that is in part marine and abundantly fossiliferous, overlain by thick-bedded to cross-bedded sand.

From its outcrop in central Barbour and Pike Counties, the Providence Sand extends southward through southern Covington, Geneva, and Houston Counties, to the Alabama-Florida State Line, thus underlying the entire study area (Smith, 2001).

TERTIARY SYSTEM

PALEOCENE SERIES

CLAYTON FORMATION

Outcrop exposures of the Clayton Formation extend from the Chattahoochee River area of southeastern Barbour County westward in a narrow arcuate band about 2 to 3 miles in width through central Barbour and Pike Counties into north-central Crenshaw County. The presence of Clayton outliers exposed on topographic high ridge crests as much as 10 miles north of its outcrop indicate these updip areas much have had a continuous cover at one time in the past (Baker and Smith, 1997). McWilliams, Newton, and Scott (1968) report that in the subsurface the Clayton generally consists of fossiliferous sandy limestone. Outcrops in many areas have weathered to residual accumulations of chert boulders, moderate-reddish-orange sand, and clay.

PORTERS CREEK FORMATION

Through Pike and Barbour Counties, the Porters Creek Formation is significantly absence. One notable outcrop, however, occurs near the type area of the Clayton Formation. This single exposure represents the only known outcrop of the Porters Creek in Barbour County. Gibson (1981) reported 34.4 feet of dark-gray, massive, waxy, fossiliferous, silty clay which he assigned to the Porters Creek Formation on the basis of its lithologic similarly to the Porters Creek in central and western Alabama.

SALT MOUNTAIN LIMESTONE

The Salt Mountain Limestone is the only stratigraphic unit underlying the Choctawhatchee, Pea, and Yellow Rivers Watersheds (or, for that matter, the entire south-central and southeastern portions of Alabama) thta does not have an equivalent updip, or northward, outcrop exposure. The Salt Mountain Limestone is lithologically distinctive throughout southern Alabama where it overlies the Porters Creek Formation, or where the Porters Creek is absent, overlies the Clayton Formation, and, in turn, is overlain by the Nanafalia Formation.

The Salt Mountain Limestone consists of white to very light-gray, massive, highly porous and permeable, more rarely dense and indurated, rarely fine to medium quartzose sandy, highly fossiliferous limestone. These limestones vary from highly fossiliferous and porous to massive, dense, very fine-grained carbonates (Smith, 2001).

NANAFALIA FORMATION

From central Crenshaw County eastward, the outcrop belt of the Nanafalia Formation increases to as much as 20 miles in width as a direct result of deep dissection and resulting high topographic relief in southeastern Alabama. In southern Barbour and northern Henry Counties, the Nanafalia is highly variable lithologically but generally consists of massive cross-bedded sands, glauconitic and fossiliferous fine sands, and unfossiliferous clays totaling about 125 feet in thickness.

In the CPYRW project study area, the Nanafalia Formation represents one of the most widespread and significant aquifers within the Cretaceous or Tertiary Systems.

TUSCAHOMA SAND

Through northern Dale and Henry Counties to the Chattachoochee River, the Tuscahoma outcrop belt varies from about 15 to 20 miles in width primarily due to the relative high topographic relief and deeply dissected sediments in the area. In the outcrop of eastern Alabama, the Tuscahoma Sand is about 80 to 125 feet thick and generally consists of a thin basal glauconitic sand overlain by dark-gray to black, thinly laminated, micaceous and carbonaceous, nonfossiliferous clay and silty clay. (Smith, 2001).

EOCENE SERIES

HATCHETIGBEE FORMATION

In outcrop, the Hatchetigbee consists of greenish-gray, very glauconitic, very fine to fine quartzose sand that is abundantly fossiliferous (Smith, 2001). In southern Crenshaw and northern Covington County, the outcropping Hatchetigbee Formation is about 100 feet thick. Further eastward, into Coffee, Dale, and Henry Counties, the Hatchetigbee is reduced to less than 50 feet in thickness. Along the Chattahoochee River in east-central Henry County, Toulmin and LaMoreaux (1963) report only 35 feet.

TALLAHATTA FORMATION

In eastern Alabama, the Tallahatta Formation is 75 to 100 feet thick. Tallahatta sediments in eastern Alabama form the most rugged topography in southeastern Alabama with a deeply dissected outcrop pattern varying from 20 to 30 miles in width.

In the outcrop through northern Covington County, central and southern Coffee and Dale Counties, and extending eastward through the central portions of Henry County, the Tallahatta generally consists of clayey sand, sandy clay, and thin beds of limestone. (Smith, 2001).

LISBON FORMATION

The Lisbon Formation is about 75 feet thick in northern and central Covington County (Toulmin, 1967). Further eastward, the Lisbon Formation consists almost entirely of deeply weathered sand. Along the Chattahoochee River in the vicinity of Columbia in northeastern Houston County, the Lisbon Formation consists of about 110 feet of various rock types (Toulmin and LaMoreaux, 1963).

JACKSON GROUP undifferentiated

The Jackson group consists of the Moodys Branch Formation and overlying Yazoo Clay. The only exposures of the Moodys Branch Formation occur along the Conecuh River west of Andalusia in north-central Covington County, along the Yellow River and Lightwood Knot Creek west of Opp in eastern Covington County, along Flat Creek and the Pea River west and northwest of Samson in western Geneva County, and along Double Bridges Creek, the Chattahoochee River and Hurricane Creek in central and east-central Geneva County (Smith, 2001). Only a single exposure of the Moodys Branch Formation is known in Houston County. Toulmin and LaMoreaux (1963) report about 30 feet of Moodys Branch Formation exposed in bluffs along the western bank of the Chattahoochee River about 3 miles north of the U. S. Highway 84 bridge over the Chattahoochee, this bridge being located about 3 miles southeast of Gordon in southeastern Houston County.

Within the outcrop of the management plan area, the Yazoo Clay is invariably deeply weathered, cannot be distinguished as a separate formation, and is included with the Tertiary residuum on geological maps. In the shallow subsurface, however, the Yazoo Clay is readily identifiable and has been mapped throughout central and southern Covington County, Geneva County, and western Houston County.

EOCENE AND OLIGOCENE SERIES

RESIDUUM and CRYSTAL RIVER FORMATION

Derived from solution and collapse of limestone in the Jackson Group and Oligocene Series and the slumping of Miocene sediments, the Residuum occurs in a wide band across the study area from Covington through Houston Counties (Osborne and others, 1989). It is primarily composed of clay, sandy clay, and layers of gravelly sand and fossiliferous chert. Beds assignable to the Crystal River Formation cannot be identified or mapped in the outcrop in southeastern Alabama but rather are included in the Tertiary residuum. In the shallow subsurface, however, the Crystal River Formation is readily recognizable and in Covington County, most of southern Geneva County, and in Houston County. It consists of about 100 to 150 feet of calcareous sands, sandy clays, and marls with thin interbedded limestones Smith, 2001).

OLIGOCENE SERIES

CHICKASAWHAY LIMESTONE

Within the Choctawhatchee, Pea, and Yellow Rivers Watershed area, the Chickasawhay Limestone is exposed only in southern Covington County. In this area, the unit is deeply weathered and oxidized and consists predominantly of reddish-brown sand and clay. Fresh unweathered exposures of the Chickasawhay Limestone are rare and occur only in streams and rivers that have cut through the weathered surfical Chickasawhay residuum (Smith, 2001).

MIOCENE SERIES

MIOCENE SERIES undifferentiated

In the study area the Miocene Series undifferentiated is exposed in southern Covington County. It consists principally of poorly sorted sands, sandy clays, and often color mottled clays, with subordinate amounts of gravel (Smith, 2001).

OUARTERNARY SYSTEM

PLEISTOCEN- AND HOLOCENE SERIES

TERRACE AND ALLUVIAL DEPOSITS

Terrace and Alluvial deposits occur throughout the CPYRW and are very similar in lithology, distinguished primarily by their elevations above stream levels. High terrace deposits represent former flood plains when streams were at higher elevations. Low terrace or alluvial deposits occur in stream valleys and along banks of current streams. These sediments consist principally of unconsolidated silt, sand, gravel, and clay, and various admixtures of these sediments (Smith, 2001).

SURFACE WATER RESOURCES

HYDROLOGIC UNITS BOUNDARIES

Hydrologic unit boundaries are the aerial extent of surface water drainage to a point (NRCS, 1992). These boundaries are defined by hydrographic and topographic criteria that delineate an area of land upstream from a specific point on a river, stream or similar surface waters (NRCS, 2004). Their selection is complete based on hydrologic principles and they do not favor any particular political or social boundaries. This classification system was originally adopted in 1974 by the U.S. Water Resources Council as a framework for detailed planning. It consists of four successively smaller hydrologic units which were classified into four levels (USGS, 1992). The largest or first level of classification is called regions, which usually contain a large drainage area of a major river or the combined drainage area of a series of rivers. The second level of classification is called sub-regions and they are typically the area drained by a river system. Sub-regions are further divided into a third level called accounting units which are used by the USGS in managing the National Water Data Network. Accounting units are divided into several cataloging units. The region, sub-region, accounting unit, and cataloging unit make up an 8-digit number called the hydrologic unit code that is applied to a specific river or stream basin. The State of Alabama comprises portions of two regions,sevensub-regions, 11 accounting units, and 53 cataloging units. During the 1980’s and 1990’s additional mapping of the 10- and 12-digit hydrologic units boundaries were delineated and called watersheds and sub-watersheds, respectively. The state of Alabama contains 629 sub-watersheds (SCS, 1984). Later in 2000 the FGDC-Spatial Water Data Subcommittee created federal standards for the delineation of hydrologic unit boundaries. In October of 2004 these standards were published in the Federal Standards for Delineation of Hydrologic Unit Boundaries; Version 2.0 (USDA, 2004). The six different hydrologic unit levels based upon these standards are shown in table 10 along with the national average of their size and the estimate of the number of units.

Table 10. —Hydrologic Unit Level and Codes.

Hydrologic Unit Level	Name	Digits	Size	Units
1	Region	2	Average:177,560 mi^2	21
2	Subregion	4	Average:16,800 mi^2	222
3	Basin	6	Average: 10,596 mi^2	352
4	Subbasin	8	Average: 703 mi^2	2,149
5	Watershed	10	63-391 mi^2	22,000 (estimate)
6	Subwatershed	12	16-63 mi^2	160,000 (estimate)

The CPYRW lies in the South Atlantic-Gulf hydrologic region (03) and in the Choctawhatchee-Escambia subregion (0314). The Choctawhatchee and Pea Rivers are both in the Choctawhatchee Basin (031402) with the Choctawhatchee River divided into the Upper Choctawhatchee subbasin (03140201) and the Lower Choctawhatchee subbasin (03140203). Pea River subbasin (03140202) is also located within the Choctawhatchee Basin while the Yellow River is in the Florida Panhandle Coastal Basin (031401) and the Yellow River subbasin (03140103) (plate 1).

Tables 11-14 list each hydrologic unit by name and number to the 12-digit subwatershed level, along with land area values. Individual river and creek discharge values are provided in table 15. Each cataloging unit is discussed below.

UPPER CHOCTAWHATCHEE RIVER (03140201)

The Upper Choctawhatchee River Subbasin comprises approximately 1,543 square miles (mi^2) of the CPYRW (plate 1). This unit lies in the eastern portion of the CPYRW study area and is comprised of the Choctawhatchee River from its headwaters near Clayton in Barbour County southwestward to the confluence of the Pea River at Geneva in southern Geneva County. This subbasin is found in six counties and it is the largest of the CPYRW. There are 12 watersheds (10-digit) and 60 sub-watersheds (12-digit) within this subbasin. They are listed in table 11 along with their names and land area values. Figures 5-16 illustrate the watersheds as well as the subwatersheds that are described below.

Upper East Choctawhatchee River Watershed (0314020101) covers approximately 111 mi² of the study area and is mostly located within Barbour County southeast of Clayton. The southern portion of the watershed extends into northern Henry County. Four subwatersheds (12-digit) form this watershed and they include the Upper East Choctawhatchee River, Beaver Creek, Piney Woods Creek, and Indian Creek. Figure 5 shows each hydrologic units location and table 11 lists individual land areas.

Lower East Fork Choctawhatchee River Watershed (0314020102) covers about 205 mi² and is located directly downstream of the Upper East Choctawhatchee River Watershed. Most of the watershed is located in western Henry County and extends into extreme eastern Dale County near Midland City. There are eight subwatersheds that constitute this watershed and they include Dunham Creek, Little Blackwood Creek, Lower East Fork Choctawhatchee River, Middle East Fork Choctawhatchee, Panther Creek, Poor Creek, Riley Creek, and Turkey Creek. Figure 6 graphically displays this watershed with each 12-digit subwatershed and table 11 lists each of the land area values.

West Fork Choctawhatchee River (031402013) and Catoma Creek (0314020103) share the same 12-digit watershed unit. This watershed covers approximately 238 mi² located in central Barbour County near Clayton and extends southward into Dale County just east of Ozark. There are eight subwatersheds within this watershed. They are Bear Creek, Cedar Creek, Chaney Branch, Lindsay Creek, Lower West Fork Choctawhatchee River, Middle West Fork Choctawhatchee, Sikes Creek, and Upper West Fork Choctawhatchee River. Figure 7 displays the watershed and subwatersheds and table 11 lists the land area values.

Judy Creek Watershed (0314020104) covers approximately 117 mi². The northern portion is located in Barbour County and includes the southeast portion of the city of Clio and continues into Dale County near Ozark. Four subwatersheds compose this watershed and they are Little Judy Creek, Lower Judy Creek, Middle Judy Creek, and Upper Judy Creek. They are found in figure 8 and table 11 lists each land area value.

Little Choctawhatchee River Watershed (0314020105) covers approximately 81 mi². The northern boundary of the watershed is southeast of Ozark in Dale County. The watershed extends in a southerly direction just east of Daleville. There are four subwatersheds that compose this watershed and they are Brooking Mill Creek, Hurricane Creek, Lower Middle Choctawhatchee River, and Upper Middle Choctawhatchee River as shown in figure 9 and table 11. Discharge or flow values for this watershed are available from the USGS for a station near Newton (no. 02361000). The average daily discharge for the period of record is about 945 cubic feet per second (cfs). A maximum daily discharge of 72,200 cfs occurred on March 18, 1990 and the minimum daily discharge of 37 cfs occurred on July 26-27, 2000 as shown in table 15. Based on a unit discharge value of 1.38 cfs per mi^2 the average daily discharge from this hydrologic unit is estimated at 2,130 cfs.

Bear Creek Watershed (0314020106) covers approximately 161 mi^2. It is located in southeast Dale County near Midland City and extends southward into the west side of Dothan in Houston County to the northeast portion of Slocomb in Geneva County. The four subwatersheds within this watershed are Bear Creek, Little Choctawhatchee River, Murphy Mill Branch, and Newton Creek as shown in figure 10 and table 11.

Hurricane Creek Watershed (0314020107) covers approximately 90 mi^2. It originates in southwest Dale County and in the southwest portion of the northwest panhandle section of Houston County and continues southward into Geneva County from Slocomb to Hartford. The four subwatersheds encompassed within this watershed are Hurricane Creek, Pates Creek, Pine Log Branch, and Sconyers Branch as shown in figure 11 and table 11.

Upper Clay Bank Creek Watershed (0314020108) is approximately 84 mi^2. The northern boundary is in northwest Dale County near Ariton and broadens as it extends southeast to Ozark and south to include Lake Tholocco. The three subwatersheds within this watershed are Bear Creek, Clay Bank Creek, and Upper Clay Bank Creek as shown in figure 12 and table 11.

Steephead Creek Watershed (0314020109) is approximately 65 mi^2. It is located in the east-central Coffee County and west central Dale County near Lake Tholocco. Four subwatersheds found within this watershed are Blocks Mill Creek, Harris Mill Creek, Steep Head Creek, and Steephead Creek shown in figure 13 and table 11.

Lower Clay Bank Creek Watershed (0314020110) is approximately 87 mi². The northern most portion of this watershed begins near the Lake Tholocco dam in Dale County and extends southward to Daleville and westward to Enterprise in Coffee County. The southern most portion continues into southwest Dale County and a small portion of north central Geneva County. The six subwatersheds that create this watershed are Brackin Mill Creek, Cowpen Creek, Harrand Creek, Line Creek, Lower Clay Band Creek, and Middle Clay Bank Creek as shown in figure 14 and table 11.

Choctawhatchee River Watershed (0314020111) covers approximately 112 mi². It extends from southeastern Coffee County near Enterprise southeasterly to Hartford and then southwestward to Geneva in Geneva County. Discharge or flow values for this watershed are available from the USGS for a station near Bellwood (no. 02361500). The average daily discharge for the period of record is about 1,599 cubic feet per second (cfs). A maximum daily discharge of 26,000 cfs occurred on January 19, 1925 and the minimum daily discharge of 175 cfs occurred on September 26, 1925 as shown in table 15. Based on a unit discharge value of 1.25 cfs per mi² the average daily discharge from this hydrologic unit is estimated at 1,928 cfs. Five years of records are available with gaps from October 31, 1925 to December 7, 2000. The five subwatersheds within this watershed are Adams Creek, Campbell Mill Creek, Choctawhatchee River, Wilkerson Creek, and Wilson Creek as shown in figure 15 and table 11.

Double Bridges Creek Watershed (0314020112) is approximately 195 mi². The northern most portion of this watershed is in Coffee County near New Brocton and extends to Enterprise, continues southward into Samson in Geneva County, and finally to Geneva in Geneva County. Discharge or flow values for this watershed are available from the USGS for a station near Enterprise (no. 02362240). The average daily discharge for the period of record is about 35 cfs. A maximum daily discharge of 5,000 cfs occurred on March 17, 1990 and the minimum daily discharge of 1.1 cfs occurred on July 20, 2000 as shown in table 15. Based on a unit discharge value of 1.64 cfs per mi² the average daily discharge from this hydrologic unit is estimated at 2,530 cfs. The six subwatersheds within this watershed are Beargrass Creek, Beaver Dam Creek, Blanket Creek, Little Double Bridges Creek, Long Branch, and Tight Eye Creek as shown in figure 16 and table 11.

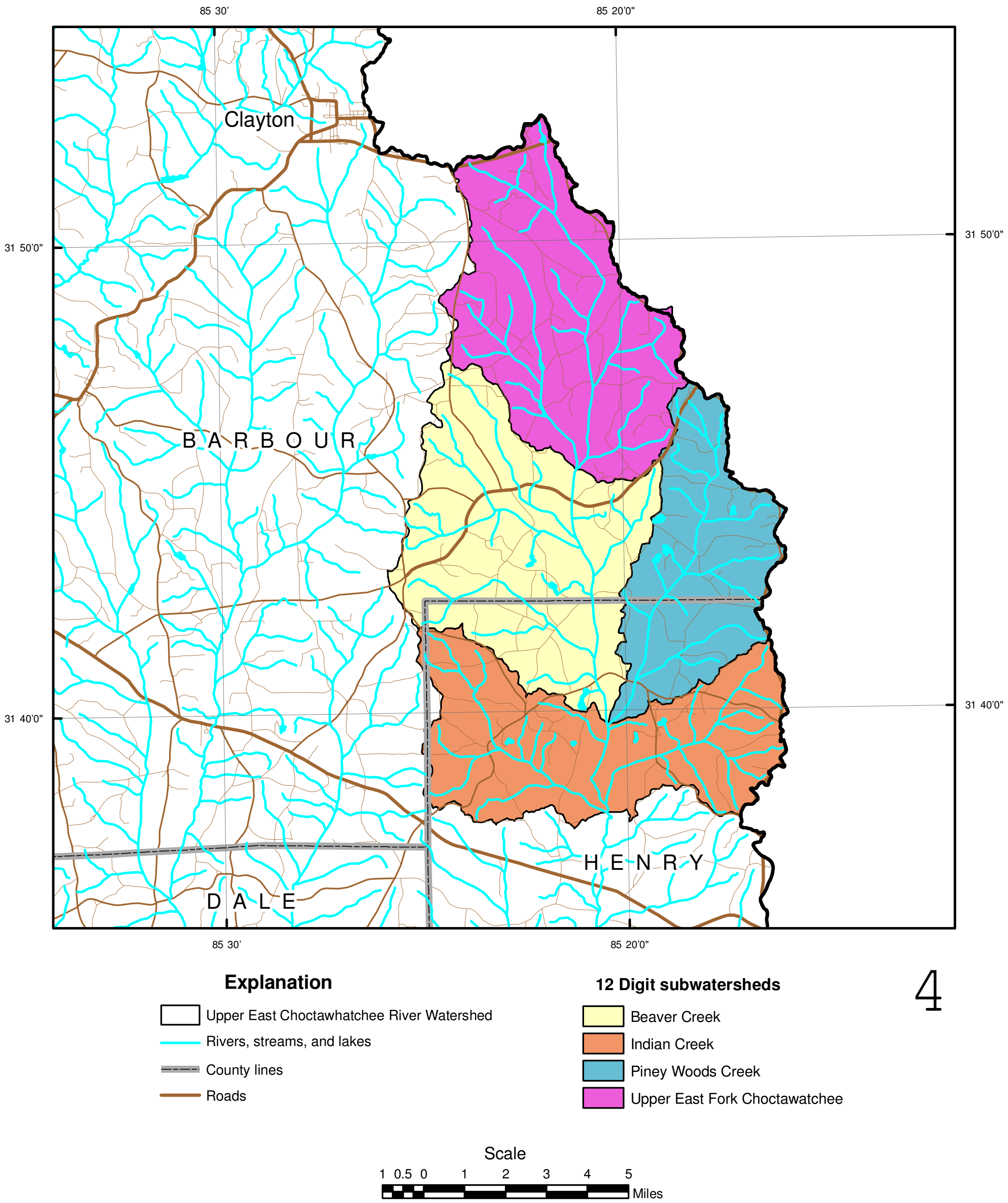


Figure 5.—Upper East Choctawhatchee River Watershed (0314020101)10-digit hydrologic unit and each 12-digit subwatersheds.

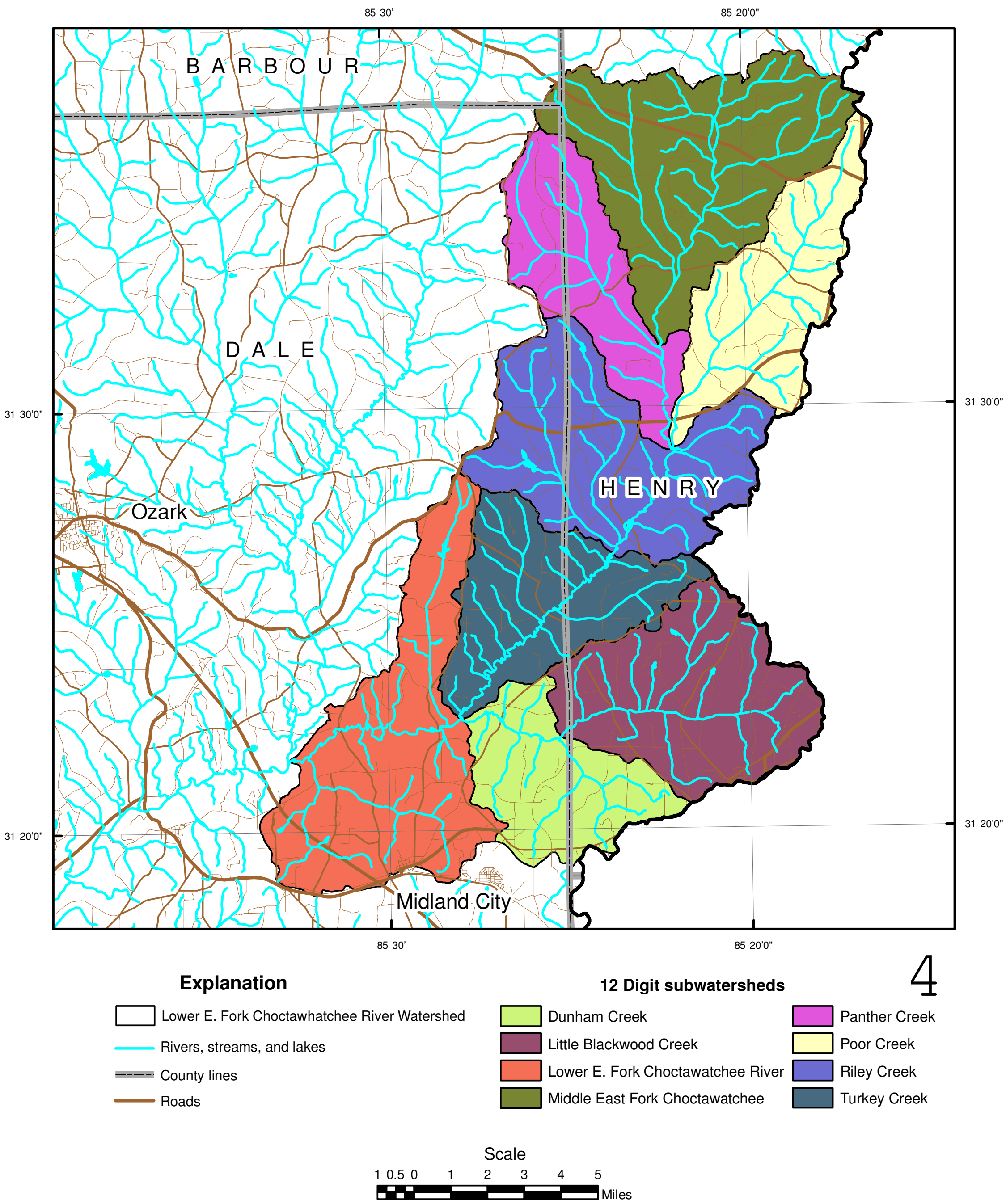


Figure 6.—Lower East Fork Choctawhatchee River Watershed (0314020102)10-digit hydrologic unit and each 12-digit subwatersheds.

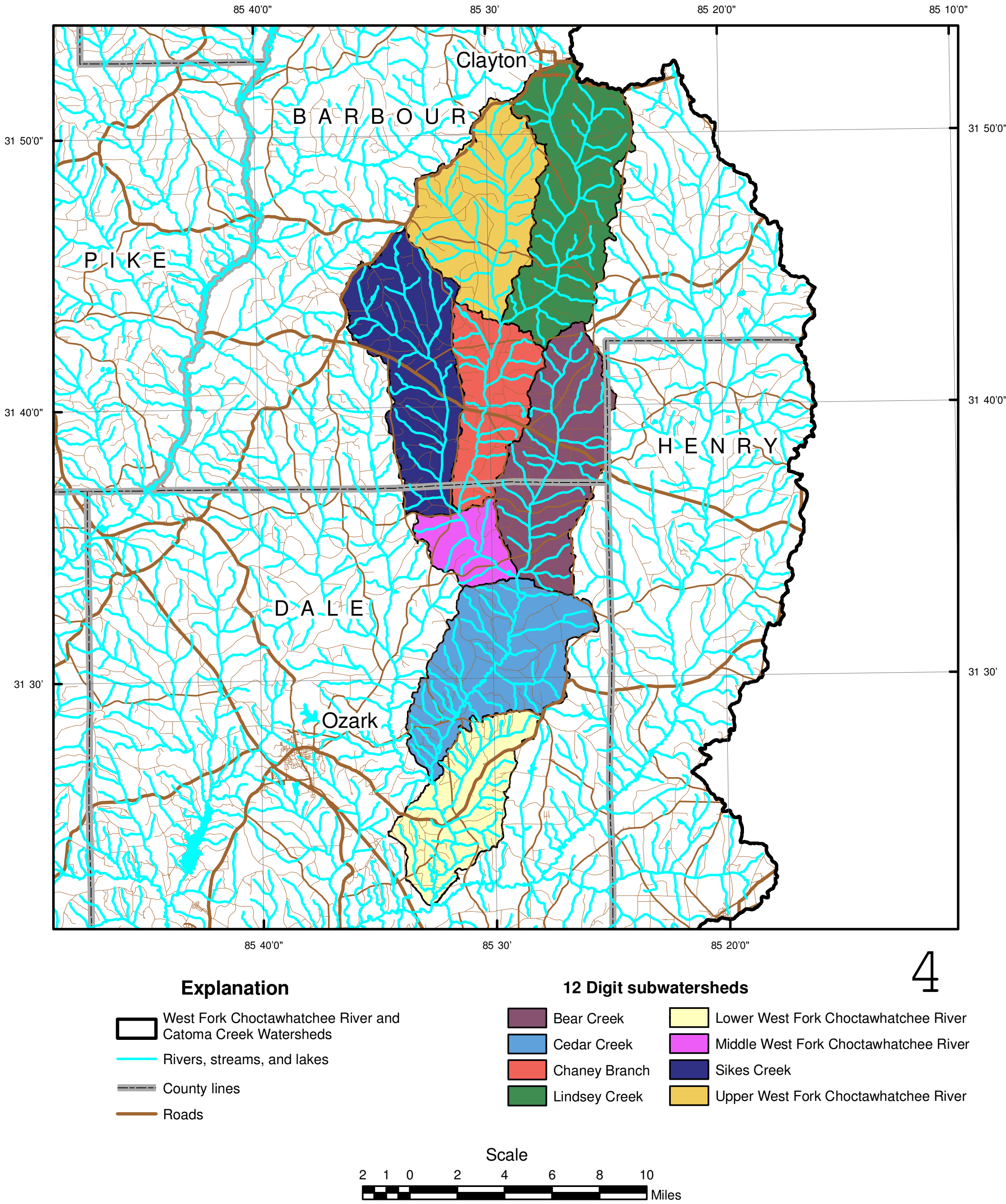


Figure 7.—West Fork Choctawhatchee River (031402103) and Catoma Creek (0314020103) Watershed 10-digit hydrologic unit and each 12-digit subwatersheds.

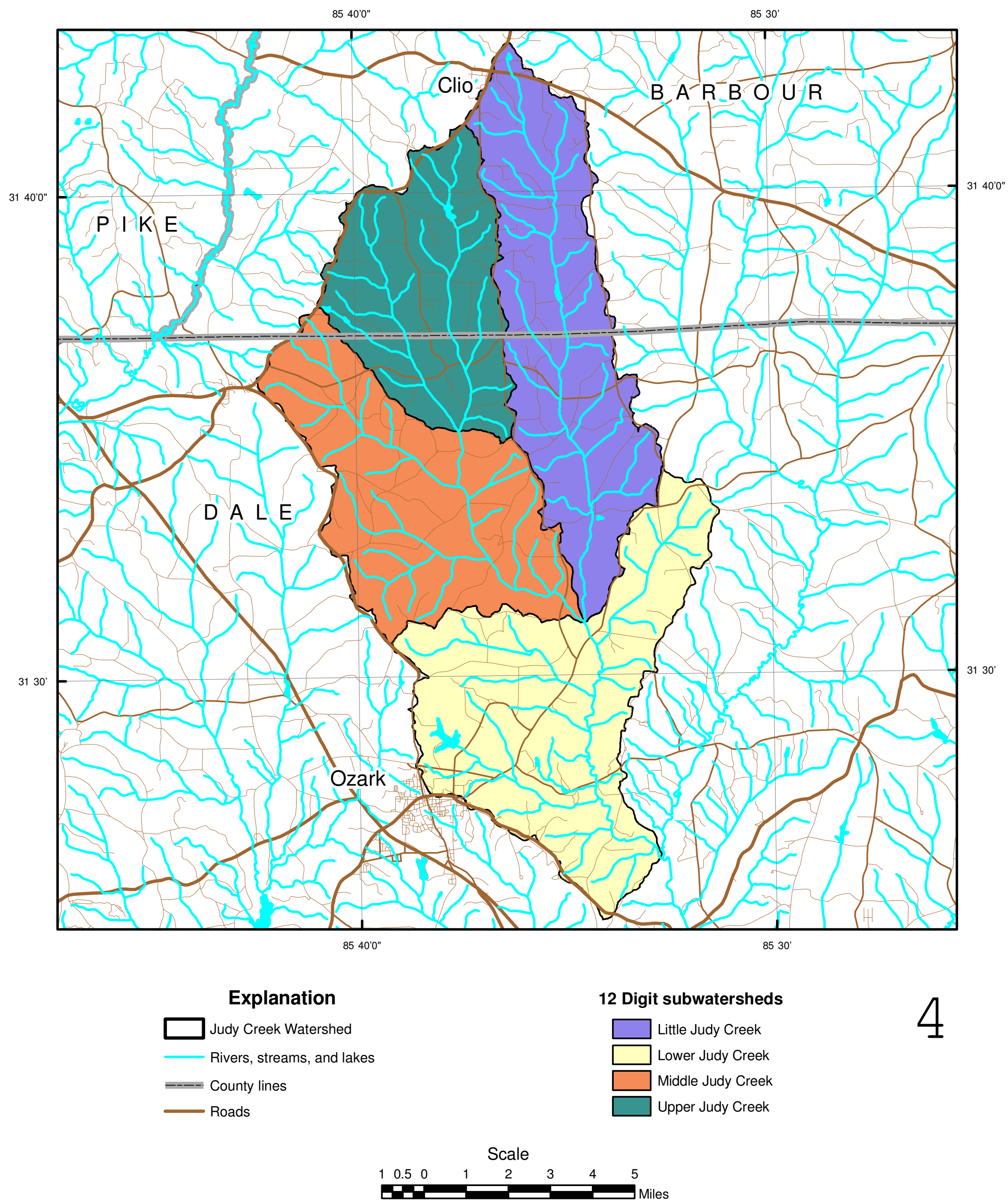


Figure 8.—Judy Creek Watershed (0314020104) 10-digit hydrologic unit and each 12-digit subwatersheds.

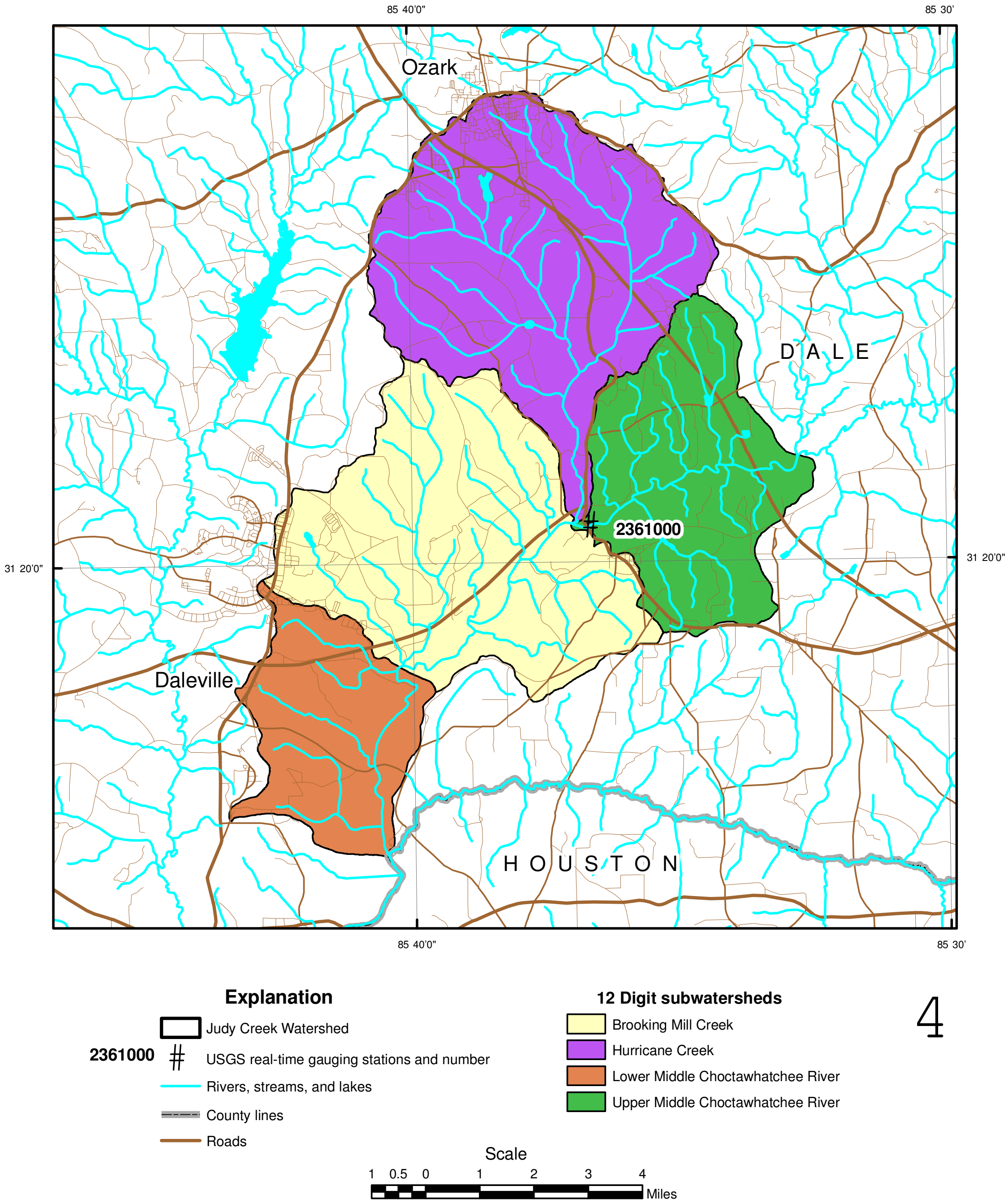


Figure 9.—Little Choctawhatchee River Watershed (0314020105) 10-digit hydrologic unit and each 12-digit subwatersheds.

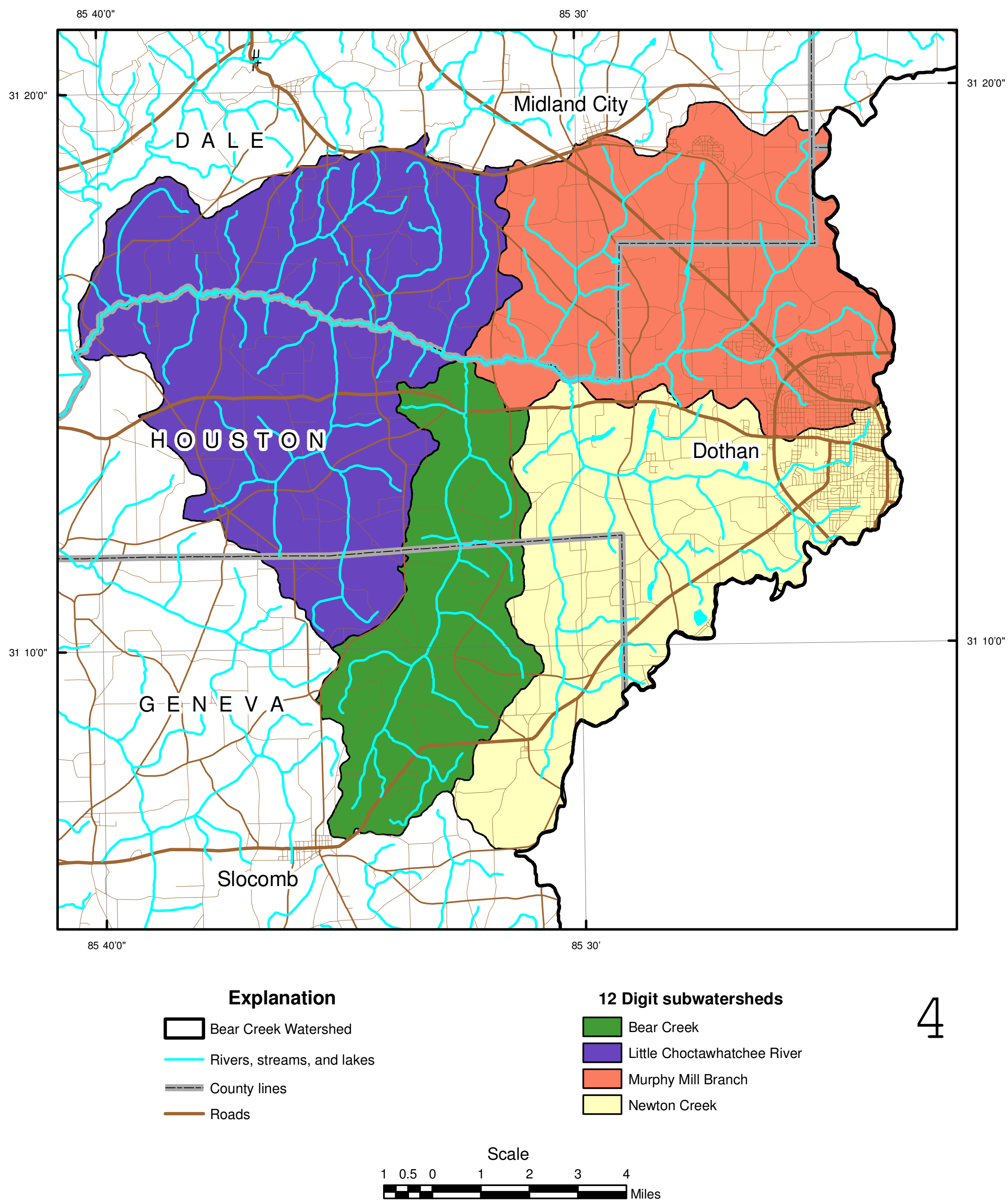


Figure 10.—Bear Creek Watershed (0314020106) 10-digit hydrologic unit and each 12-digit subwatersheds.

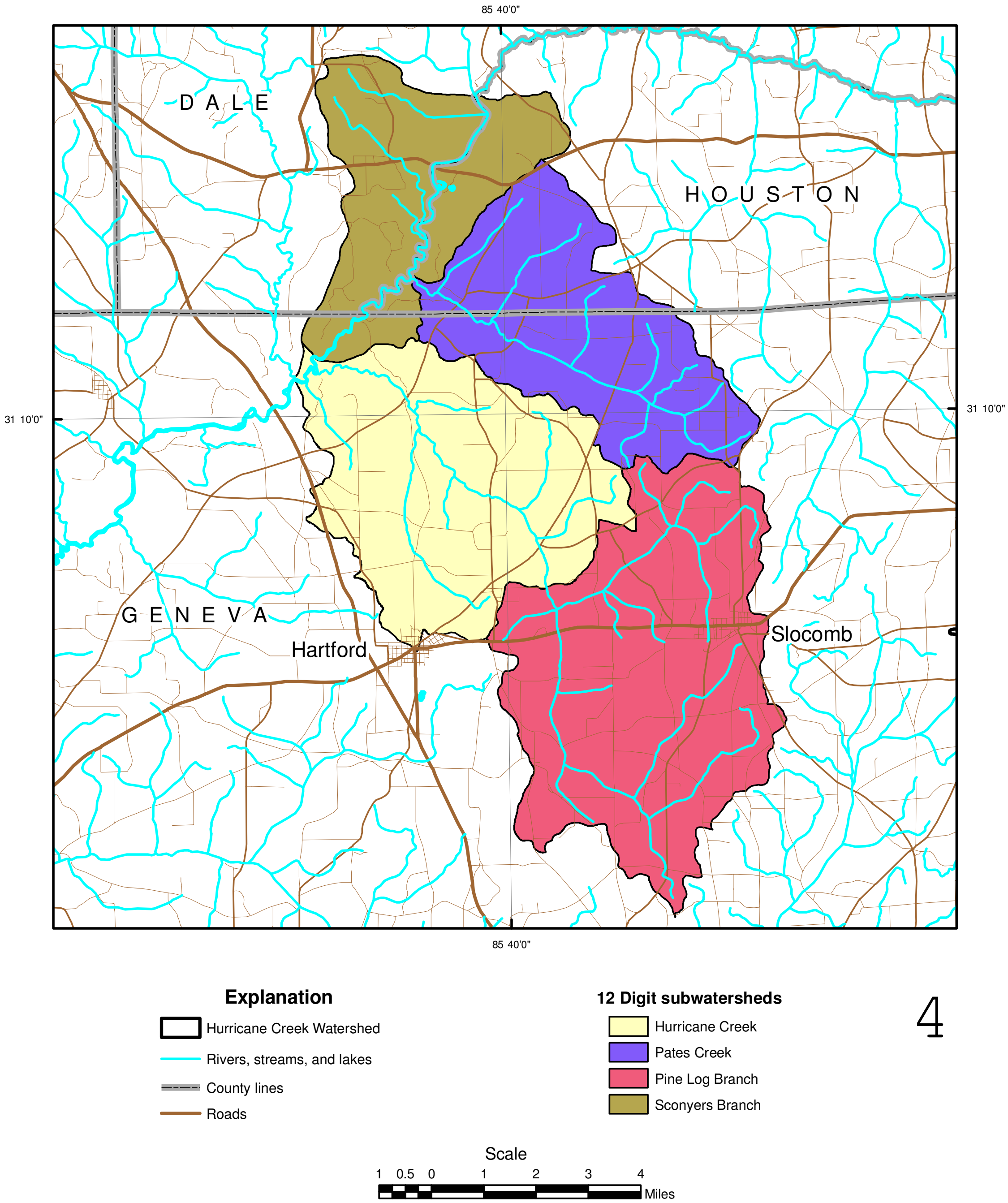


Figure 11.—Hurricane Creek Watershed (0314020107) 10-digit hydrologic unit and each 12-digit subwatersheds

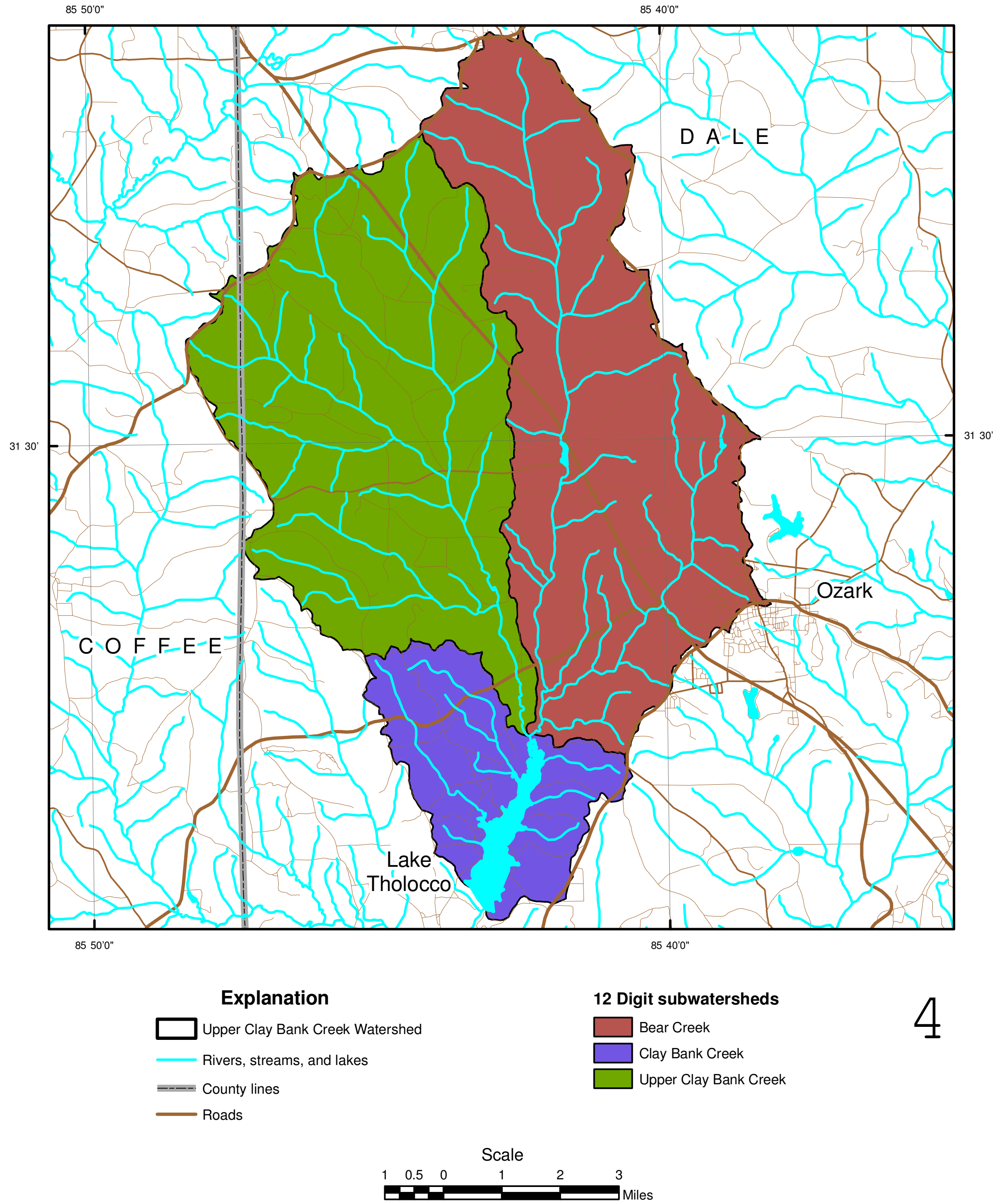


Figure 12.—Upper Clay Bank Creek Watershed (0314020108) 10-digit hydrologic unit and each 12-digit subwatersheds

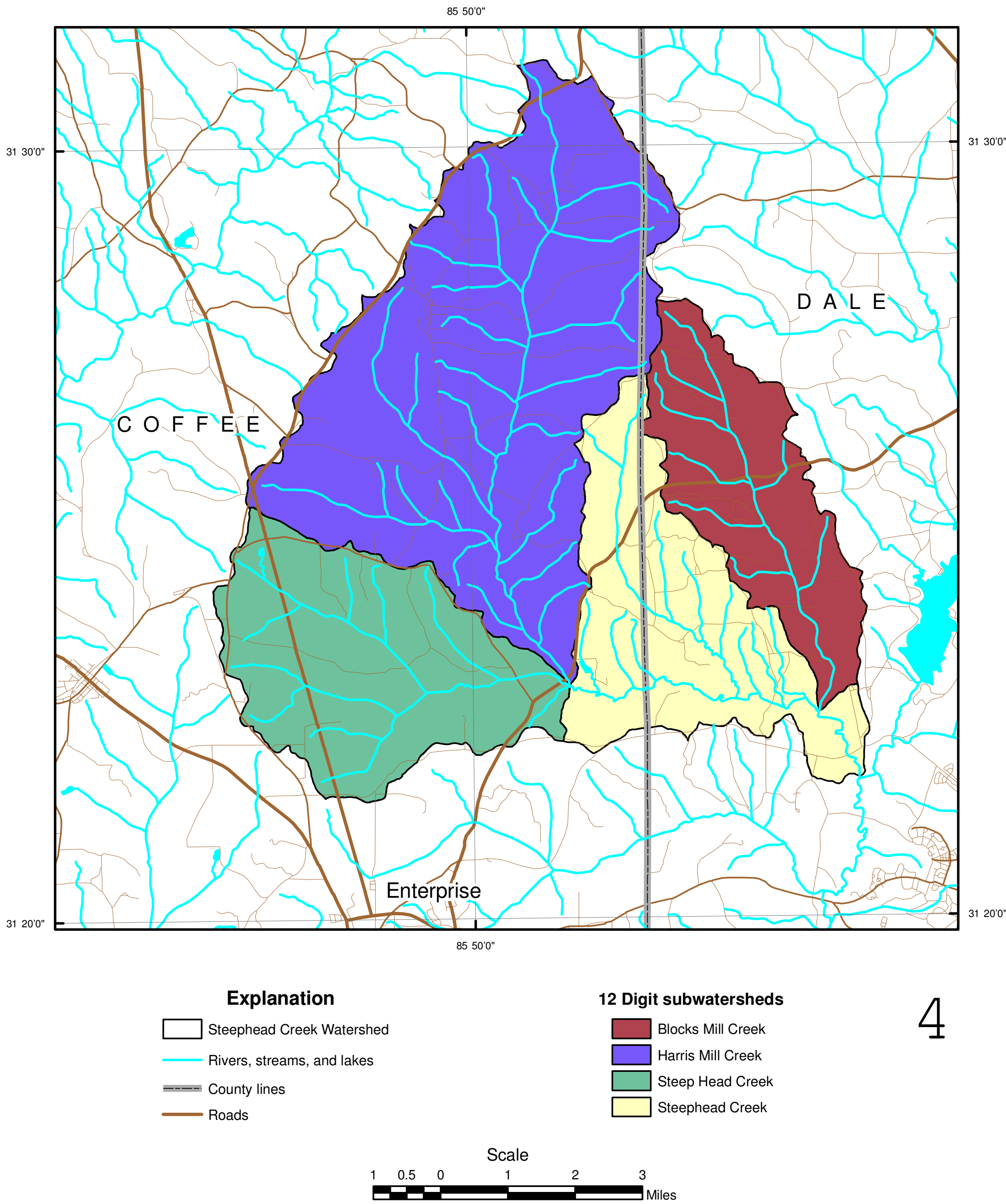


Figure 13.—Steephead Creek Watershed (0314020109) 10-digit hydrologic unit and each 12-digit subwatersheds

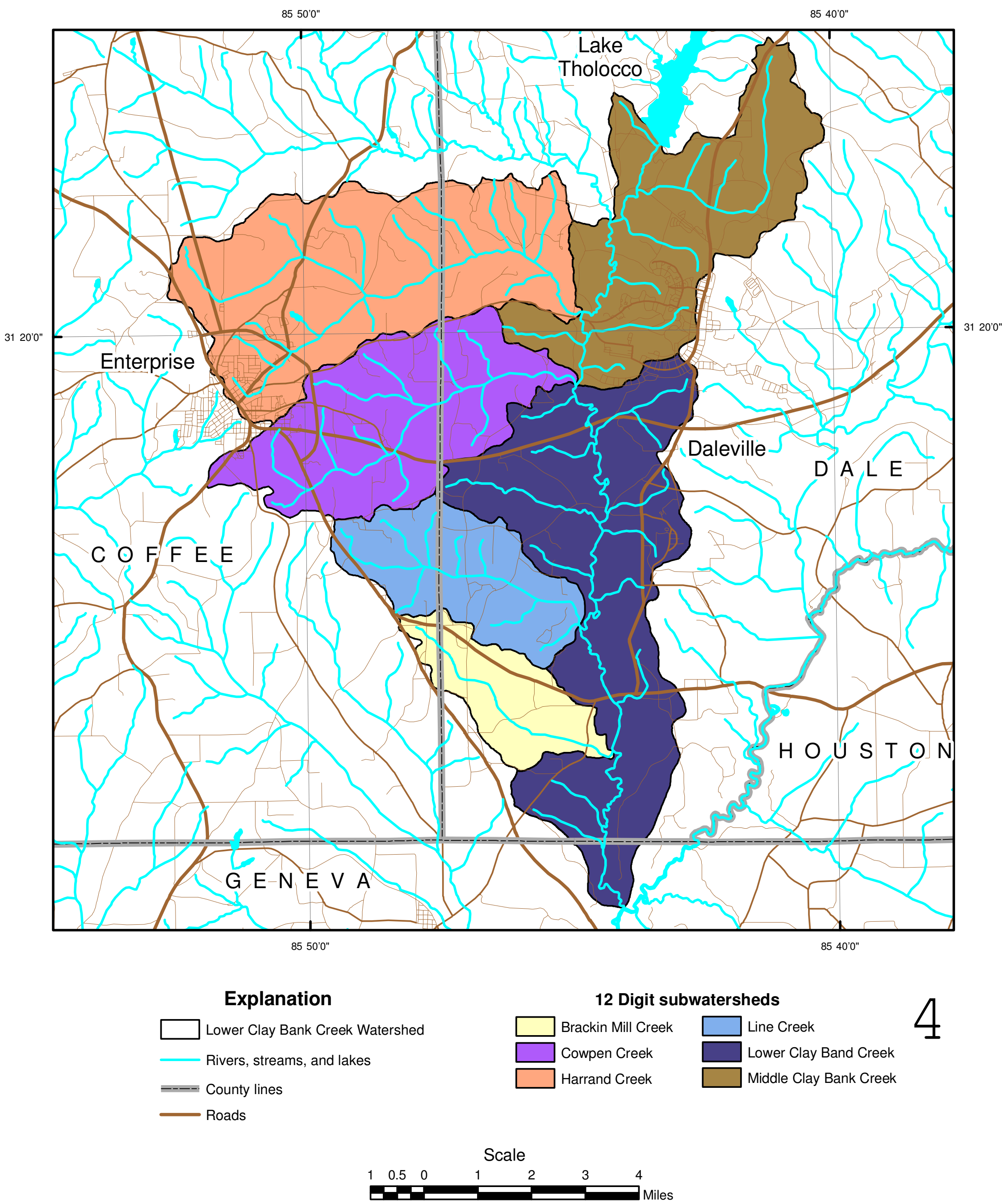


Figure 14.—Lower Clay Bank Creek Watershed (0314020110) 10-digit hydrologic unit and each 12-digit subwatersheds

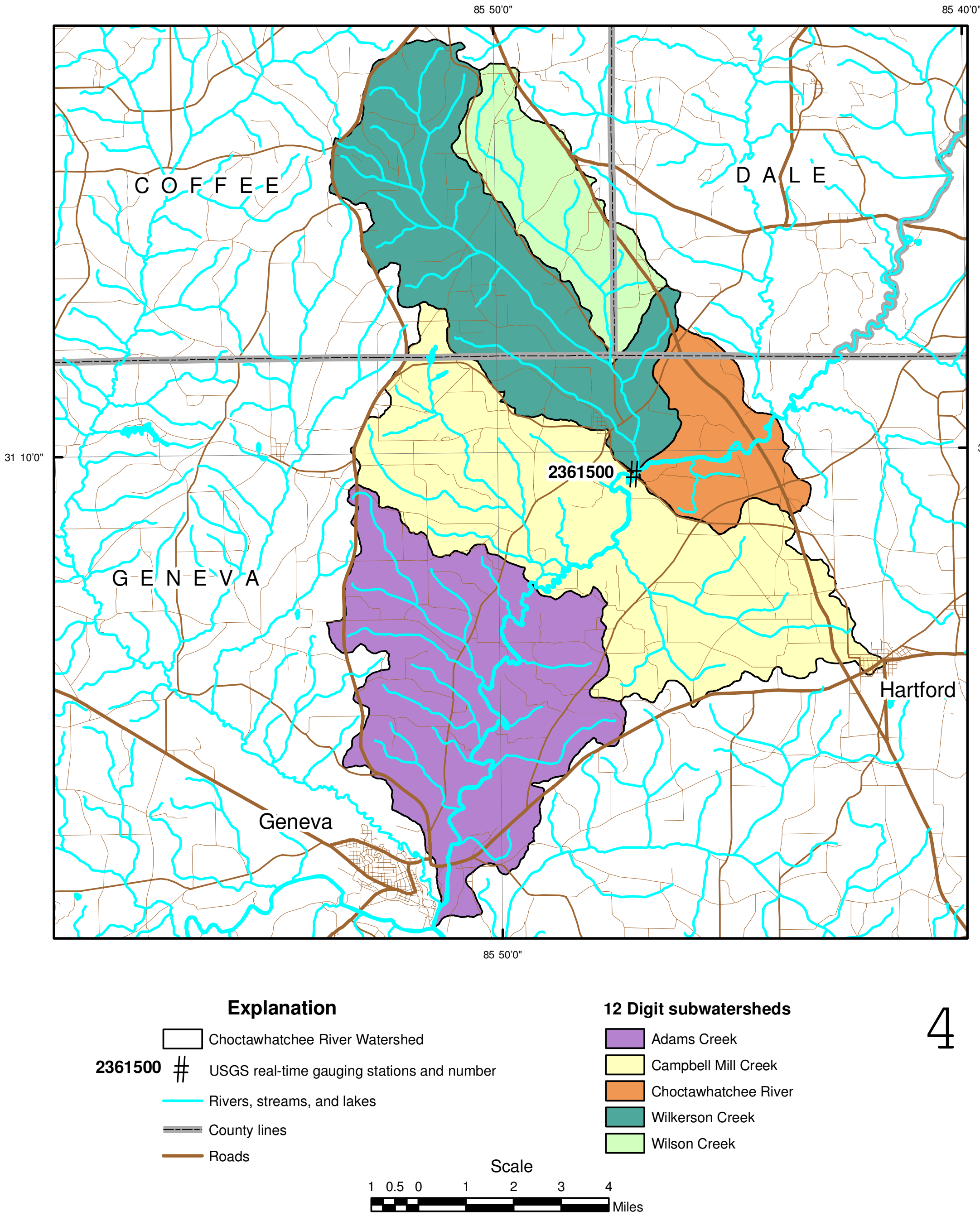


Figure 15.—Choctawhatchee River Watershed (0314020111) 10-digit hydrologic unit and each 12-digit subwatersheds

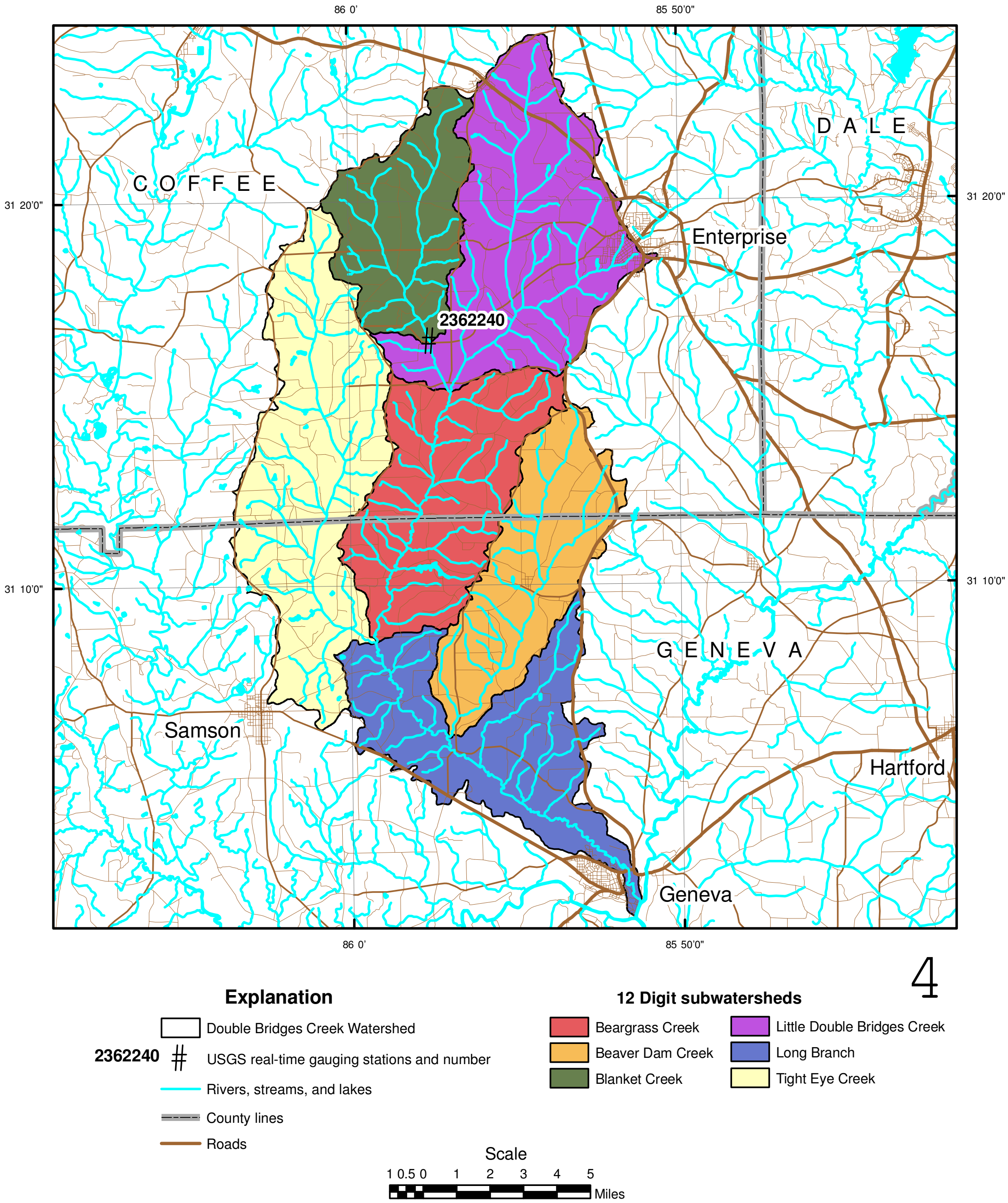


Figure 16.—Double Bridges Creek Watershed (0314020112) 10-digit hydrologic unit and each 12-digit subwatersheds

Table 11. —Upper Choctawhatchee River “Sub-basin” hydrologic unit codes.

Sub-basin (8-digit)	Watershed (10-digit)	Watershed name (10-digit)	Subwatershed (12-digit)	Subwatershed name (12-digit)	Acres	Sq miles
03140201	0314020101	Upper East Choctawhatchee River	031402010101	Upper East Fork Choctawhatchee	19908.87	31.11
03140201	0314020101	Upper East Choctawhatchee River	031402010102	Beaver Creek	20977.29	32.78
03140201	0314020101	Upper East Choctawhatchee River	031402010103	Piney Woods Creek	12566.88	19.64
03140201	0314020101	Upper East Choctawhatchee River	031402010104	Indian Creek	17330.97	27.08
03140201	0314020102	Lower E. Fork Choctawhatchee River	031402010201	Middle East Fork Choctawhatchee	22495.79	35.15
03140201	0314020102	Lower E. Fork Choctawhatchee River	031402010202	Panther Creek	11953.67	18.68
03140201	0314020102	Lower E. Fork Choctawhatchee River	031402010203	Poor Creek	13272.75	20.74
03140201	0314020102	Lower E. Fork Choctawhatchee River	031402010204	Riley Creek	19401.75	30.32
03140201	0314020102	Lower E. Fork Choctawhatchee River	031402010205	Turkey Creek	14248.31	22.26
03140201	0314020102	Lower E. Fork Choctawhatchee River	031402010206	Little Blackwood Creek	17492.09	27.33
03140201	0314020102	Lower E. Fork Choctawhatchee River	031402010207	Dunham Creek	10814.60	16.90
03140201	0314020102	Lower E. Fork Choctawhatchee River	031402010208	Lower E. Fork Choctawhatchee River	21665.58	33.85
03140201	0314020103	West Fork Choctawhatchee River	031402010301	Upper W. Fork Choctawhatchee River	21310.16	33.30
03140201	0314020103	Catoma Creek	031402010302	Lindsey Creek	25807.66	40.32
03140201	0314020103	Catoma Creek	031402010303	Chaney Branch	13985.21	21.85
03140201	0314020103	Catoma Creek	031402010304	Sikes Creek	23164.71	36.19
03140201	0314020103	Catoma Creek	031402010305	Middle W. Fork Choctawhatchee Rive	6483.77	10.13
03140201	0314020103	Catoma Creek	031402010306	Bear Creek	22460.58	35.09
03140201	0314020103	Catoma Creek	031402010307	Cedar Creek	23116.67	36.12
03140201	0314020103	Catoma Creek	031402010308	Lower W. Fork Choctawhatchee River	16023.54	25.04
03140201	0314020104	Judy Creek	031402010401	Upper Judy Creek	14288.31	22.33
03140201	0314020104	Judy Creek	031402010402	Middle Judy Creek	18617.52	29.09
03140201	0314020104	Judy Creek	031402010403	Little Judy Creek	19348.22	30.23
03140201	0314020104	Judy Creek	031402010404	Lower Judy Creek	22559.83	35.25
03140201	0314020105	Little Choctawhatchee River	031402010501	Upper Middle Choctawhatchee River	10387.81	16.23
03140201	0314020105	Little Choctawhatchee River	031402010502	Hurricane Creek	17341.17	27.10
03140201	0314020105	Little Choctawhatchee River	031402010503	Brooking Mill Creek	16693.51	26.08

Table 11. —Upper Choctawhatchee River "Sub-basin" hydrologic unit codes.

Sub-basin (8-digit)	Watershed (10-digit)	Watershed name (10-digit)	Subwatershed (12-digit)	Subwatershed name (12-digit)	Acres	Sq miles
03140201	0314020105	Little Choctawhatchee River	031402010504	Lower Middle Choctawhatchee River	7173.96	11.21
03140201	0314020106	Bear Creek	031402010601	Murphy Mill Branch	26359.86	41.19
03140201	0314020106	Bear Creek	031402010602	Newton Creek	25382.59	39.66
03140201	0314020106	Bear Creek	031402010603	Bear Creek	15970.46	24.95
03140201	0314020106	Bear Creek	031402010604	Little Choctawhatchee River	35069.84	54.80
03140201	0314020107	Hurricane Creek	031402010701	Pates Creek	12132.85	18.96
03140201	0314020107	Hurricane Creek	031402010702	Sconyers Branch	9957.91	15.56
03140201	0314020107	Hurricane Creek	031402010703	Pine Log Branch	19627.94	30.67
03140201	0314020107	Hurricane Creek	031402010704	Hurricane Creek	15652.30	24.46
03140201	0314020108	Upper Clay Bank Creek	031402010801	Upper Clay Bank Creek	23141.82	36.16
03140201	0314020108	Upper Clay Bank Creek	031402010802	Bear Creek	23123.22	36.13
03140201	0314020108	Upper Clay Bank Creek	031402010803	Clay Bank Creek	7215.61	11.27
03140201	0314020109	Steephead Creek	031402010901	Harris Mill Creek	18949.74	29.61
03140201	0314020109	Steephead Creek	031402010902	Steep Head Creek	8552.10	13.36
03140201	0314020109	Steephead Creek	031402010903	Blocks Mill Creek	5854.25	9.15
03140201	0314020109	Steephead Creek	031402010904	Steephead Creek	7824.04	12.23
03140201	0314020110	Lower Clay Bank Creek	031402011001	Harrand Creek	13104.37	20.48
03140201	0314020110	Lower Clay Bank Creek	031402011002	Middle Clay Bank Creek	10302.52	16.10
03140201	0314020110	Lower Clay Bank Creek	031402011003	Cowpen Creek	8974.44	14.02
03140201	0314020110	Lower Clay Bank Creek	031402011004	Line Creek	5242.81	8.19
03140201	0314020110	Lower Clay Bank Creek	031402011005	Brackin Mill Creek	3363.25	5.26
03140201	0314020110	Lower Clay Bank Creek	031402011006	Lower Clay Band Creek	14717.08	23.00
03140201	0314020111	Choctawhatchee River	031402011101	Choctawhatchee River	5429.63	8.48
03140201	0314020111	Choctawhatchee River	031402011102	Wilson Creek	6703.44	10.47
03140201	0314020111	Choctawhatchee River	031402011103	Wilkerson Creek	16511.38	25.80
03140201	0314020111	Choctawhatchee River	031402011104	Campbell Mill Creek	23507.82	36.73
03140201	0314020111	Choctawhatchee River	031402011105	Adams Creek	19417.48	30.34
03140201	0314020112	Double Bridges Creek	031402011201	Little Double Bridges Creek	27034.83	42.24
03140201	0314020112	Double Bridges Creek	031402011202	Blanket Creek	13642.58	21.32
03140201	0314020112	Double Bridges Creek	031402011203	Beargrass Creek	20239.11	31.62
03140201	0314020112	Double Bridges Creek	031402011204	Tight Eye Creek	27640.60	43.19
03140201	0314020112	Double Bridges Creek	031402011205	Beaver Dam Creek	16525.38	25.82
03140201	0314020112	Double Bridges Creek	031402011206	Long Branch	19483.08	30.44
Totals					987545.54	1543.04

LOWER CHOCTAWHATCHEE RIVER (03140203)

The Lower Choctawhatchee River Subbasin comprises approximately 134 mi² of the CPYRW (plate 1). This unit lies in the extreme southeastern portion of the CPYRW study area and is comprised of tributaries to the Choctawhatchee River from the southeast boarder of Geneva County northwestward to Hartford and southwestward to Geneva. This subbasin is almost entirely in Geneva County with the exception of extreme southwest corner of Houston County. The three watersheds (10-digit) and eight sub-watersheds (12-digit) within this subbasin are listed in table 12 along with their names and land area values. Figures 17-19 illustrates the watersheds as well as the subwatersheds and they are described below.

Choctawhatchee River-Spring Creek Watershed (0314020301) covers approximately 50 mi² of the study area. It originates near Hartford in Geneva County and extends southward to the Alabama and Florida state line and continues west to Geneva in Geneva County. Five subwatersheds that compose this watershed are Justice Mill Creek, Lower Spring Creek, Middle Spring Creek, Parrot Creek, and Upper Spring Creek are shown in figure 17 and table 12.

Wrights Creek Watershed (0314020303) covers approximately 68 mi². It is located just east of Slocomb in Geneva County and continues in a south and southwest direction to the Alabama Florida state line. The two subwatersheds within this watershed are Ten Mile Creek and Upper Wrights Creek as shown in figure 18 and table 12.

Holmes Creek Watershed (0314020307) covers approximately 18 mi² of the study area. It is located in extreme southeast Geneva and southwest Houston Counties and terminates at the Alabama Florida state line. It is made up of one subwatershed, Upper Holmes Creek as shown figure 19 and table 12.

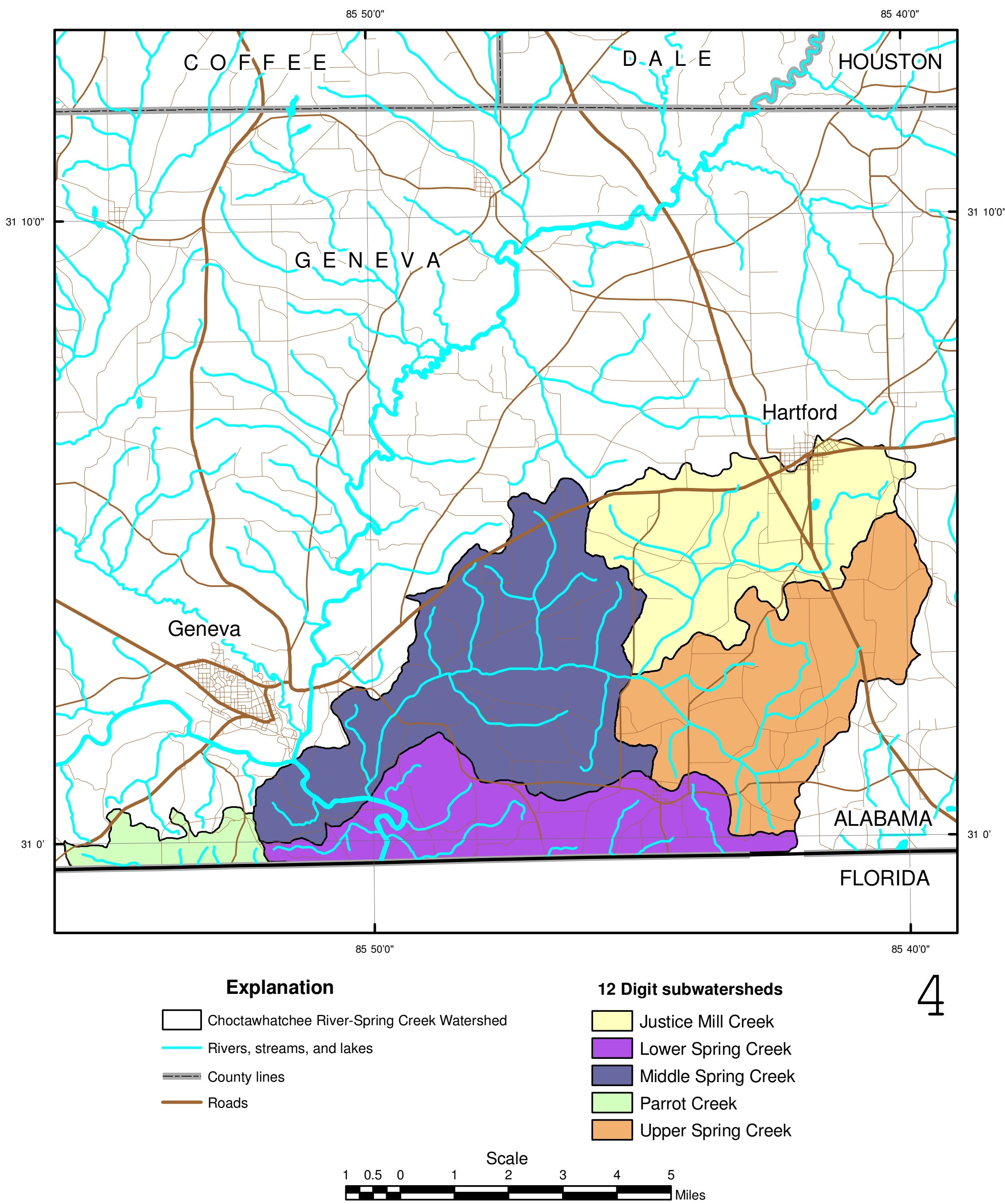


Figure 17.—Choctawhatchee River-Spring Creek Watershed (0314020301) 10-digit hydrologic unit and each 12-digit subwatersheds

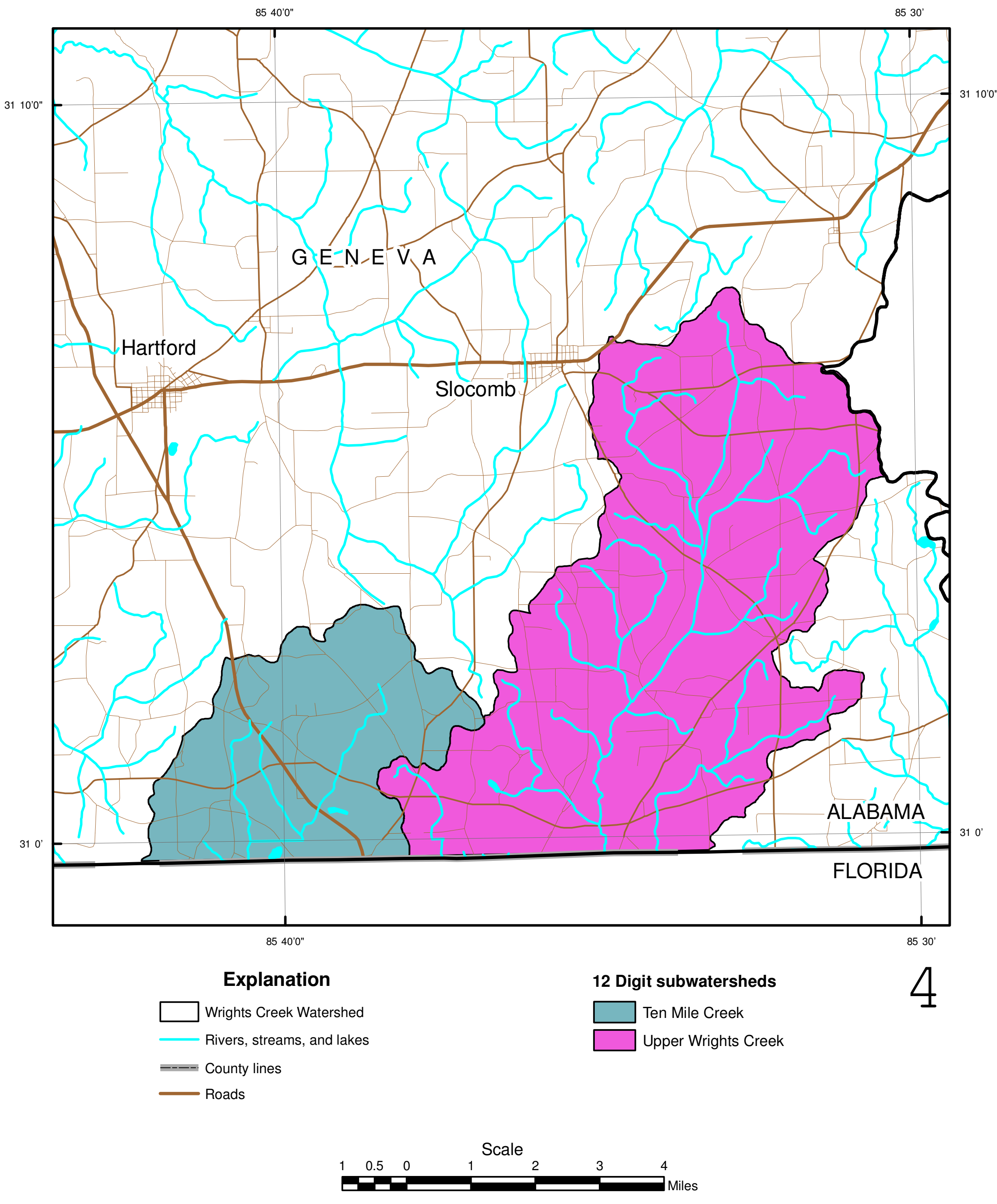


Figure 18.—Wrights Creek Watershed (0314020303) 10-digit hydrologic unit and each 12-digit subwatersheds

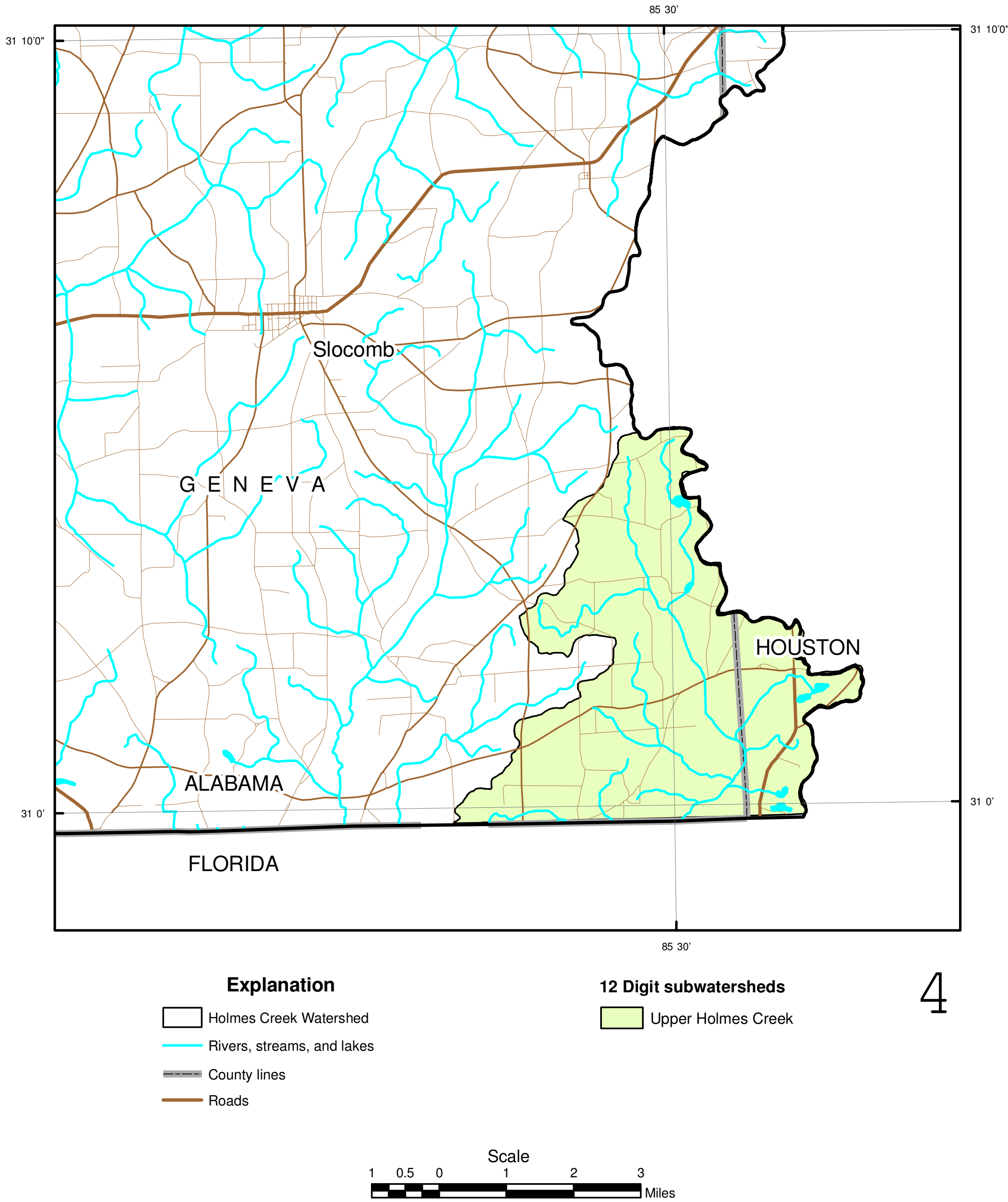


Figure 19.—Holmes Creek Watershed (0314020307) 10-digit hydrologic unit and each 12-digit subwatersheds

Table 12. —Lower Choctawhatchee River "Sub-basin" hydrologic unit codes.

Sub-basin (8-digit)	Watershed (10-digit)	Watershed name (10-digit)	Subwatershed (12-digit)	Subwatershed name (12-digit)	Acres	Sq miles
03140203	0314020301	Choctawhatchee R.-Spring Cr.	031402030101	Upper Spring Creek	10415.13	16.27
03140203	0314020301	Choctawhatchee R.-Spring Cr.	031402030102	Justice Mill Creek	9066.91	14.17
03140203	0314020301	Choctawhatchee R.-Spring Cr.	031402030103	Middle Spring Creek	14237.42	22.25
03140203	0314020301	Choctawhatchee R.-Spring Cr.	031402030104	Lower Spring Creek	7370.51	11.52
03140203	0314020301	Choctawhatchee R.-Spring Cr.	031402030105	Parrot Creek	1643.10	2.57
03140203	0314020303	Wrights Creek	031402030301	Upper Wrights Creek	23447.79	36.64
03140203	0314020303	Wrights Creek	031402030303	Ten Mile Creek	8471.75	13.24
03140203	0314020307	Holmes Creek	031402030701	Upper Holmes Creek	11334.76	17.71
Totals					85987.38	134.36

PEA RIVER (03140202)

The Pea River Subbasin comprises approximately 1,445 mi² of the CPYRW (plate 1). This unit lies in the central portion of the CPYRW study area and is comprised of the Pea River from its headwaters in the area of the city of Midway in Bullock County southwestward to the confluence of the Pea River with the Choctawhatchee at Geneva in southern Geneva County. This subbasin is the longest covering eight counties and it is the second largest of the CPYRW. There are nine watersheds (10-digit) and 52 sub-watersheds (12-digit) within this subbasin. They are listed in table 13 along with their names and land area values. Figures 20-28 illustrates the watersheds as well as the subwatersheds which are described below.

Headwaters Pea River Watershed (0314020201) covers approximately 193 mi². It originates in southern Bullock County and includes the city of Midway and extends southward into the extreme northeastern corner of Pike County and northwest Bullock County along the Pea River. Nine subwatersheds compose this watershed and they are Johnson Creek, Spring Creek, Little Indian Creek, Big Sandy Creek, Bogue Chitta Creek, Dry Creek, Pea River, and Double Creek as shown in figure 20 and table 13.

Pea Creek Watershed (0314020202) covers approximately 105 mi². This watershed is contained within Barbour County. It begins in the central portion of the county near the City of Clayton. It extends to the southwestward to the confluence with the Pea River at the Barbour and Pike County line. There are four subwatersheds that create the watershed and they are Williams Mill Branch, Stinking Creek, Hurricane Creek, and Pea Creek as shown in figure 21 and table 13.

Buckhorn Creek Watershed (0314020203) covers approximately 144 mi^2. The northern portion of this watershed is in the southwest corner of Bullock County and extends southward to the City of Brundidge in Pike County and eastward to the City of Clio in Barbour County. Three subwatersheds create this watershed. They are Buckhorn Creek, Richland Creek, and Sand Creek as shown in figure 22 and table 13.

Upper Pea River Watershed (0314020204) covers approximately 199 mi^2. It originates near the southeast portion of the City of Brundidge in southeast Pike County and in the extreme southwest corner of Barbour County. This watershed extends southwestward through the northwest corner of Dale County to the City of Elba in Coffee County. Discharge for this watershed are available from the USGS for a station near Ariton (no. 02363000). The average daily discharge for the period of record is about 608 cfs. A maximum daily discharge of 38,200 cfs occurred on March 18, 1990 and the minimum daily discharge of 3.3 cfs occurred on July 29, 2000 as shown in table 14. Based on a unit discharge value of 1.22 cfs per mi^2, the average daily discharge from this hydrologic unit is estimated at 1,763 cfs. Forty-eight years of records are available with gaps from September 30, 1970 to October 1, 1987. There are eight subwatersheds within this watershed and they are Danner Creek, Bowden Mill Creek, Huckleberry Creek, Clearwater Creek, Pea River, Halls Creek, Cardwell Creek, and Harpers Mill Creek as shown in figure 23 and table 13.

Whitewater Creek Watershed (0314020205) is approximately 318 mi^2. It extends from the cities of Troy and Brundidge in Pike County southwestward to the city of Elba in Coffee County. Nine subwatersheds create this watershed and they are Beaver Pond Branch, Walnut Creek, Mims Creek, Jump Creek, Big Creek, Silers Mill Creek, Sweetwater Creek, Bluff Creek, and Pea Creek as shown in figure 24 and table 13.

Middle Pea River Watershed (0314020206) covers approximately 236 mi^2. It is located in the west central portions of Coffee County just to the northwest of the city Elba and extends southward to Samson in Geneva County and westward to Opp in Covington County. Discharge values for this watershed are available from the USGS for a station near Samson (no. 02364500). The average daily discharge for the period of record is about 1,718 cfs. A maximum daily discharge of 28,800 cfs occurred on January 19-20, 1925 and the minimum daily discharge of 63 cfs occurred on October 26, 1935 (tbl. 14). Based on a unit discharge value of 1.45 cfs per mi^2, the average daily discharge from this hydrologic unit is estimated at 2,095 cfs. Forty-eight years of records are available with three gaps from August 31, 1913 to October 1, 1922, September 30, 1925 to October 1, 1935, and September 30, 1970 to October 1, 2002. Ten subwatersheds make up this watershed and they are Beaver Dam Creek, Helms Mill Creek, Bucks Mill Creek, Kimmy Creek, Hays Creek, Pages Creek, Cripple Creek, Bear Branch, Holley Mill Creek, and Samson Branch as shown in figure 25 and table 13.

Flat Creek Watershed (0314020207) includes approximately 90 mi^2. The northern portion of this watershed begins in Covington County near the city of Opp and extends southward along US Highway 331 within two miles of the Alabama Florida state line. It also extends southeastward from Opp through the City of Kinston in Coffee County to within one mile of the state line. There are three subwatersheds within this watershed and they are Lower Flat Creek, Panther Creek, and Upper Flat Creek as shown in figure 26 and table 13.

Corner Creek Watershed (0314020208) is approximately 81 mi^2. It is located along the Alabama Florida state line at the City of Florala and extends northeastward into Geneva County. Two subwatersheds are found within this watershed. They are Corner Creek and Eightmile Creek as shown in figure 27 and table 13.

Lower Pea River Watershed (0314020209) covers approximately 80 mi^2. The northern portion of this watershed is located in the City of Samson in Geneva County and extends southward to the Alabama Florida state line. It continues southeastward to the city of Geneva in Geneva County and southward to the state line. There are four subwatersheds that create this watershed and they are Gin Creek, Fish Branch, Sandy Creek and Limestone Branch as shown in figure 28 and table 13.

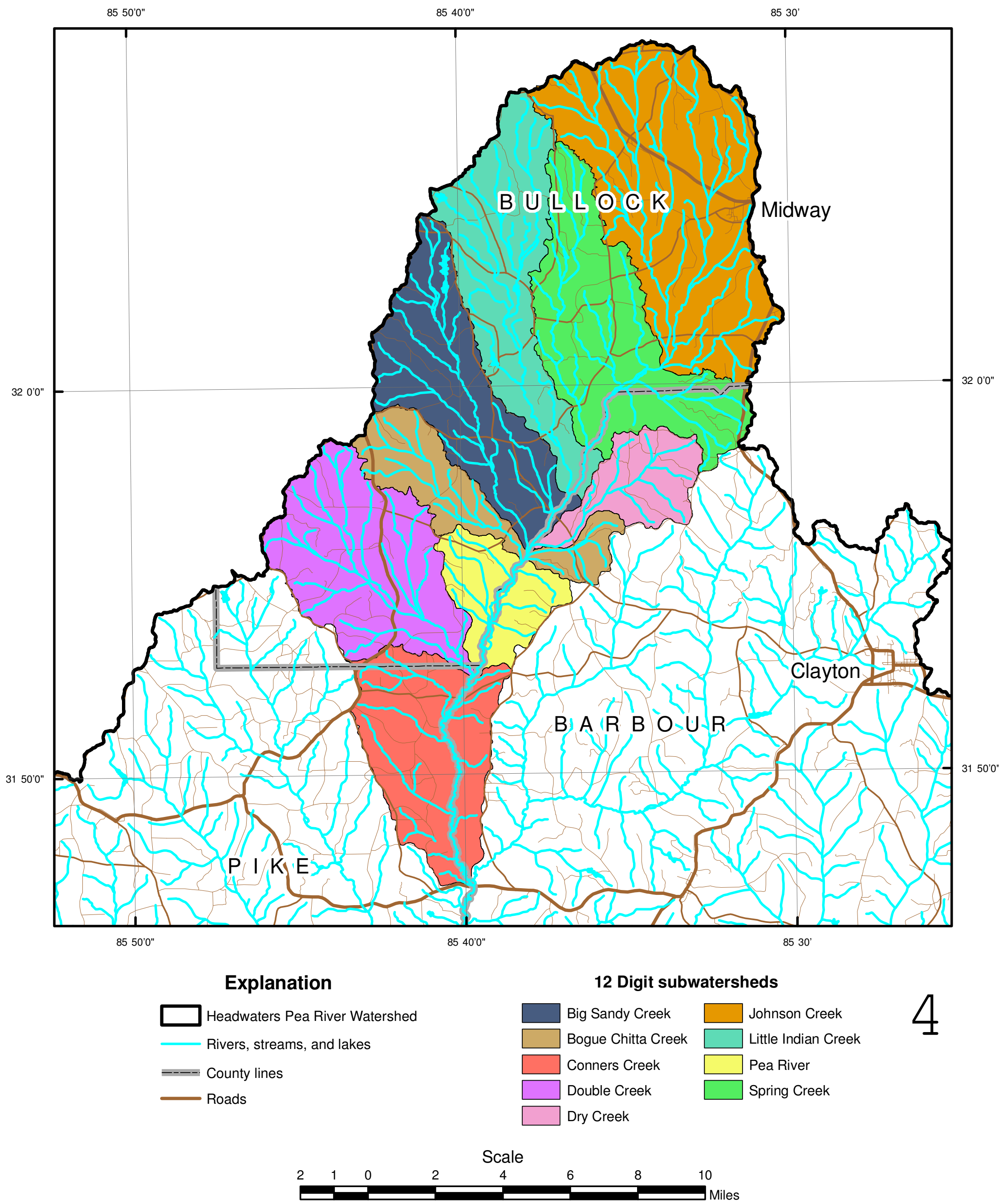


Figure 20.—Headwaters Pea River Watershed (0314020201) 10-digit hydrologic unit and each 12-digit subwatersheds

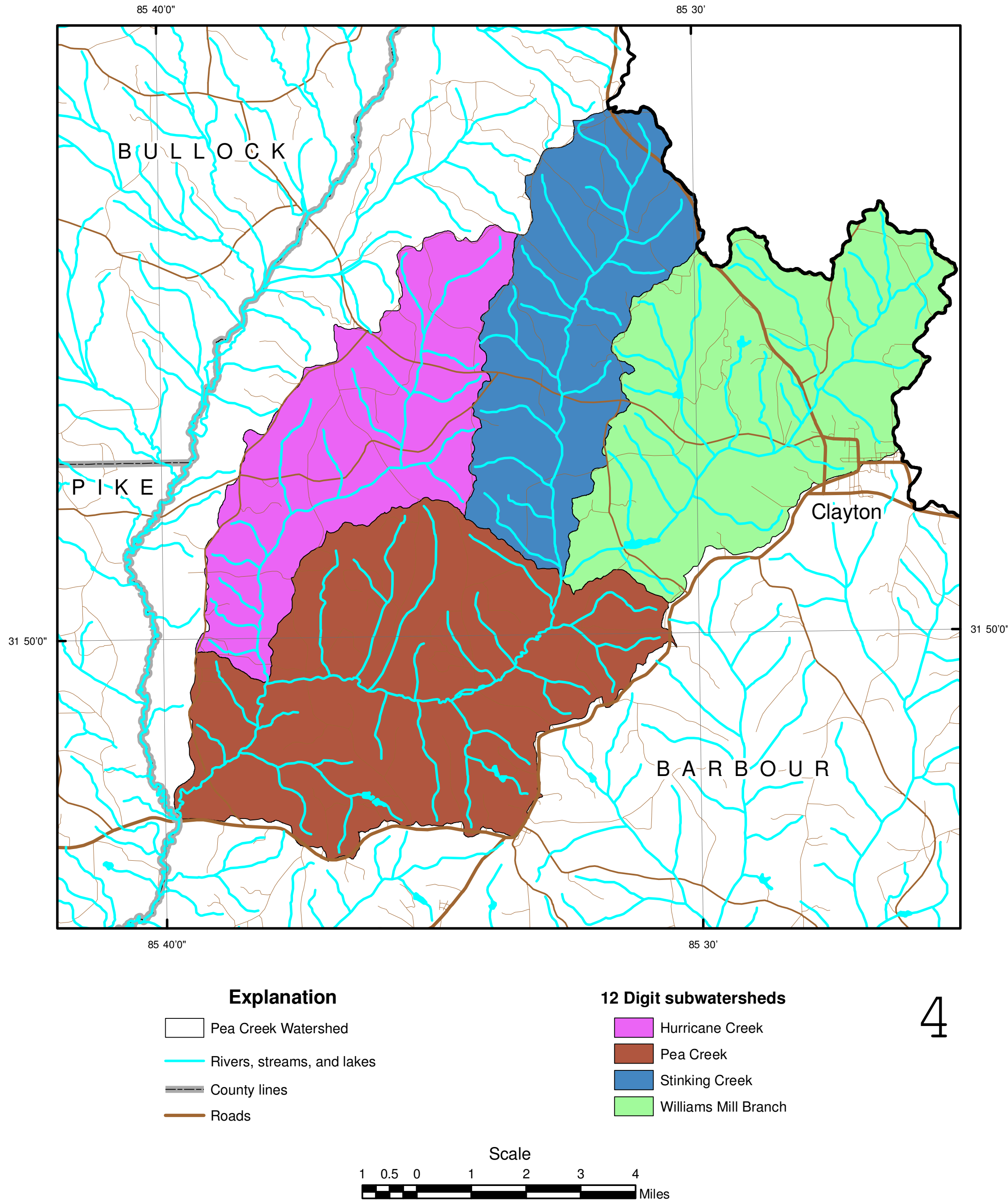


Figure 21.— Pea Creek Watershed (0314020202) 10-digit hydrologic unit and each 12-digit subwatersheds

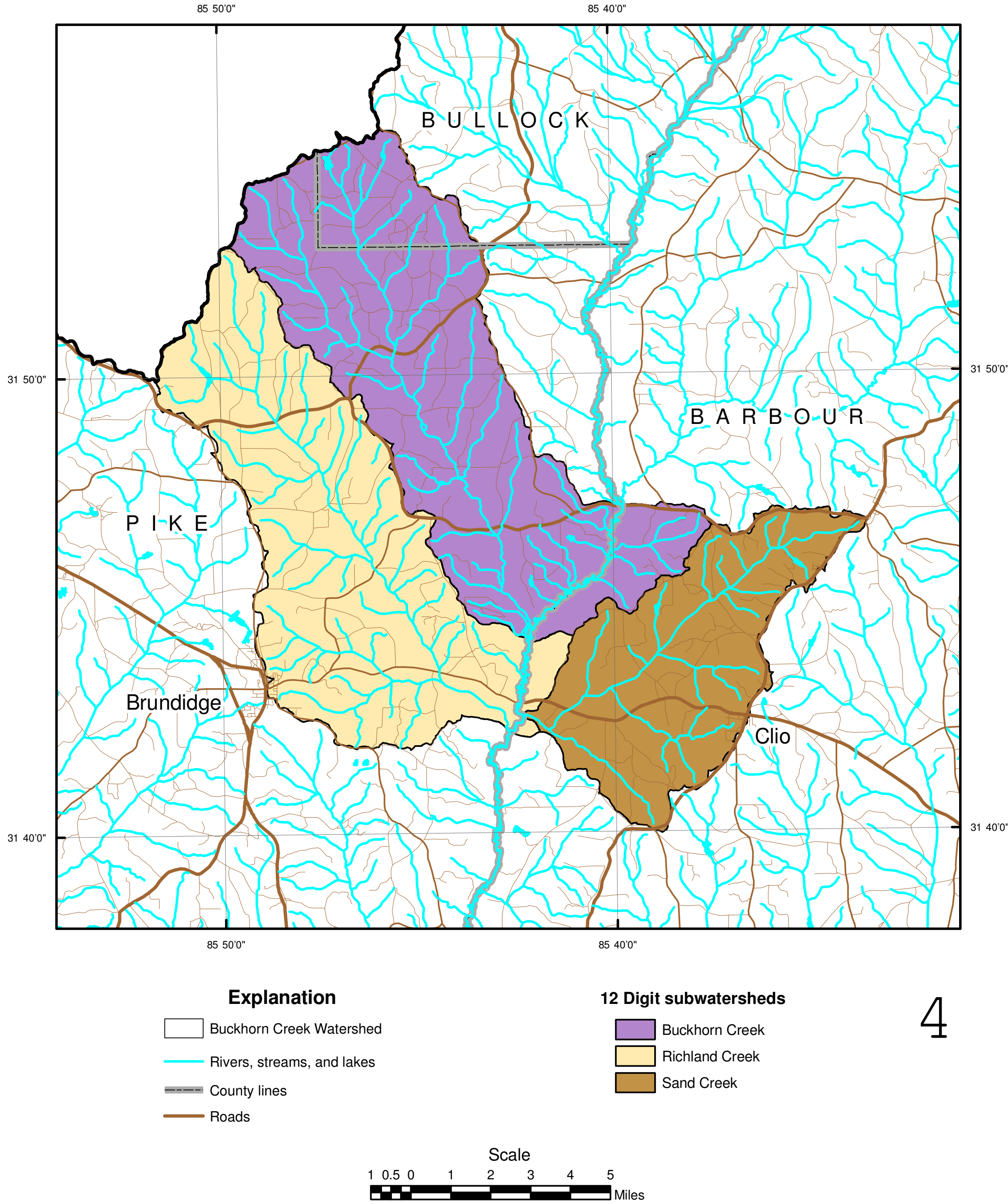


Figure 22.— Buckhorn Creek Watershed (0314020203) 10-digit hydrologic unit and each 12-digit subwatersheds

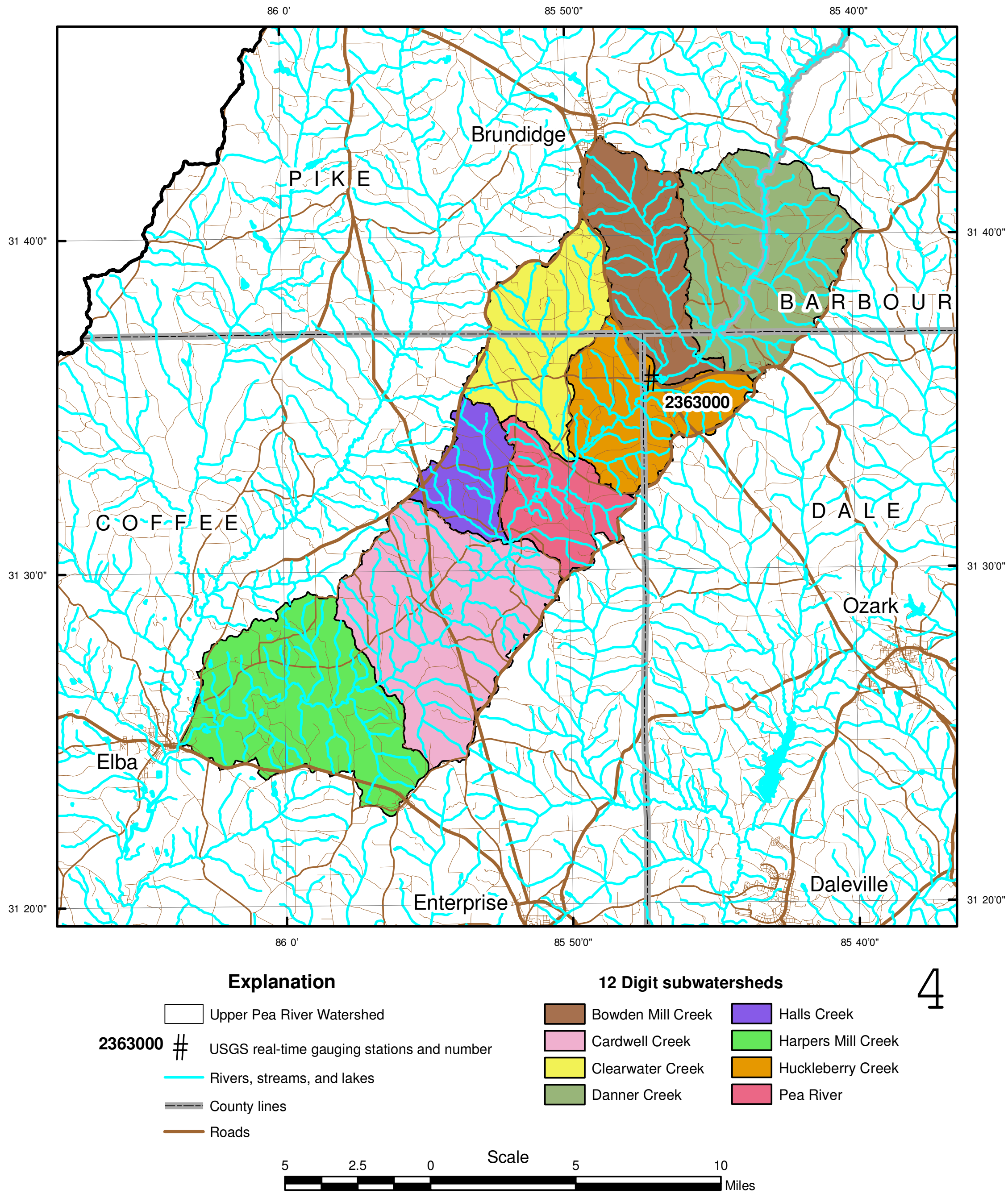


Figure 23.— Upper Pea River Watershed (0314020204) 10-digit hydrologic unit and each 12-digit subwatersheds

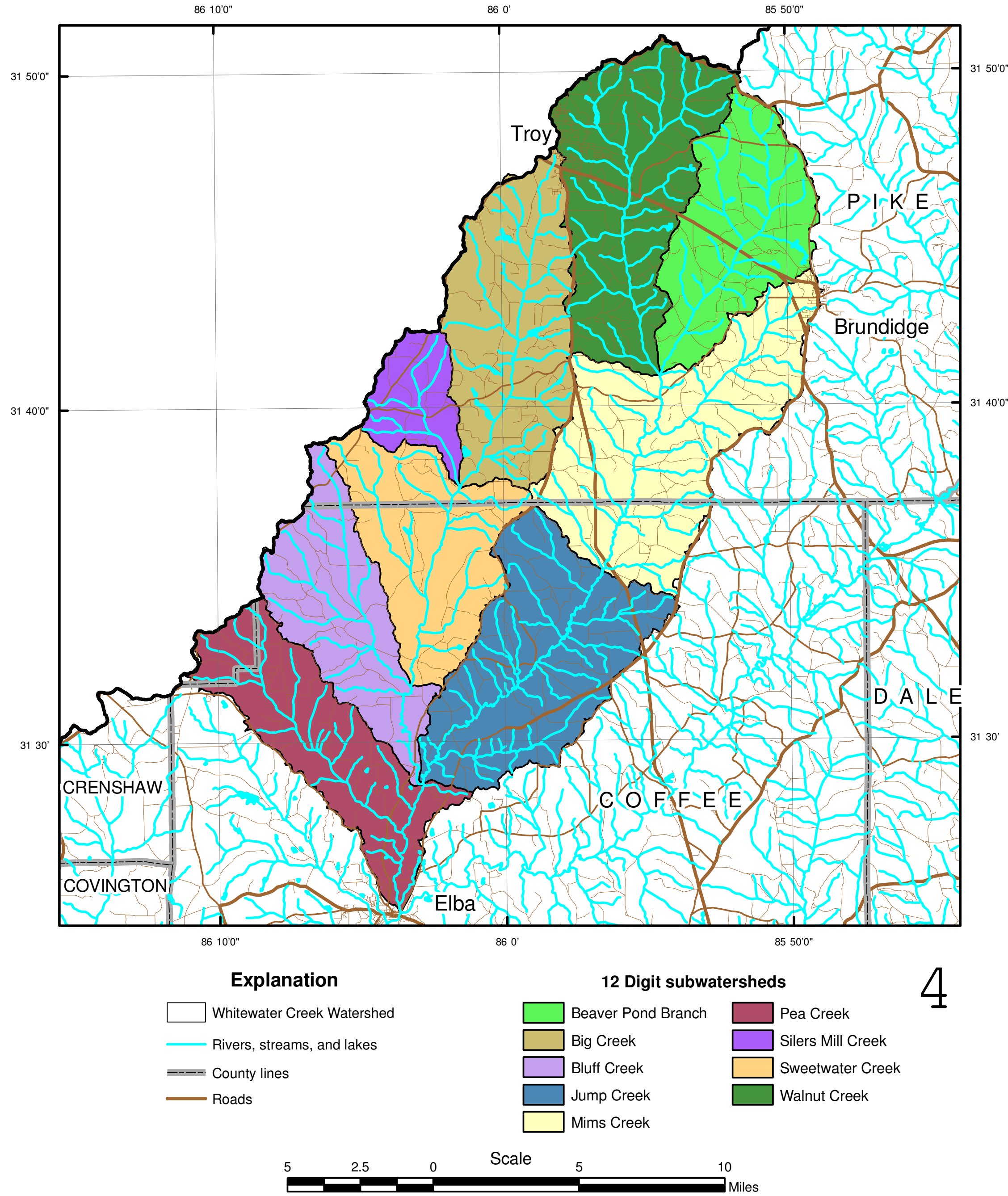


Figure 24.— Whitewater Creek Watershed (0314020205) 10-digit hydrologic unit and each 12-digit subwatersheds

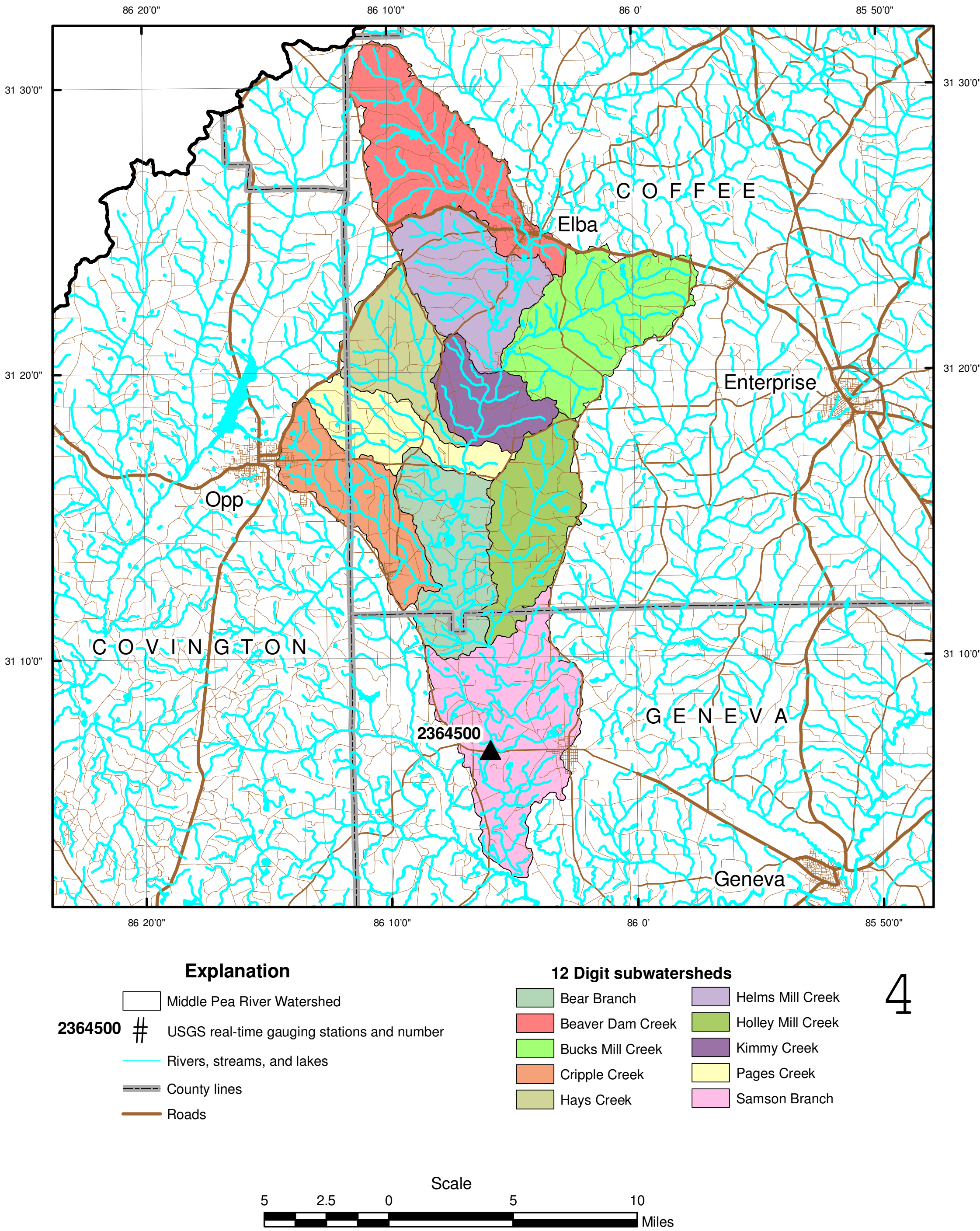


Figure 25.— Middle Pea River Watershed (0314020206) 10-digit hydrologic unit and each 12-digit subwatersheds

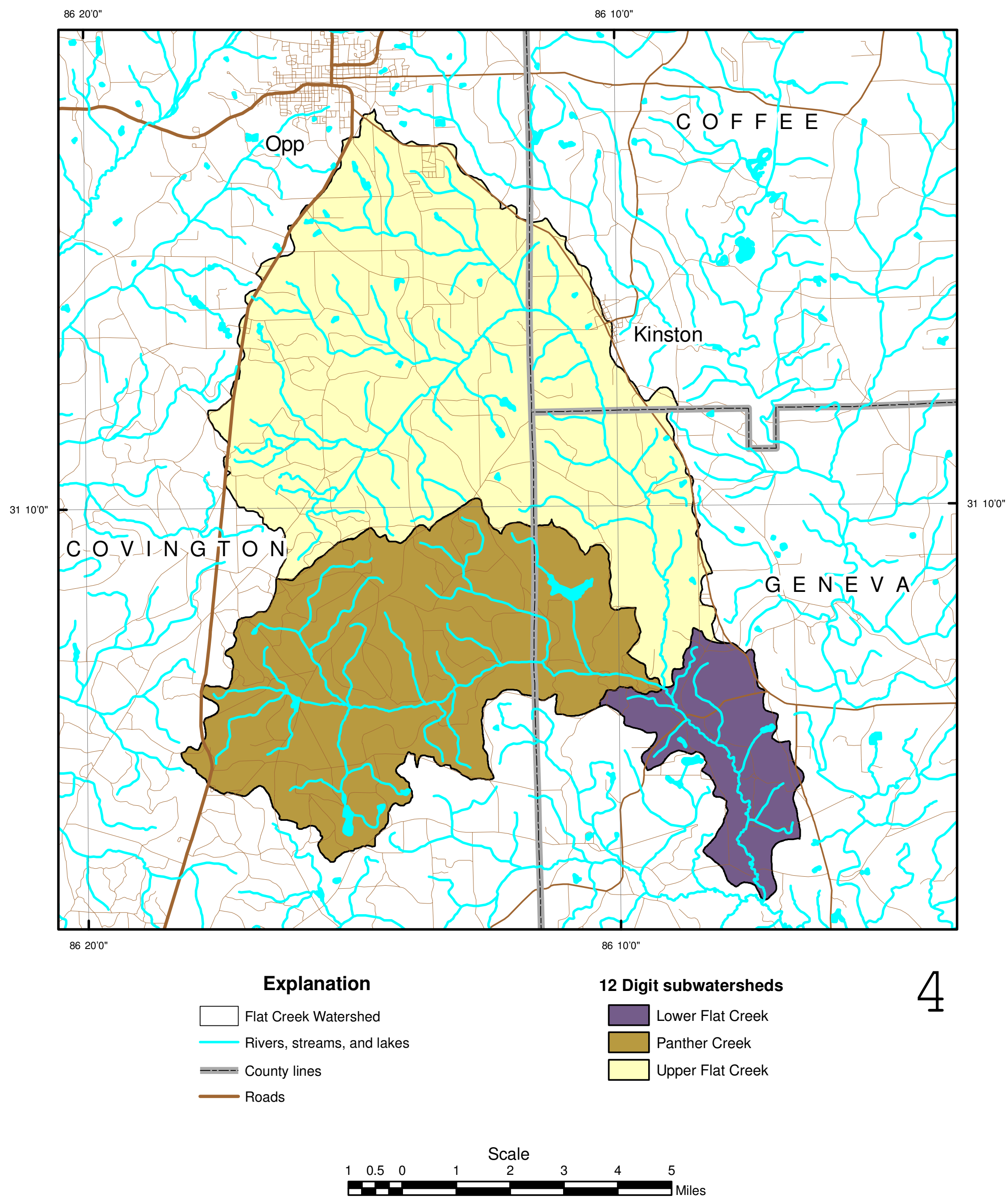


Figure 26.— Flat Creek Watershed (0314020207) 10-digit hydrologic unit and each 12-digit subwatersheds

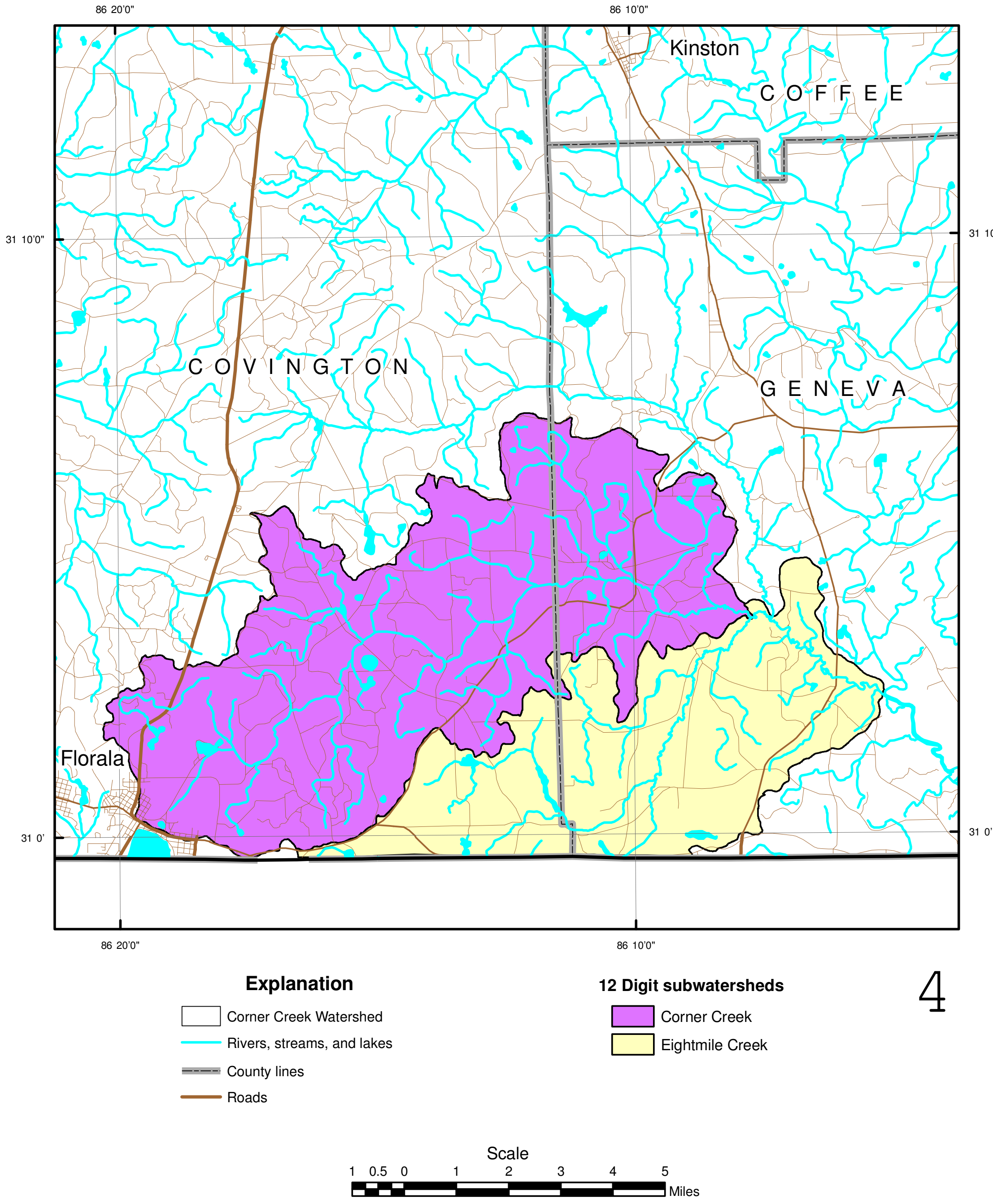


Figure 27.— Corner Creek Watershed (0314020208) 10-digit hydrologic unit and each 12-digit subwatersheds

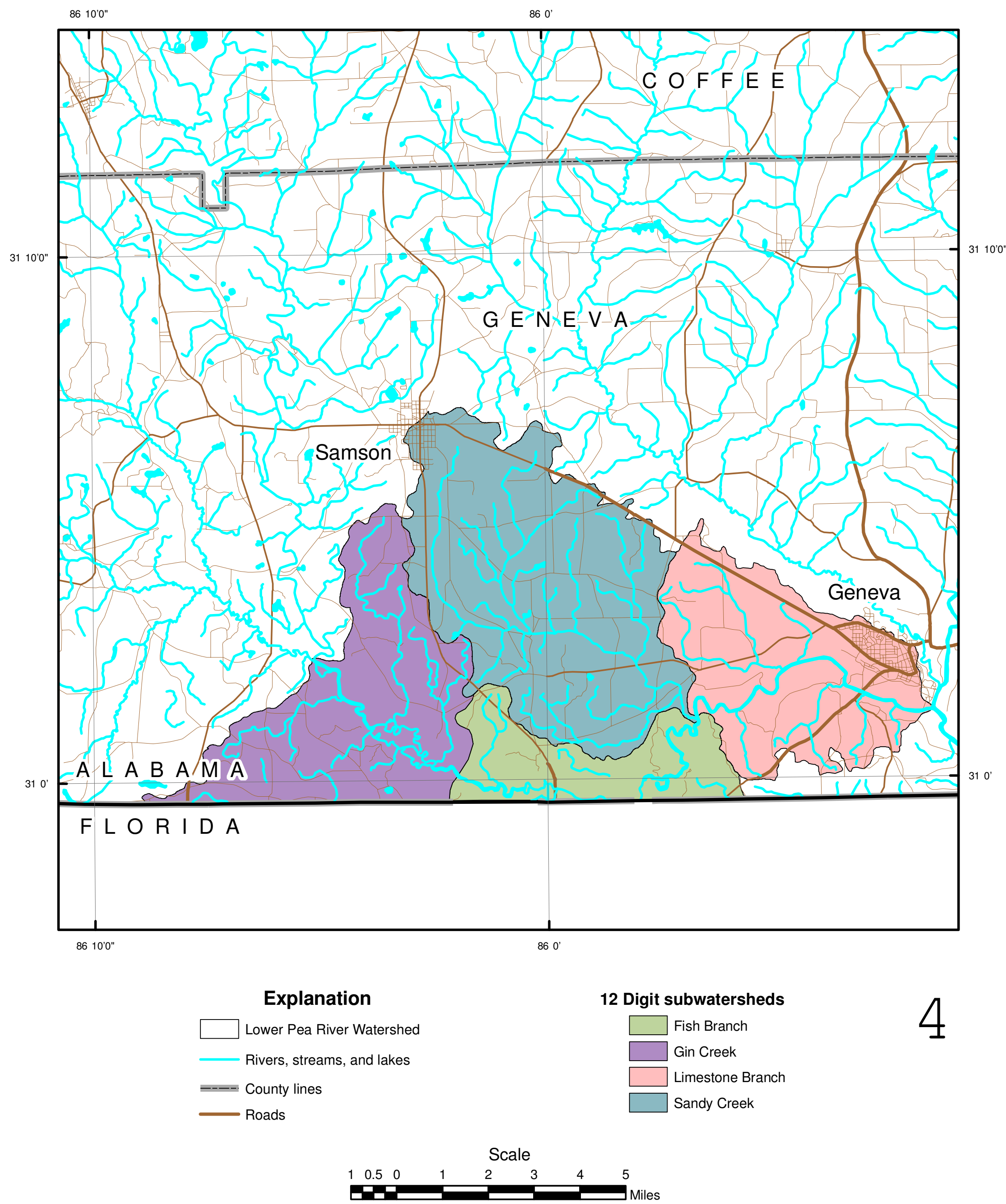


Figure 28.— Lower Pea River Watershed (0314020209) 10-digit hydrologic unit and each 12-digit subwatersheds

Table 13. —Pea River "Sub-basin" hydrologic unit codes.

Sub-basin (8-digit)	Watershed (10-digit)	Watershed name (10-digit)	Subwatershed (12-digit)	Subwatershed name (12-digit)	Acres	Sq miles
03140202	0314020201	Headwaters Pea River	031402020101	Johnson Creek	27317.93	42.68
03140202	0314020201	Headwaters Pea River	031402020102	Spring Creek	17466.66	27.29
03140202	0314020201	Headwaters Pea River	031402020103	Little Indian Creek	15220.28	23.78
03140202	0314020201	Headwaters Pea River	031402020104	Big Sandy Creek	14570.88	22.77
03140202	0314020201	Headwaters Pea River	031402020105	Bogue Chitta Creek	7791.74	12.17
03140202	0314020201	Headwaters Pea River	031402020106	Dry Creek	5590.41	8.74
03140202	0314020201	Headwaters Pea River	031402020107	Pea River	6189.52	9.67
03140202	0314020201	Headwaters Pea River	031402020108	Double Creek	16023.43	25.04
03140202	0314020201	Headwaters Pea River	031402020109	Conners Creek	13611.51	21.27
03140202	0314020202	Pea Creek	031402020201	Williams Mill Branch	18616.15	29.09
03140202	0314020202	Pea Creek	031402020202	Stinking Creek	12781.87	19.97
03140202	0314020202	Pea Creek	031402020203	Hurricane Creek	13016.70	20.34
03140202	0314020202	Pea Creek	031402020204	Pea Creek	22947.93	35.86
03140202	0314020203	Buckhorn Creek	031402020301	Buckhorn Creek	37934.50	59.27
03140202	0314020203	Buckhorn Creek	031402020302	Richland Creek	34622.09	54.10
03140202	0314020203	Buckhorn Creek	031402020303	Sand Creek	19675.12	30.74
03140202	0314020204	Upper Pea River	031402020401	Danner Creek	21718.65	33.94
03140202	0314020204	Upper Pea River	031402020402	Bowden Mill Creek	13871.63	21.67
03140202	0314020204	Upper Pea River	031402020403	Huckleberry Creek	13003.52	20.32
03140202	0314020204	Upper Pea River	031402020404	Clearwater Creek	14229.67	22.23
03140202	0314020204	Upper Pea River	031402020405	Pea River	8841.87	13.82
03140202	0314020204	Upper Pea River	031402020406	Halls Creek	6598.02	10.31
03140202	0314020204	Upper Pea River	031402020407	Cardwell Creek	25953.24	40.55
03140202	0314020204	Upper Pea River	031402020408	Harpers Mill Creek	23256.38	36.34
03140202	0314020205	Whitewater Creek	031402020501	Beaver Pond Branch	20395.42	31.87
03140202	0314020205	Whitewater Creek	031402020502	Walnut Creek	28136.87	43.96
03140202	0314020205	Whitewater Creek	031402020503	Mims Creek	32709.21	51.11
03140202	0314020205	Whitewater Creek	031402020504	Jump Creek	28277.88	44.18
03140202	0314020205	Whitewater Creek	031402020505	Big Creek	25675.81	40.12
03140202	0314020205	Whitewater Creek	031402020506	Silers Mill Creek	7025.91	10.98
03140202	0314020205	Whitewater Creek	031402020507	Sweetwater Creek	20971.40	32.77
03140202	0314020205	Whitewater Creek	031402020508	Bluff Creek	18642.44	29.13
03140202	0314020205	Whitewater Creek	031402020509	Pea Creek	20762.43	32.44
03140202	0314020206	Middle Pea River	031402020601	Beaver Dam Creek	21298.04	33.28
03140202	0314020206	Middle Pea River	031402020602	Helms Mill Creek	15303.19	23.91
03140202	0314020206	Middle Pea River	031402020603	Bucks Mill Creek	19902.67	31.10
03140202	0314020206	Middle Pea River	031402020604	Kimmy Creek	8238.62	12.87
03140202	0314020206	Middle Pea River	031402020605	Hays Creek	10855.30	16.96
03140202	0314020206	Middle Pea River	031402020606	Pages Creek	9595.14	14.99
03140202	0314020206	Middle Pea River	031402020607	Cripple Creek	12576.17	19.65
03140202	0314020206	Middle Pea River	031402020608	Bear Branch	14442.11	22.57
03140202	0314020206	Middle Pea River	031402020609	Holley Mill Creek	14361.52	22.44

Table 13. —Pea River "Sub-basin" hydrologic unit codes.

Sub-basin (8-digit)	Watershed (10-digit)	Watershed name (10-digit)	Subwatershed (12-digit)	Subwatershed name (12-digit)	Acres	Sq miles
03140202	0314020206	Middle Pea River	031402020610	Samson Branch	24638.89	38.50
03140202	0314020207	Flat Creek	031402020701	Upper Flat Creek	32367.78	50.57
03140202	0314020207	Flat Creek	031402020702	Panther Creek	20127.96	31.45
03140202	0314020207	Flat Creek	031402020703	Lower Flat Creek	5067.35	7.92
03140202	0314020208	Corner Creek	031402020801	Corner Creek	33298.04	52.03
03140202	0314020208	Corner Creek	031402020802	Eightmile Creek	18531.31	28.96
03140202	0314020209	Lower Pea River	031402020901	Gin Creek	13218.21	20.65
03140202	0314020209	Lower Pea River	031402020903	Fish Branch	5977.29	9.34
03140202	0314020209	Lower Pea River	031402020904	Sandy Creek	19635.05	30.68
03140202	0314020209	Lower Pea River	031402020905	Limestone Branch	12143.69	18.97
Totals					925025.39	1445.35

YELLOW RIVER (03140103)

The Yellow River Subbasin comprises approximately 515 mi² of the CPYRW (plate 1). This subbasin lies in the southwest portion of the CPYRW study area and is comprised of the Yellow River from its headwaters in the southeast corner of Crenshaw County through most of Covington County to the Alabama Florida state line. This is the only subbasin in the Florida Panhandle Coastal Basin (031401) of the CPYRW. There are five watersheds (10-digit) and 17 sub-watersheds (12-digit) within this subbasin and they are listed in table 14 along with their names and land area values. Figures 29-33 illustrates the watersheds as well as the subwatersheds which are described below.

Upper Yellow River Watershed (0314010301) covers approximately 159 mi². The northern portion of this watershed is in the southeast corner of Crenshaw County just south of the town of Brantley. It continues in a southward direction and includes a small portion of extreme northwest Coffee County and extends southward to the city of Opp in Covington County. This watershed extends to approximately seven miles west of Opp and includes Lake Frank Jackson. Four subwatersheds are found within this watershed. They are Pond Creek, Lightwood Know Creek, Poley Creek, and Yellow River and are shown in figure 29 and table 14.

Middle Yellow River Watershed (0314010302) covers approximately 162 mi². It is located just south of the Upper Yellow River Watershed. This watershed extends in a southwestward direction to within two or three miles of the city of Florala. The watershed contains five subwatersheds which are Yellow above Indian Creek, Indian Creek, Yellow Below Indian Creek, Clear Creek, and North Creek as shown in figure 30 and table 14.

Five Runs Creek Watershed (0314010303) is approximately 123 mi^2. This watershed is contained within Covington County from approximately seven miles to the northwest of Andalusia, through west central Covington County to the city of Pleasant Home. There are three subwatersheds found within the watershed and they are Bay Branch Creek, Hog Foot Creek, and Five Runs Creek as shown in figure 31 and table 14.

Lower Yellow River (0314010304) covers approximately 53 mi^2. This watershed is located completely within Covington on the Alabama Florida state line. It is approximately six miles west of the city of Florala in south central portion of the county. Three subwatersheds are within this watershed and they are Yellow River with Larkin Creek, Big Creek, and Big Horse Creek as shown in figure 32 and table 14.

Pond Creek Watershed (0314010306) contains approximately 18 mi^2. It is located on the Alabama Florida state line from approximately six miles west of the city Florala to the south central portion of Covington County. Two subwatersheds are within this watershed and they are Pond Creek and Horsehead Creek as shown in figure 33 and table 14.

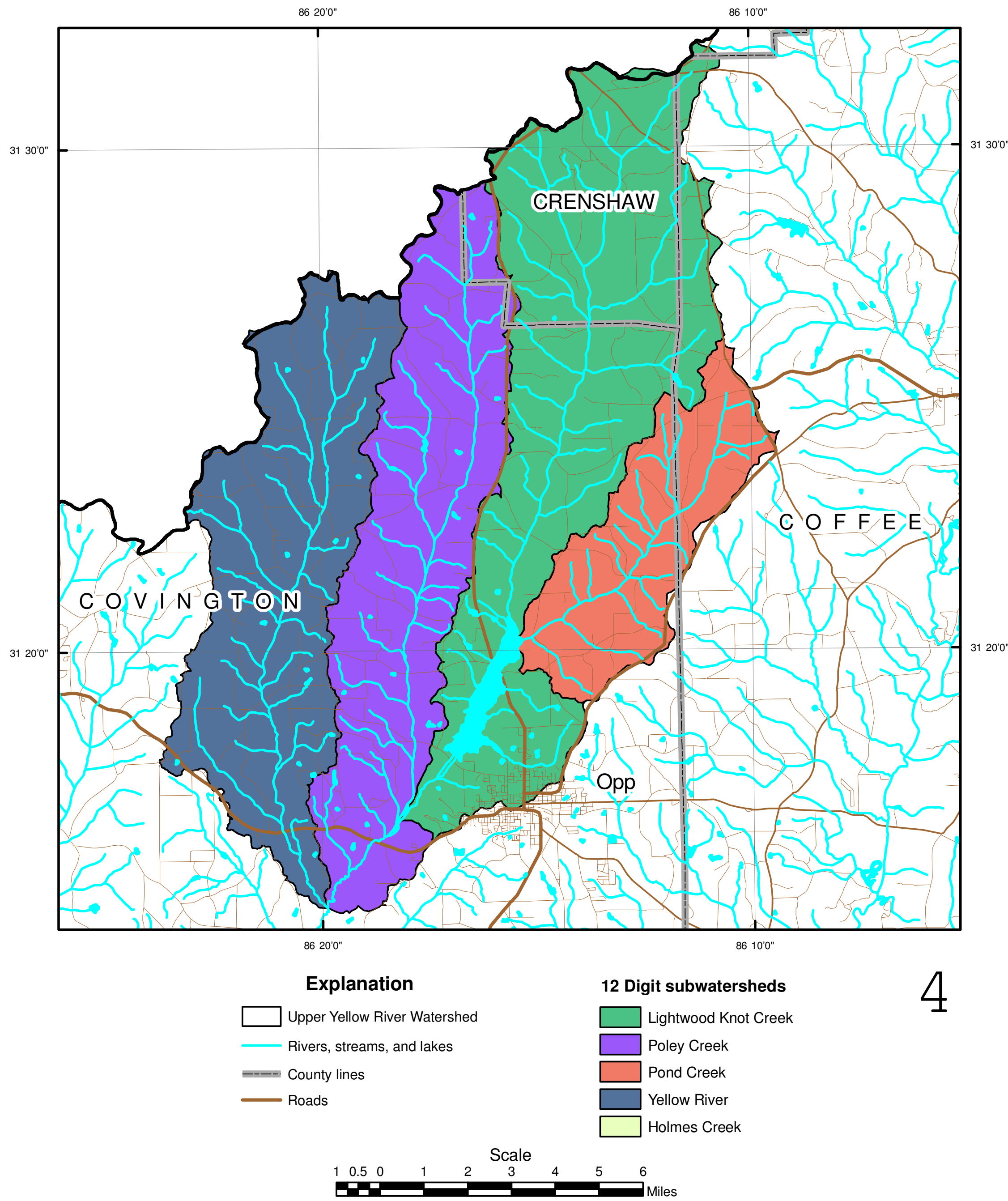


Figure 29.— Upper Yellow River Watershed (0314010301) 10-digit hydrologic unit and each 12-digit subwatersheds

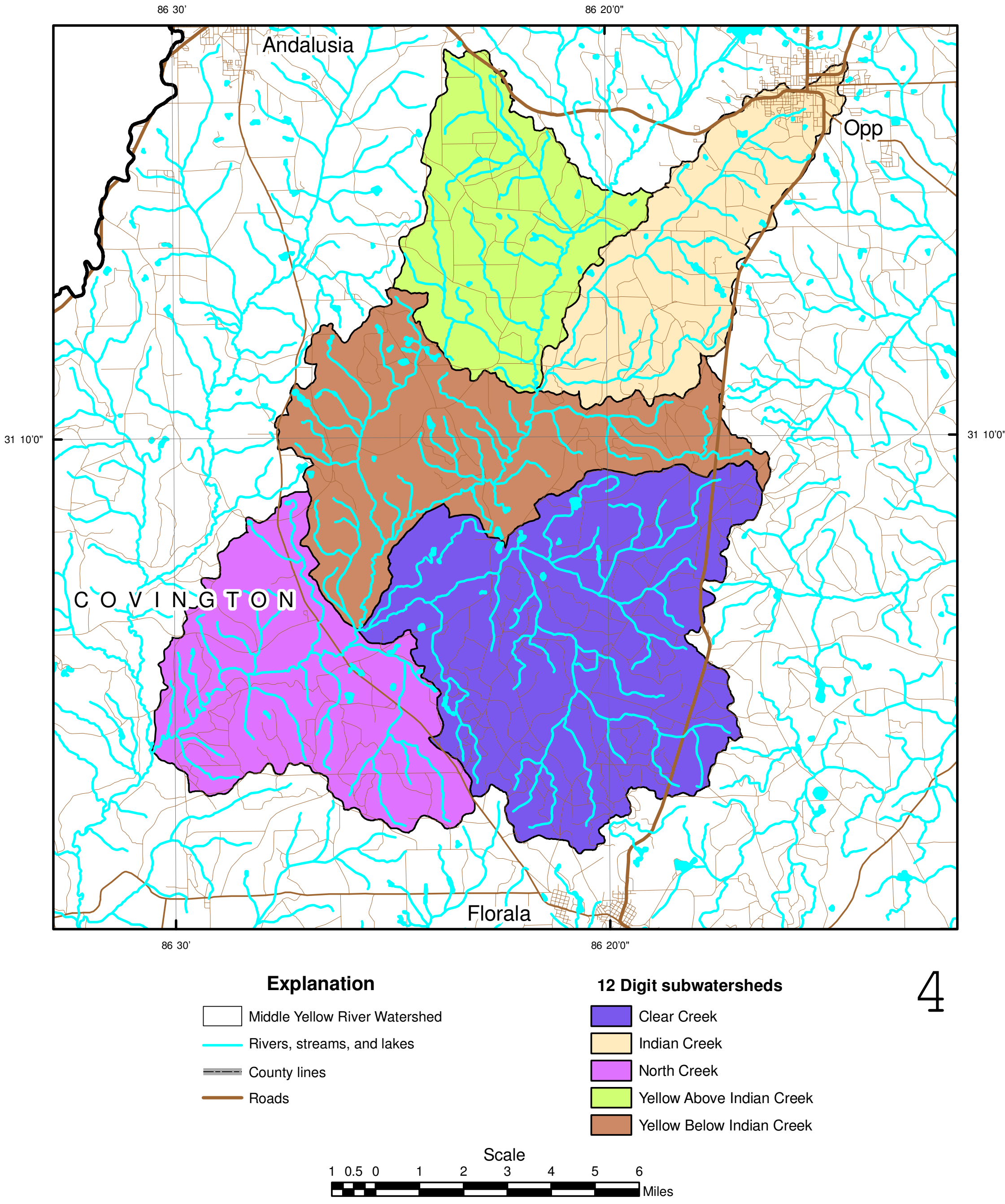


Figure 30.— Middle Yellow River Watershed (0314010302) 10-digit hydrologic unit and each 12-digit subwatersheds

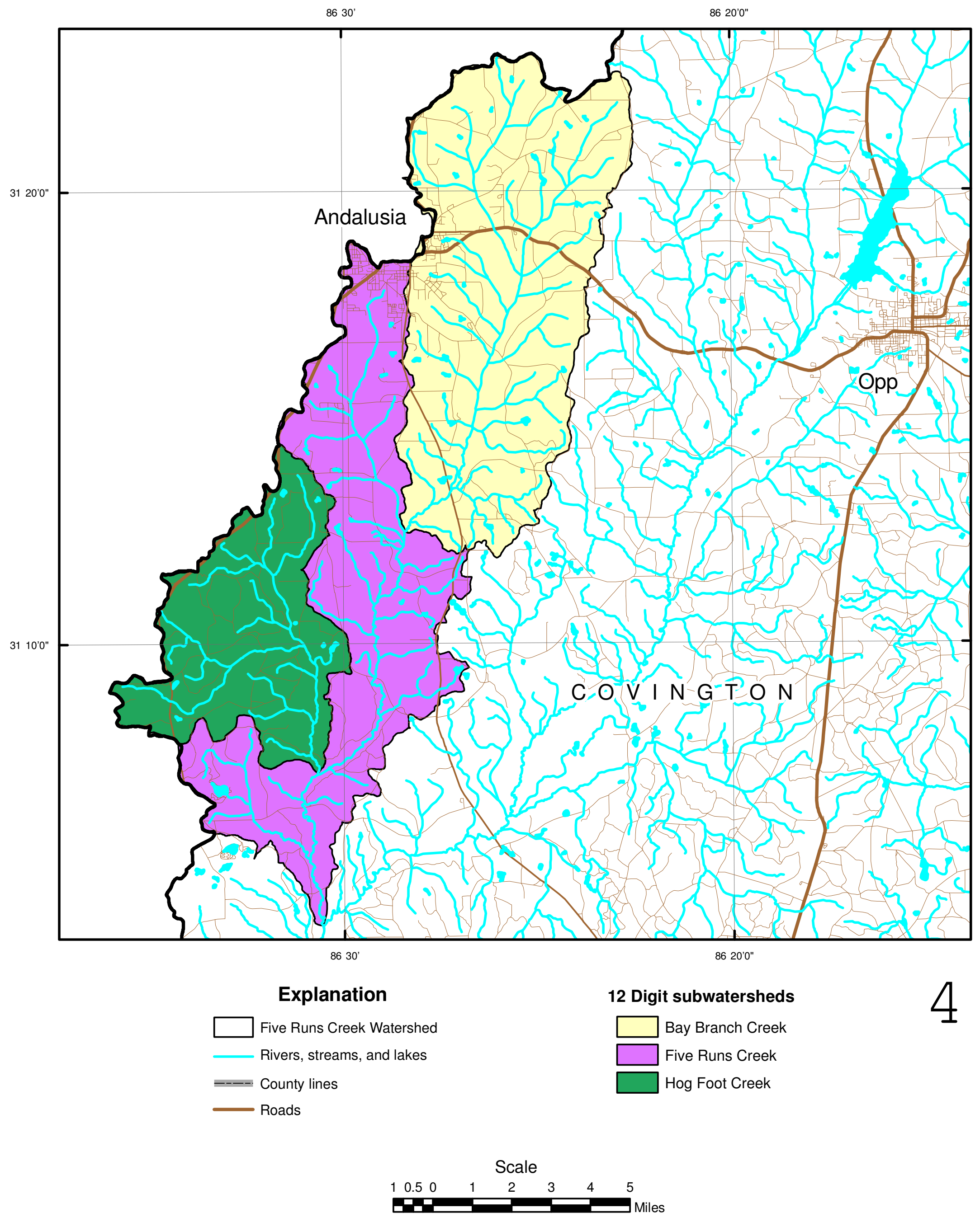


Figure 31.— Five Runs Creek Watershed (0314010303) 10-digit hydrologic unit and each 12-digit subwatersheds

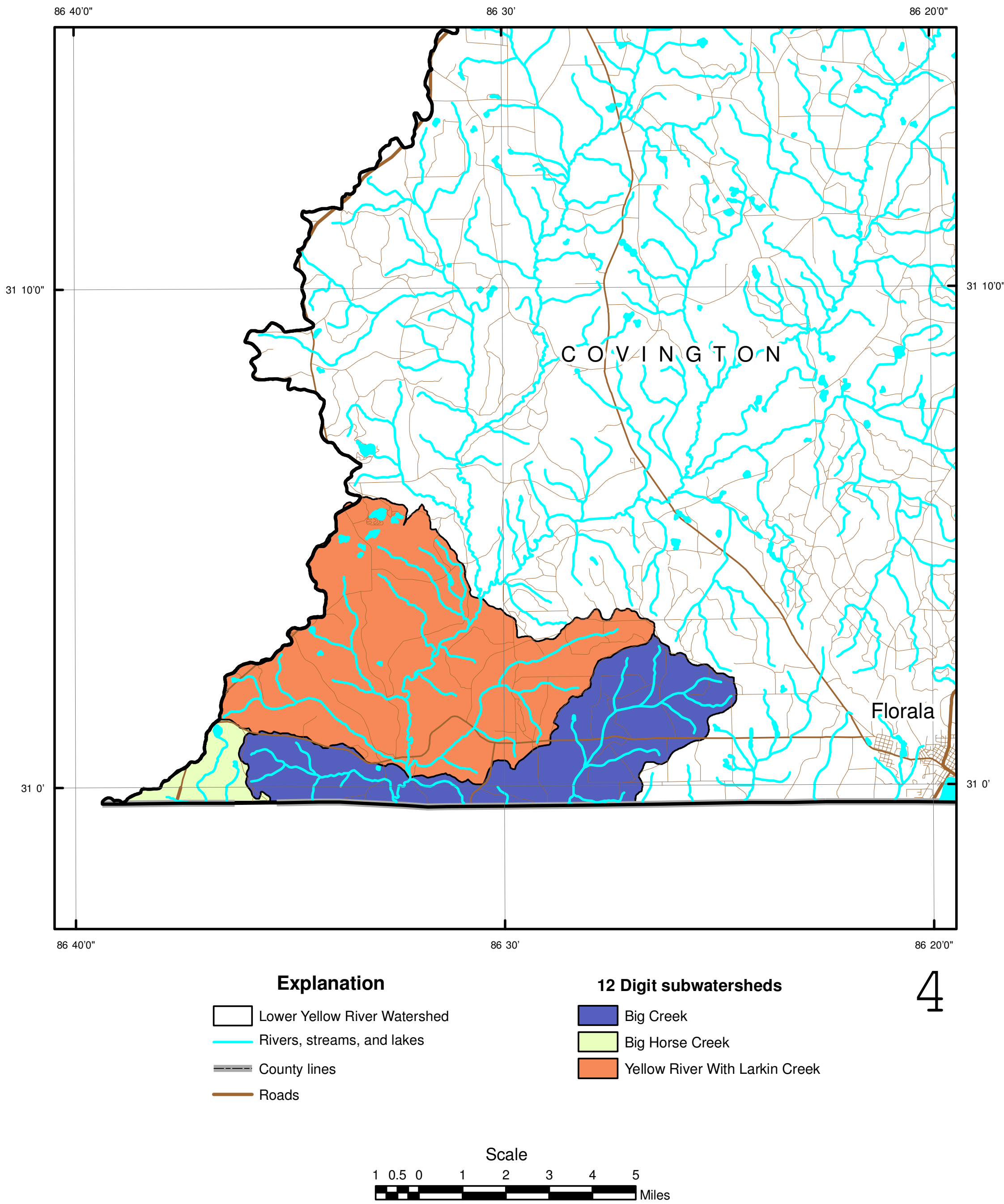


Figure 32.—Lower Yellow River Watershed (0314010304) 10-digit hydrologic unit and each 12-digit subwatersheds

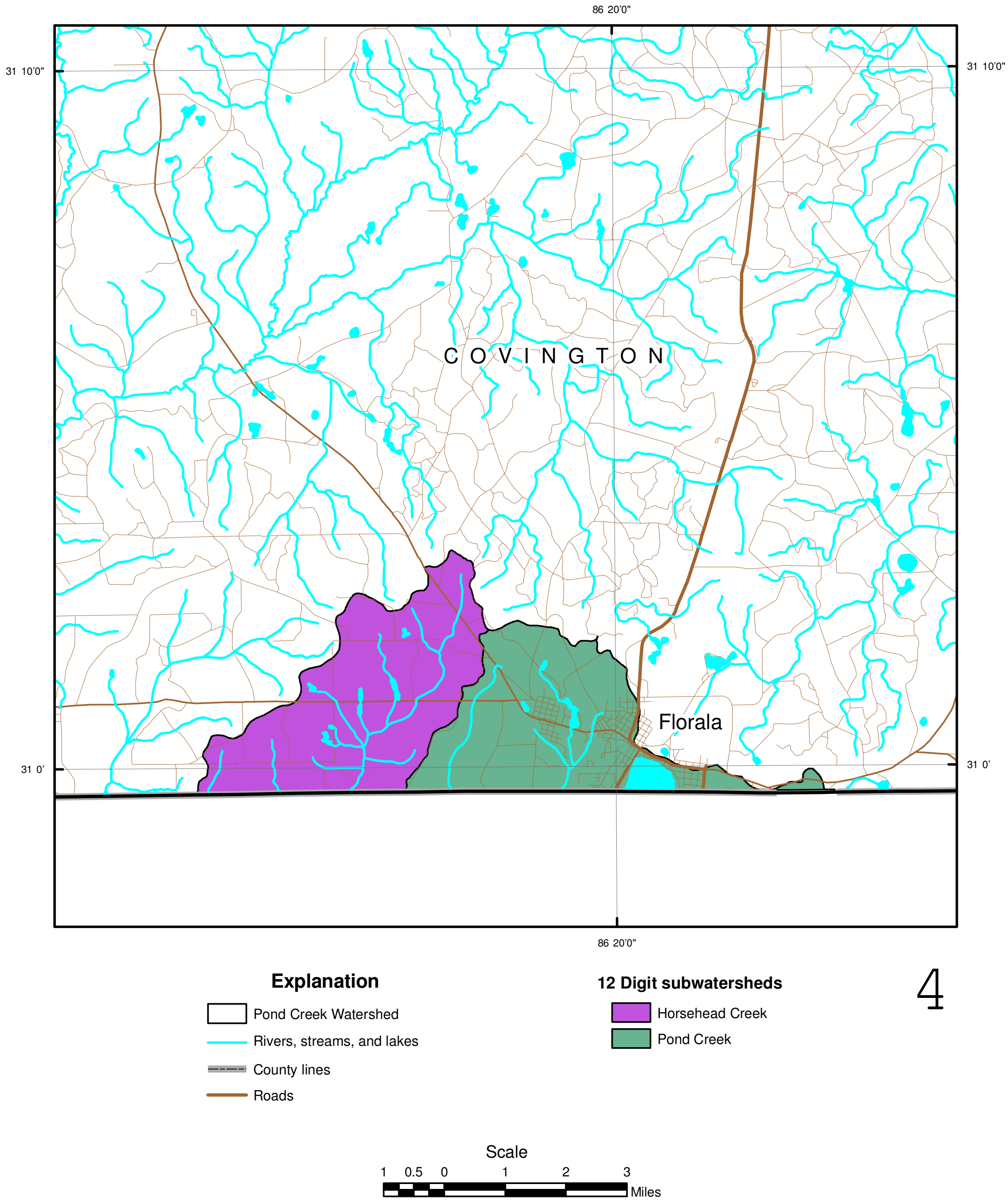


Figure 33.—Pond Creek Watershed (0314010306) 10-digit hydrologic unit and each 12-digit subwatersheds

Table 14. —Yellow River "Sub-basin" hydrologic unit codes.

Sub-basin (8-digit)	Watershed (10-digit)	Watershed name (10-digit)	Subwatershed (12-digit)	Subwatershed name (12-digit)	Acres	Sq miles
03140103	0314010301	Upper Yellow River	031401030101	Pond Creek	12676.68	19.81
03140103	0314010301	Upper Yellow River	031401030102	Lightwood Knot Creek	36953.66	57.74
03140103	0314010301	Upper Yellow River	031401030103	Poley Creek	25983.27	40.60
03140103	0314010301	Upper Yellow River	031401030104	Yellow River	25827.52	40.36
03140103	0314010302	Middle Yellow River	031401030201	Yellow Above Indian Creek	15369.69	24.02
03140103	0314010302	Middle Yellow River	031401030202	Indian Creek	14430.58	22.55
03140103	0314010302	Middle Yellow River	031401030203	Yellow Below Indian Creek	22026.55	34.42
03140103	0314010302	Middle Yellow River	031401030204	Clear Creek	32476.95	50.75
03140103	0314010302	Middle Yellow River	031401030205	North Creek	19268.42	30.11
03140103	0314010303	Five Runs Creek	031401030301	Bay Branch Creek	34004.04	53.13
03140103	0314010303	Five Runs Creek	031401030302	Hog Foot Creek	16416.66	25.65
03140103	0314010303	Five Runs Creek	031401030303	Five Runs Creek	28133.83	43.96
03140103	0314010304	Lower Yellow River	031401030401	Yellow River With Larkin Creek	21107.93	32.98
03140103	0314010304	Lower Yellow River	031401030402	Big Creek	11261.88	17.60
03140103	0314010304	Lower Yellow River	031401030403	Big Horse Creek	1760.61	2.75
03140103	0314010306	Pond Creek	031401030601	Pond Creek	92.67	0.14
03140103	0314010306	Pond Creek	031401030601	Pond Creek	5299.38	8.28
03140103	0314010306	Pond Creek	031401030602	Horsehead Creek	6206.71	9.70
Totals					329297.04	514.53

Table 15.— Discharge data for selected USGS gauging stations in the CPYRW

Station name and number	**Drainage area (mi²)**	**Discharge (cfs)**				**Record (Years)**
		Avg.	**Min.**	**Max.**	**Mi²**	
Choctawhatchee River near Newton/02361000	686	945	37	72,200	1.38	73
Little Double Bridges Creek near Enterprise/02362240	21.4	35	1.1	5,000	1.64	18
Choctawhatchee River near Bellwood/02361500	1,280	1,599	175	26,000	1.25	5
Pea River near Ariton/02363000	498	608	3.3	38,200	1.22	48
Pea River near Samson/02364500	1,182	1,718	63	28,800	1.45	48

GROUNDWATER RESOURCES

Groundwater in the CPYRW occurs in porous sand, gravel, clay, and limestone under water table and artesian conditions. Precipitation, primarily in the form of rainfall, infiltrates the ground surface in a geologic unit's area of outcrop and percolates downward until contacting a confining unit (mainly clay) and moving laterally or down-dip. Geologic units that crop out in the study area are shown in figure 4 and tables 9 are a generalized stratigraphic column of geologic units that crop out in the watershed management area.

AVAILABILITY

Water does not occur uniformly in all geologic units. Mainly due to lithologic differences, the porosity and permeability of units vary considerably. As a result, not all geologic units are considered aquifers and those that are yield varying quantities of water to individual wells in different geographic areas. In their Alabama coastal plain aquifer study the USGS identified five aquifers and five confining units in the Alabama Coastal Plain (USGS, 1993). For purposes of this report, geologic units in the study area can be grouped into four aquifers and described in descending order as the Eocene-Pleistocene undifferentiated, the Lisbon, the Nanafalia-Clayton, Providence-Ripley, and Eutaw-Tuscaloosa aquifers shown in figure 34. The deeply buried Cretaceous age Eutaw Formation and Tuscaloosa Group aquifers occur throughout the management plan area, however, water in these aquifers in the southern portion of the area is excessively mineralized and is not used for water supply.

EOCENE-PLEISTOCENE UNDIFFERENTIATED AQUIFER

This aquifer group is composed of alluvial and terrace deposits, Oligocene-Miocene Series undifferentiated, and Crystal River Formation sediments. These sediments are primarily sand, clay, gravel, unconsolidated silt, and some soft limestone that are unconfined (Smith, 2001). Yields of water to individual wells are generally less than 200 gallons per minute (gpm). The recharge area for this aquifer is in the southern portion of the study area shown in figure 34.

LISBON AQUIFER

This aquifer, as defined by the USGS (1993) includes the lower Moodys Branch Formation, the Lisbon, Tallahatta, Hatchetigbee Formations (all Eocene) and the upper sands of the Tuscahoma Formation (Paleocene). The Lisbon aquifer is composed mostly of sand and clay beds, but may locally contain claystone or carbonate rocks. The recharge area for this aquifer extends across northern Covington County, southern Coffee and Dale Counties, and northern Houston County shown in figure 34. Individual wells generally yield 200 to 500 gpm.

The middle Tuscahoma Formation is mainly composed of clay beds. In some areas these beds probably form an effective confining unit between the Lisbon aquifer and the underlying Nanafalia-Clayton aquifer.

NANAFALIA-CLAYTON AQUIFER

The Nanafalia-Clayton aquifer includes the lower Tuscahoma Formation sands, the Nanafalia Formation, Salt Mountain Limestone, and the Porters Creek and Clayton Formations (USGS, 1993). This aquifer is primarily composed of unconsolidated sand and clay beds, however it does include carbonate rocks in the Salt Mountain Limestone. Recharge to this aquifer occurs in a band across southern Pike and Barbour Counties, and northern Henry County shown in figure 34. The Nanafalia-Clayton aquifer is very productive, capable of yielding thousands of gallons per minute to large public-supply wells.

PROVIDENCE-RIPLEY AQUIFER

Recharging from an area of southern Bullock and northern Pike Counties, this aquifer includes the Providence Sand and the Ripley Formation shown in figure 34. These formations are composed of sand, sandstone, and clay beds. Potential yields to large wells range from about 200 to 1,400 gpm (USGS, 1993).

EUTAW AQUIFER

The Eutaw aquifer is major water source for much of west and central Alabama. Water production decreases in the east-central and southeastern portions of the state due to stratigraphic facies changes to more silty and clayey lithology. The aquifer varies in thickness from 300 to 400 feet with most water production from the basal portion of the unit. The recharge area of the Eutaw Formation extends through northern Montgomery and northern Russell Counties to the Chattahoochee River. The aquifer most likely contains water with relatively high chloride content from southern Coffee, Dale, and Henry Counties southward.

TUSCALOOSA GROUP AQUIFER

The Tuscaloosa Group aquifer is composed of the Gordo and Coker aquifers. The recharge area extends through Macon County eastward to the Chattahoochee River. In this area, the stratigraphy of the Gordo recharge area is not differentiated from the underlying Coker and both units are mapped as the Tuscaloosa Group undifferentiated. In the subsurface the Gordo aquifer is composed of alternating sand and clay. The water bearing zones consist of fine to coarse-grained sand and gravel. The Gordo aquifer is a major water source for much of the northern portion of the CPYRW. The aquifer in the central portion of the watershed may yield more than 2,000 gpm at depths from 1,500 to 2,700 feet. Water with high chloride concentrations is likely from central Coffee, Dale, and Henry Counties, southward.

The Coker aquifer supplies the deepest water production in south Alabama. In the CPYRW, the Coker yields water to wells in the northern portion. However, few wells have penetrated the zone in the central portions of the watershed. Most likely, the Coker aquifer contains water with high chloride concentrations from northern Coffee, Dale, and Henry Counties, southward.

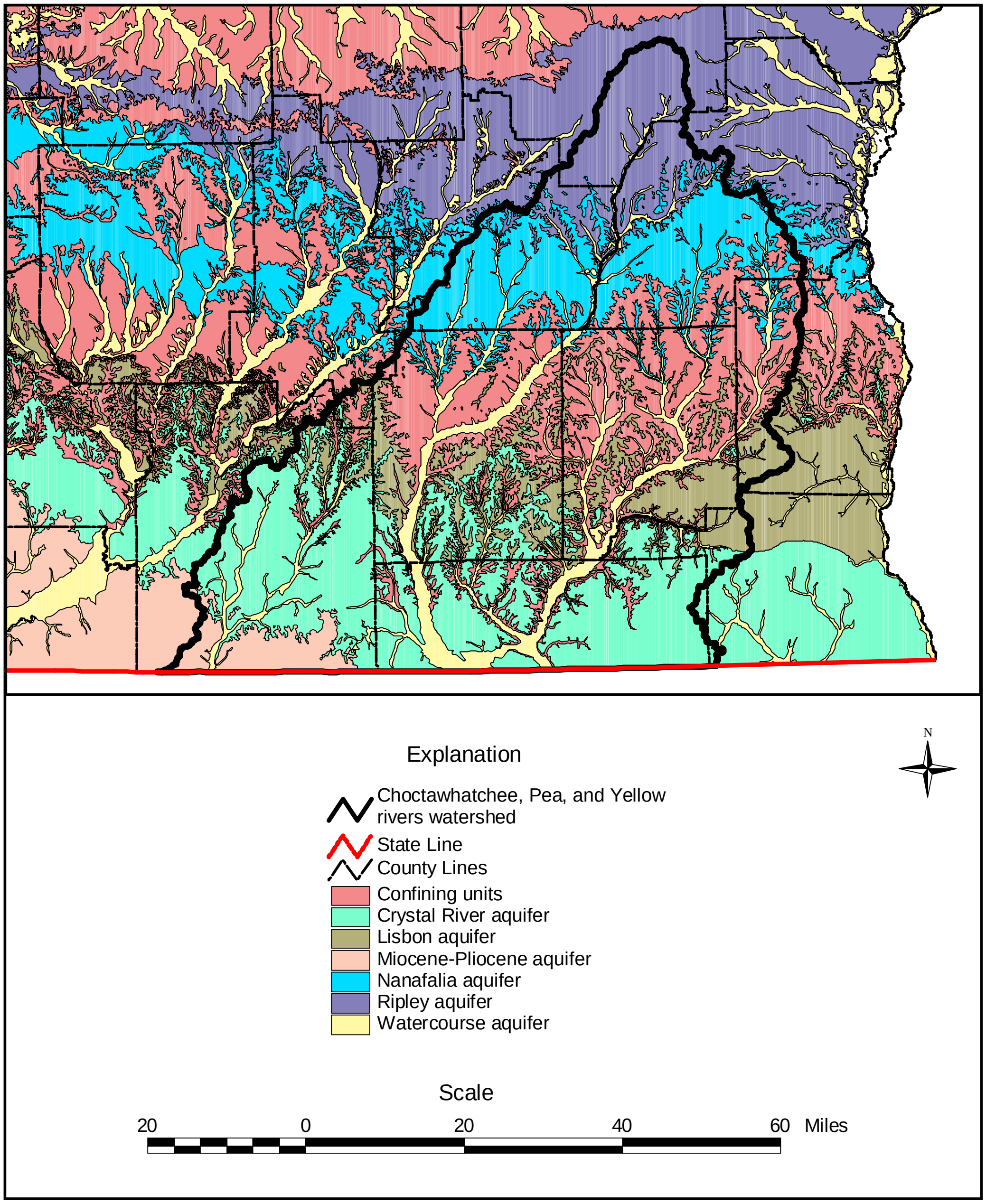


Figure 34.— Generalized aquifer map of the CPYRW.

RECHARGE

Currently, a comprehensive assessment of recharge rates for all major aquifers in the CPYRW is being performed by the GSA. However, based on a study of the Eutaw aquifer performed by the GSA in 1993 (Cook, 1993), and stream hydrograph separation techniques (Fetter, 1988) applied to data from gauging stations on the Choctawhatchee, Pea Rivers and tributaries, as well as consideration of the various elements of the overall water budget for the watershed, ground-water recharge is estimated at 10 percent or less of average annual precipitation and varies from three to six inches.

WATER USE

Sources of water used in the watershed are primarily ground water especially for public water supply. Some surface water is used but the volume is small in comparison to ground water. Significant use categories include residential, non residential, and agricultural. OWR (a division of ADECA), is charged with the collection of water use and related data for Alabama. However, only fragmented data is available from this source. Therefore, the primary sources of water use data for this plan were the 2002 *Municipal and Industrial Water Demand Forecasts* report prepared for the CPYRWMA by the COE and the *Agricultural Water Demand* report prepared by the NRCS in 2002. The COE document reports historic water use and gives predictions of future water demand for the ten county CPYRW. The report contains data from water utilities and water use reports prepared by the GSA (1970, 1975, 1980, 1985) and the 1995 cooperative study by GSA and USGS (USGS, 1998). Water demand forecasts employ economic and population data from US Census reports, 1960-2000. The NRCS report is a comprehensive analysis of historic agricultural water use and predicted future demand to the year 2050 in the CPYRW. Data presented by the NRCS do not agree well with COE data concerning agricultural water use and demand. Therefore, due to their relationship with the agriculture industry in Alabama, the NRCS data were considered the most reliable. These agricultural water use data were used with the COE data for other categories to determine historic use and future demand for the project area.

Total water use for the ten county area in 1970 was approximately 30.01 million gallons per day (mgd). By 2000 total water use was approximately 135.67 mgd as shown in figure 36. In 2000, Houston County had the largest water use (32.63 mgd) and Bullock County had the smallest (3.95 mgd) as shown in figure 36. However, much of Bullock County is not included in the Choctawhatchee, Pea, and Yellow Rivers watershed.

Water demand forecasts prepared by the COE involved changes in population, housing units, and employment. Forecasts were made for three growth scenarios (low, moderate, and high) for residential and non-residential use only. The NRCS agricultural water use study included forecasts for future water demand. Therefore, the data sets were combined to obtain a comprehensive water demand forecast for this plan.

Figure 35.--Estimated total water use for counties in the Choctawhatchee, Pea, and Yellow Rivers watershed.

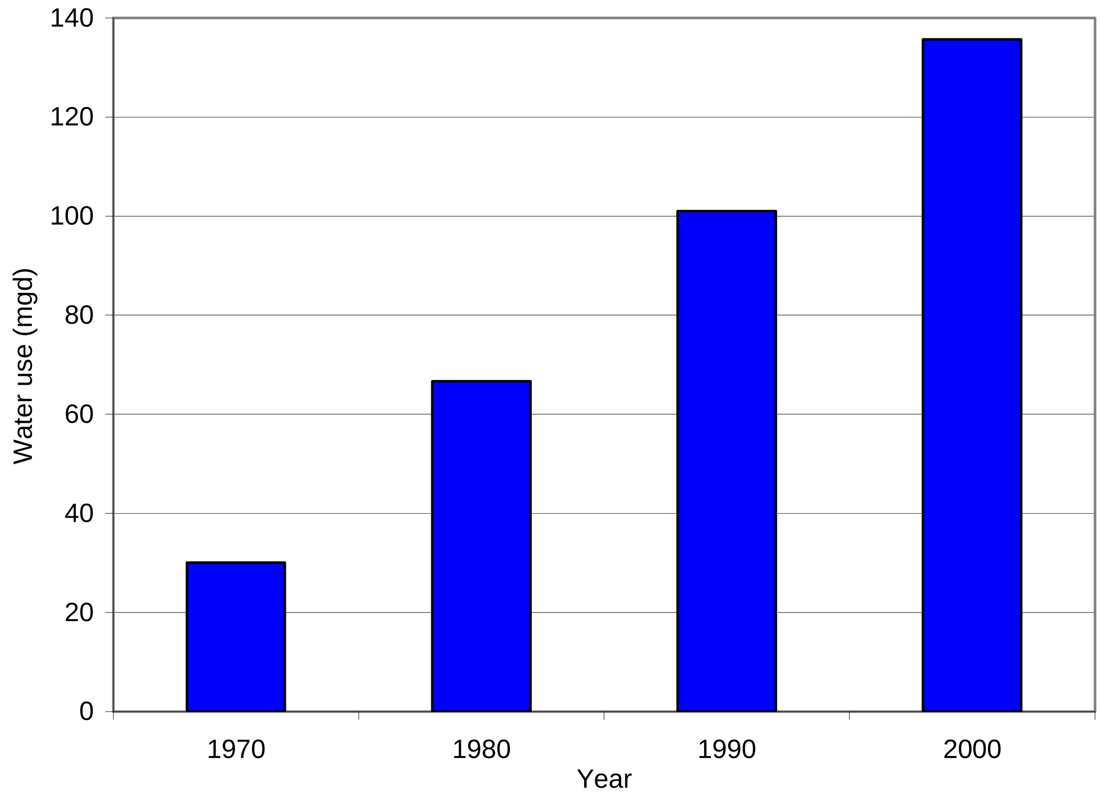
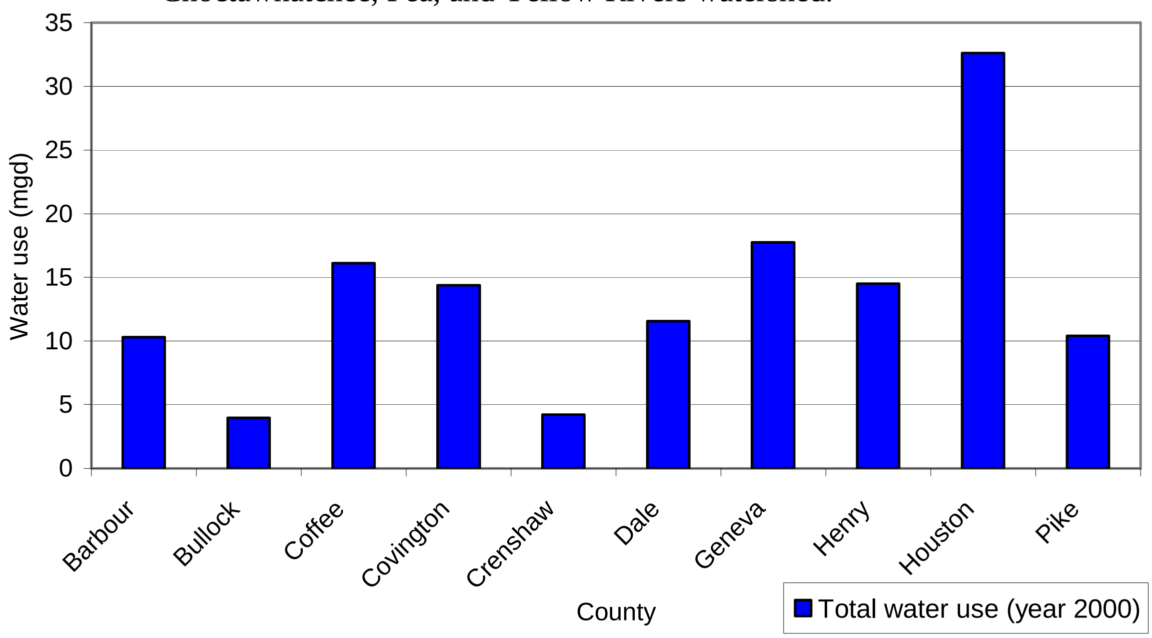


Figure 36.--Year 2000 estimated total water use for counties in the Choctawhatchee, Pea, and Yellow Rivers watershed.



HISTORIC USE

RESIDENTIAL SUPPLY

Residential water includes both publicly supplied and self-supplied sources for household use. Public-supply water use includes all water delivered to household customers via municipal or county water systems and water authorities. Ground water is the sole source of supply for all residential water in the watershed. Residential water use increased by 51 percent from 1970 to 1980 and 25 percent from 1980 to 1990 but only increased by 2.2 percent during the 1990's shown in figure 37. Residential water use in Bullock, Dale, Pike, and Houston Counties declined during the 1990's, offsetting increases in the other six counties. During 2000, 238,000 people were served by an estimated withdrawal of approximately 46.37 mgd from aquifers in the watershed for residential use figure 37.

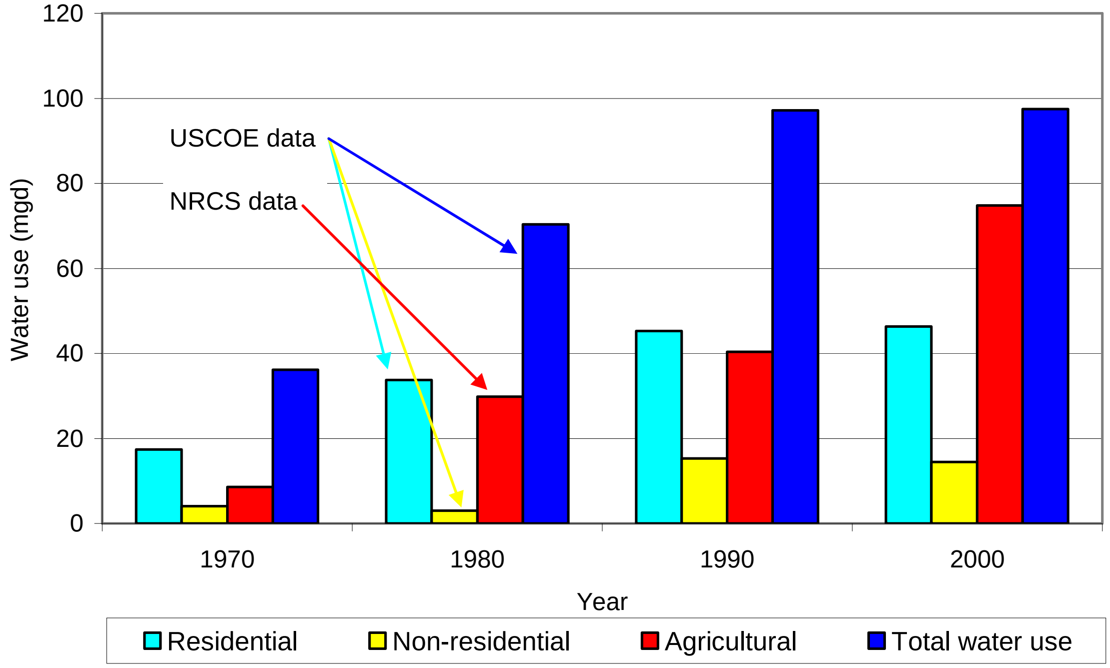
NON-RESIDENTIAL SUPPLY

Non-residential water use includes all commercial, industrial, government, and non-household public water usage. It was divided into eight major categories by the COE including construction; manufacturing; transportation, communications, and utilities; wholesale trade; retail trade; finance, insurance, and real estate; services; and government and public administration. Since 1970 non-residential water use has comprised an average of only 12 percent of total water use shown in figure 37. In 2000, Houston County had the largest non-residential use, 4.4 mgd or approximately 30 percent of total use for the category and Barbour County had the smallest usage (0.5 mgd).

AGRICULTURAL SUPPLY

Agricultural water use includes both water for irrigation and livestock. Water used for agricultural purposes has increased during each estimate period. In 1970, 8.6 mgd were used and by 2000 the total increased by 870 percent to 74.8 mgd shown in figure 37. Surface water accounts for more than 75 percent of the agricultural water supply. In 2000, 87 percent of agricultural water was used for irrigation compared to 20 percent in 1970.

Figure 37.--Estimated total water use from 1970-2000 for all categories for counties in the Choctawhatchee, Pea, and Yellow Rivers watershed area.



WATER DEMAND FORECASTS

Future water demand (2000 to 2050) for the CPYRW was estimated by the COE for residential and non-residential water demand using three water demand growth scenarios (low, moderate, and high). The NRCS estimated future demand for agricultural water.

Residential water demand in the low growth scenario is expected to increase from 46.37 mgd in 2000 to 55.64 mgd in 2050. The moderate growth scenario indicates water demand increases from 46.37 mgd in 2000 to 61.40 mgd in 2050 and the high growth scenario predicts an increase from 46.37 mgd in 2000 to 72.31 mgd in 2050.

Non-residential water demand is expected to increase from 14.55 mgd in 2000 to 17.91 mgd in 2050 for the low growth scenario, 19.78 mgd for the moderate growth scenario, and 23.29 mgd for the high growth scenario.

Agricultural water demand is expected to increase from 75 mgd in 2000 to approximately 2000 mgd in 2050. Most of this increase is expected to be from expanded irrigation in the watershed.

Combining the forecasted demand values given above indicates that total water demand will increase approximately 54 percent, from 136 mgd in 2000 to 296 mgd in 2050.

LAND USE

Primary land-uses in the CPYRW are agricultural and silvicultural (plate 3). Urban and residential uses are mostly confined to the small towns and county seats. As can be seen on plate 3 and figure 38, two areas of intense agricultural land use are easily observed; Area A extending from the Pea River in Pike County eastward to central Barbour County, and Area B extending from Andalusia in Covington County to Dothan in Houston County. These areas are easily discernible from the Multi-Resolution Land Characteristics Consortiums (MRLC) National Land Cover Data (NLCD). This dataset was compiled from Landsat satellite Thematic Mapper imagery (circa 1992) with a spatial resolution of 30 meters and supplemented by various ancillary data (where available). From this dataset, 15 land-use/land-cover classifications are identified within the state of Alabama. Each classification is visually displayed in a specific color. Three shades of yellow symbolize residential, commercial, industrial, and transportation areas (highly developed areas). Green areas correspond to forest, with light green representing evergreen forest, dark green the deciduous forest, and medium green mixed evergreen and deciduous forest. Red areas indicate transition from one land cover to another, often because of changes in land-use activities. Examples include forest clear cuts, a transition phase between forest and agricultural land, the temporary clearing of vegetation, and change due to natural causes such as fire. The pink or salmon color signifies agricultural areas such as pasture, hay, or row crops. This color plays a principal role in determining areas for evaluation of impaired water quality. The concentration of agriculture in areas A and B distinguishes them from the rest of the CPYRW. The boundaries of areas A and B on the NLCD land-use map were derived by assessing the geology, soils, physiography, topography, and land use patterns.

The predominant land-use in the CPYRW is that of forest land (61.4 %), which is comprised of evergreen forest (23.4 %), deciduous forest (14.6 %), and mixed forest (23.4 %). Agricultural uses are the second most common (30.5 %), consisting of row crops (19.5 %) and pastureland/hay (11 %). Wetlands encompass 6 %, followed by urban uses from residential, commercial, industrial, and transportation area at 1%, and the remaining 1.1 % in lakes and water bodies, and other uses.

The land-use in area A is predominately deciduous, evergreen, and mixed forest (58.9%), followed by agricultural row crops, pastureland, and hay (32.3%), emergent and woody wetland (7.6%), urban and commercial (.5%), lakes and water bodies (.5%), and other uses (.2%). Area B is predominately deciduous, evergreen, and mixed forest land use (48%), followed by agricultural row crops, pastureland, and hay (42.8%), emergent and woody wetland (6.6%), urban and commercial (1.4%), lakes and water bodies (.8%), and other uses (.4%). The area outside of A and B have land-use values that are considerably different due to the change in proportion of agricultural processes. Percentage values for this area are dominated by deciduous, evergreen, and mixed forest land use (82.3%), followed by the agricultural row crops, pastureland, and hay (11.7%), emergent and woody wetland (4.5%), urban and commercial (.8%), lakes and water bodies (.4%), and other uses (.3%).

Clayton Formation, Nanafalia Formation, Providence Sand, and Tuscahoma Sand, all of which are composed of sand, clay, and limestone, dominate the geology of area A. Area B is underlain primarily by the Gosport Sand, Lisbon Formation, Tallahatta Formation, Jackson Group undifferentiated, and Residuum that contains sand, clay, claystone, chert, and limestone. Geologic contacts conform closely to the boundaries of agricultural land use.

As the geologic materials weather, they create a base for the soils. In addition, the underlying sands, clays, and limestone provide a good foundation for soils. Soils in the designated areas are described as the Ultisols and Entisols order. Ultisols are soils that occur in humid areas and have clay-enriched subsoil that is low in nutrients. With soil amendments they are productive for row crops. The Entisols are soils that have little or slight development and are characterized by properties of their parent material. They include soils on steep slopes, flood plains, and sand dunes. Both Ultisols and Entisols have a strong reliance on the base material or geology. These soils, are particularly valuable for agricultural production.

The physiography of the region is closely tied to the geology and soils. Area A is in the Southern Red Hills and the Chunnenuggee Hills district while area B is in the physiographic districts called the Dougherty Plain and the Southern Red Hills. These districts are described in the physiography section and they are generally characterized by irregular plains with a mostly low to moderate gradient. The physiography and topography of both areas is conducive to the agricultural activities shown on the NLCD imagery.

The geology, soils, physiography, and topography collectively create an environment that is favorable for the land uses observed in areas A and B which, in large part, are pasture, hay, and row crops (agricultural uses). These land-use activities have been shown to cause excessive sedimentation, bacteria, and nutrients in the watershed. Runoff from fertilizers and waste from animals create excessive amounts of phosphorus, nitrate, and bacterial activity that cause deterioration of water quality. The 303(d) listed stream segments in the CPYRW are characterized by excessive sedimentation and organic enrichment, low dissolved oxygen concentrations, and in some locations, excessive pathogens. Six of seven 2002 303(d) listed stream segments in the watershed are found in areas A and B demonstrating a relationship between land use and diminished water quality. The 2002 303(d) list can be found on ADEM’s website at http://www.adem.state.al.us/WaterDivision/Wquality/303d/WQ303d.htm.

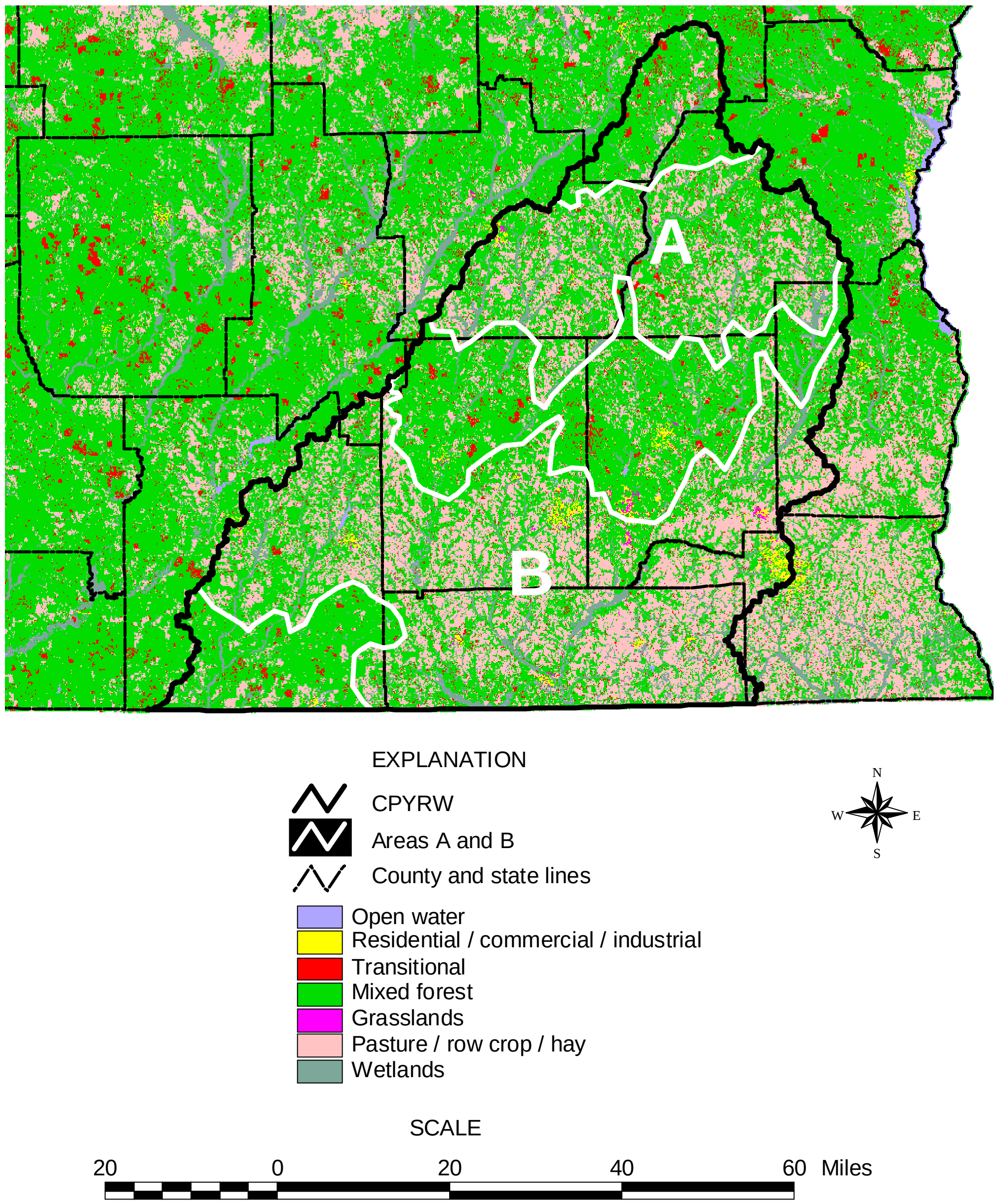


Figure 38.— Land-use in the CPYRW.

NATURAL AND RECREATIONAL RESOURCES

Natural resources in the CPYRW study area include abundant timber and wood product lands, quarry sand and limestone, and fertile soils for agriculture. Outdoor recreational opportunities are available from the streams and lakes. Alabama is blessed with a natural diversity of freshwater fish, with more than 300 species of native freshwater fish living in state waters, fourteen of these species are only known to have lived within the borders of the State of Alabama. Alabama's rivers are a great place to enjoy canoeing or rafting and our pristine lakes are the ideal place for boating. Seven public lakes varying from 32 to 1,100 acres are located in the CPYRW. Five are county lakes and two are state owned.

Barbour County Lake is a 75-acre lake located six miles north from Clayton. Coffee County Lake is an 80-acre impoundment located four miles northwest from Elba. The lake is currently closed and will reopen in 2007. Dale County Lake, also called Ed Lisenby Lake is a 92-acre lake located in Ozark. Geneva County has two lakes, 33- and 32-acres in size, located 20 miles southwest of Enterprise. Pike County Lake is a 45-acre lake located five miles south of Troy.

Three state parks are located inside the CPYRW boundary. Two of these parks are constructed around lakes. Lake Jackson is the largest natural lake in Alabama (426 acres). The lake is bisected by the Alabama-Florida state line with 51% in Alabama. The lake is a part of Florala State Park (floralastatepark@gtcom.net), a 40-acre park in the town of Florala in Covington County. Lake Jackson was the subject of a hydrogeologic investigation performed by the GSA in 2005 (Baker and others, 2005). The investigation determined that the lake was formed as a sinkhole in limestone that underlies the area and is replenished only by rainfall and surface runoff. Considered one of the cleanest and clearest bodies of water in the state, the lake supports fishing, boating, swimming, and water-skiing. A boat launch and piers provide access to the water for fishermen hoping to capture the bass. A recently upgraded RV park offers full hook-ups, while a 30 site tent camp and primitive sites are available for those without vehicles. Picnic areas lie along the beaches, a playground sits beside the picnic tables, and an adjacent community building provides indoor meeting spaces. The park’s day use area includes a bicycle / pedestrian trail that extends through the entire length of the park. Swimming, fishing, wave runners and skiing are allowed in the lake. The park has a picnic area and a 200 – foot pier. Figure 39 shows an aerial photograph of Lake Jackson.

Figure 39.—Photograph of Lake Jackson, southern Covington County.

Lake Frank Jackson (fjackson@oppcatv.com) is a 1,100 acre stream fed lake at the town of Opp in eastern Covington County. The lake has a natural island and boardwalk and is a part of the 2,050-acre Lake Frank Jackson State Park. The park has both day use and camping facilities. The lake is specially stocked and managed for prime freshwater fishing. Bass, bream, crappie, and catfish are abundant. Each April anglers converge on the park for a bass fishing tournament. Boat launch ramps and a grassy beach provide water access for boaters, canoe paddlers, and swimmers. Trails covering two miles cross the park for hikers and birdwatchers to explore the wildlife of the area. There is a playground and picnic area along the lake. Lake Jackson and its tributary stream, Lightwood Knot Creek were the subjects of a comprehensive hydro geochemical assessment performed by the GSA in 2005 (Cook and Moss, 2005). Figure 40 shows an aerial photograph of Lake Frank Jackson.

Blue Springs State Park is near the town of Blue Springs in southern Barbour County. This 103-acre park is constructed around Blue Spring, a point of ground-water discharge from cavities developed in limestone of the Clayton Formation. Average spring discharge is approximately 3.6 million gallons per day (Geological Survey of Alabama, 2001). The park includes day use and primitive and modern camping facilities. Other complementing facilities include picnic shelters, tables, grills, comfort stations, playground and a crystal-clear spring-fed swimming pool. Campers may pan fish in the Choctawhatchee River, rent a paddle boat for river exploration, or play tennis on the park courts.

Sand is abundant in the CPYRW and is quarried from relatively small pits scattered across the watershed. Sand is used for road construction and unpaved road surfacing as well as aggregate material for concrete, mortar, and other construction applications. Limestone is also available from the Chickasawhay Limestone in the southern portion of watershed. Currently, one limestone quarry, shown in figure 41, is operating in southeastern Covington County where approximately 1,200 tons of relatively soft, high calcium limestone is quarried each day. This material is used locally and in portions of northwest Florida for construction and road base.

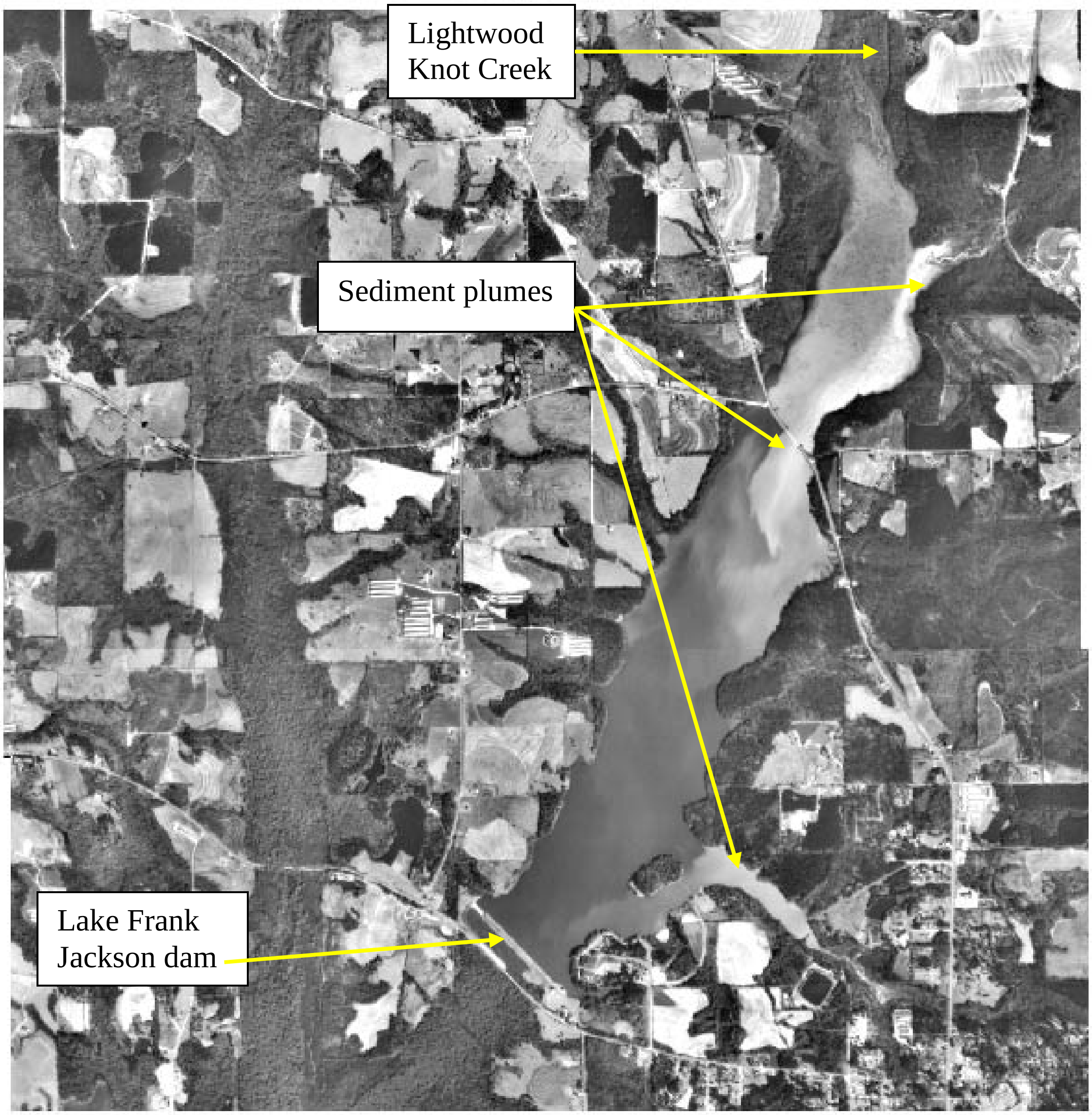


Figure 40.—Photograph of Lake Frank Jackson, Covington County.

Figure 41.—Photograph of a limestone quarry near Florala in Covington County.

Wild game is abundant throughout the watershed and Alabama is one of the premier states in the nation for hunting white-tailed deer and Eastern wild turkey. Our generous hunting seasons and bag limits are the envy of other states; also numerous sport shooting facilities are available. Covington Wildlife Management Area located in Covington and Geneva Counties near Florala encompasses 22,490 acres and have abundant big game and small game.

IMPERILED SPECIES

Following is a summary of species of concern in the CPYRW. Information contained in this section was derived from Mirarchi and others (2004). These accounts include Priority 1 and Priority 2 species from that work. Priority 1 species (Highest Conservation Concern) are taxa critically imperiled and at risk of extinction/extirpation because of extreme rarity, restricted distribution, decreasing population trend/population viability problems, and specialized habitat needs/habitat vulnerability due to natural/human-caused factors. Priority 2 species (High Conservation Concern) are taxa imperiled because of three of four of the following: rarity; very limited, disjunct, or peripheral distribution; decreasing population trend/population viability problems; specialized habitat needs/habitat vulnerability due to natural/human-caused factors shown in table 16.

Table 16.— Conservation status of species of concern in the CPYRW.

Species	Status	Distribution	Major Habitat	Threats
Mollusks				
Rayed Creekshell *Anodontoides radiatus*	P1	LA to Apalachicola Basin in AL and FL	Sand or silt substrata with low to moderate flow	Habitat degradation, declining population
Fluted Elephantear *Elliptio mcmichaeli*	P1	Choctawhatchee Rivers, AL and FL	Moderate current over sand or sand and gravel substrata	Habitat degradation, declining population
Alabama Pearlshell	P1; C	South-central AL	Riffles and pools in small creeks	Restricted distribution, rarity, declining population
Narrow Pigtoe	P1; C	Escambia and Yellow Rivers, AL and FL	Small streams with stable sand/gravel substrate	Restricted distribution, rarity, habitat degradation
Southern Sandshell *Lampsilis australis*	P1; C	Choctawhatchee, Escambia and Yellow Rivers, AL and FL	Clear creeks and rivers with sandy substrates	Restricted distribution, rarity, habitat degradation
Alabama Moccasinshell *Medionidus acutissimus*	P2; T	Mobile Basin and Gulf Coast rivers west of Apalachicola Basin in AL and FL	Small upland tributaries to large coastal rivers	Small, widely disjunctive, isolated populations
Southern Kidneyshell *Ptychobranchus jonesi*	P1; C	Choctawhatchee, Escambia and Yellow Rivers, AL and FL	Creeks and rivers with silty/sand substrate	Restricted distribution, rarity, declining habitat, declining population
Fuzzy Pigtoe *Pleurobema strodeanum*	P2; C	Choctawhatchee, Escambia and Yellow Rivers, AL and FL	Small to large streams with woody debris/gravel	Restricted distribution, rarity, habitat degradation
Choctaw Bean *Villosa choctawensis*	P1; C	Choctawhatchee, Escambia and Yellow Rivers, AL and FL	Small to medium rivers with sand substrate and moderate to swift current	Restricted distribution, rarity, habitat degradation

Species	Status	Distribution	Major Habitat	Threats
Fishes				
Ironcolor Shiner *Notropis chalybaeus*	P1	Atlantic and Gulf seaboards from NJ to MS and lower MS River basin	Small, sluggish, clear creeks with sand substrates and abundant vegetation and swamps	Limited degraded habitat
Gulf Sturgeon *Acipenser oxyrinchus desotoi*	P2; T	Gulf of Mexico tributaries from FL to TX	Gulf of Mexico and large rivers	Over fishing, habitat loss to dam construction; channel modifications; pollution
Alabama Shad *Alosa alabamae*	P2	Gulf of Mexico tributaries from Mississippi River east	Gulf of Mexico and large rivers	Habitat loss to dam construction; channel modifications; pollution
Bluenose Shiner *Pteronotropis welaka*	P2	Gulf of Mexico tributaries from FL to MS and St. John's River, FL	Small to medium streams with clear or black water below Fall Line	Sporadic distribution, declining populations, short life span, limited dispersal ability
Dusky Shiner *Notropis cummingsae*	P1	Tar River NC to Tamaraha River GA St. Johns, Aucilla Rivers, Apalachicola, and Choctawhatchee River drainages in AL, FL, and GA	Clear and tannic streams, small river, sand and mud substrate, moderate current	Restricted distribution, rarity, declining habitat, declining population
Amphibians				
Gopher Frog	P1; E	Coastal Plain from LA to NC	Longleaf pine forests; breeds in temporary ponds	Small, disjunct populations, declining quantity and quality of breeding habitat, disease, association with gopher tortoise
River frog *Rana heckscheri*	P1	Coastal Plain from NC to MS	Floodplains of rivers and small streams, swamps, and other water sources	Loss and degradation of habitat logging, drainage of bottomland forests
Flatwoods Salamander *Ambystoma cingulatum*	P1; E	Coastal Plain from SC to AL	Pine flatwoods with groundcover, burrowing near ponds and ditches	Loss of habitat to deforestation and urban sprawl; fire suppression
One-toed Amphiuma *Amphiuma pholeter*	P2	Swampy floodplains on Gulf Coast from Central FL to MS	Swampy floodplains near coast	Limited distribution and specialized habitat requirements, habitat loss
Red Hills Salamander	P2; T	Red Hills of south AL	Steep slopes in old growth hardwood forests	Limited distribution and specialized habitat requirements, habitat loss, low fecundity
Southern Dusky Salamander *Desmognathus auriculatus*	P1	Coastal Plain from NC to TX	Mucky areas of swamps, bogs, and moist floodplains	Unknown
Reptiles				
Coal Skink *Eumeces anthracinus* ssp.	P2	Eastern U.S.	Hilly pine-hardwood forests near water	Decreasing population densities, spotty distribution

Species	Status	Distribution	Major Habitat	Threats
Southeastern Five-lined Skink *Eumeces inexpectatus*	P2	Coastal Plain and nearby from MD to LA	Open, dry forest	Unknown; possibly declining numbers
Eastern Indigo Snake *Drymarchon couperi*	P1; E	Extreme southern Coastal Plain from GA to AL	Xeric sand ridges in winter, moist, forested stream bottoms in summer	Unknown; possibly declining numbers due to habitat loss/degradation; overcollecting for pet trade
Rainbow Snake *Farancia erytrogramma erytrogramma*	P2	Coastal Plain from MD and VA to MS and LA	Burrows near rivers, large creeks, ponds	Loss of habitat for prey (American eel) due to dam construction
Southern Hognose Snake *Heterodon simus*	P1	Coastal Plain and Ridge and Valley from NC to MS	Upland sandy woods, fields	Unknown; possible declining populations
Eastern Kingsnake *Lampropeltis getula getula*	P2	Coastal Plain and Piedmont from NJ to AL	Terrestrial habitats with open canopies	Loss/degradation of habitat
Eastern Coral Snake *Micrurus fulvius*	P2	Coastal Plain from NC to LA	Terrestrial habitats with loose soils where it burrows	Loss/degradation of habitat; pesticides/herbicides; fire ant destruction of prey species
Eastern Diamondback Rattlesnake *Crotalus adamanteus*	P2	Coastal Plain from NC to LA	Upland forests of pine flatwoods and longleaf pine-turkey oak sandhills	Loss/degradation of habitat, gassing by poachers in gopher tortoise burrows
Alligator Snapping Turtle *Macrochelys temminckii*	P2	Southeast GA and northeast FL, AL, MS, LA	Rivers, oxbows, sloughs, and large creeks	Over harvest for food, commercial fishing by-catch, alteration of rivers, pollution
Gopher Tortoise *Gopherus polyphemus*	P2; T	Coastal Plain and nearby Fall Line Hills from GA to MS	Burrows in open sandy habitat	Habitat loss/degradation, over harvest, gassed by poachers in gopher tortoise burrows; low fecundity, slow growth to maturity
Barbour's Map Turtle *Graptemys barbouri*	P1	Pea, Choctawhatchee, and Apalachicola Rivers	Flowing rivers with exposed limestone, snags, and stumps	Alterations of rivers, pollution, and depletion for human food and pets
Birds				
Red-cockaded Woodpecker *Picoides borealis*	P1; E	Southeastern U.S.	Mature, open pine forests with frequent burning	Fragmented populations, low numbers, fire suppression
Henslow's Sparrow *Ammodramus henslowii*	P1	Eastern U.S.	Tall grasslands with standing dead vegetation, salt marshes, meadows	Loss of breeding and wintering habitat, fire suppression
American Kestrel *Falco sparverious*	P2	Coastal Plain from SC to LA	Open to semi-open areas; breeds in longleaf pine/turkey oak	Loss/degradation of habitat, fire suppression, shooting, poison

Species	Status	Distribution	Major Habitat	Threats
American Woodcock *Scolopax minor*	P2	Eastern North America	Boreal forests	Habitat loss/degradation
Northern Harrier *Circus cyaneus*	P2	Central, North and South America, Eurasia	Open wetlands, fields, marshes	Habitat loss/degradation, pesticides, low numbers
American Black Duck *Anas rubripes*	P2	Eastern North America	Marshes, meadows, river floodplains	Overharvest, hybridization
Swallow-tailed Kite *Elanoides forficatus*	P2	Coastal Plain from SC to TX	Floodplain forests of large rivers	Disjunct populations, low numbers, shooting, low fecundity
Wood Stork *Mycteria americana*	P2	Central, North, and South America	Freshwater marshes, swamps, ponds and flooded fields	Loss/degradation of habitat, changing hydrologic regimes, disjunct breeding colonies
Short-eared Owl *Asio flammeus*	P2	North America	Prairies, meadows, tundra, steppes, marshes, savannas, fields	Low numbers, expected loss of non-breeding habitat, loss of prey base
Wood Thrush *Hylocichla mustelina*	P2	Central and North America	Deciduous or mixed forests with dense canopy and understory	Habitat degradation and fragmentation
Worm-eating Warbler *Helmitheros vermivorus*	P2	Eastern North America and coastal Central America and West Indies	Deciduous or mixed forests with dense canopy and understory	Low abundance, patchy distribution, loss of habitat
Swainson's Warbler *Limnothlypis swainsonii*	P2	Eastern and southern U.S., Central America and West Indies	Floodplain forests with dense understory	Habitat loss/degradation, low numbers, patchy distribution
Kentucky Warbler *Oporonis formosus*	P2	Eastern U.S., Central America	Mature bottomland hardwoods with open midstory and dense understory	Low numbers, habitat loss/degradation (hardwood to pine conversion), patchy distribution
Bachman's Sparrow *Aimophila aestivalis*	P2	Southeastern U.S.	Open pine forests with dense groundcover	Habitat fragmentation, fire suppression
Mammals				
Black Bear *Ursus americanus*	P1	North America	Rugged isolated areas with low human density	Habitat loss to human encroachment
Gray Myotis *Myotis grisescens*	P1; E	Southeastern U.S.	Near water in caves, barns, roofs, storm drains	Vandalism, habitat loss, pesticide pollution
Little Brown Myotis *Myotis lucifugus*	P2	North America except lower Great Plains	Tree cavities, rocks, woodpiles, crevices, caves and manmade structures	Rarity despite broad distribution
Southeastern Myotis *Myotis austroriparius*	P2	Southeastern U.S. usually in Coastal Plain	Riparian zones and edge habitats in buildings, culverts, wells, tree cavities, and bridges	Poorly known life history and ecology

Species	Status	Distribution	Major Habitat	Threats
Northern Yellow Bat *Lasiurus intermedius*	P2	Coastal Plain from SC to Central America and along Atlantic Coast	Mixed forests with Spanish moss near water	Poorly known life history and ecology
Brazilian Free-tailed Bat *Tadarida brasiliensis*	P2	Coastal Plain and Piedmont in southeastern U.S.	Buildings, bridges, stadiums, large hollow trees	Vandalism, loss of habitat, pesticide exposure
Rafinesque's Big-eared Bat *Corynorhinus rafinesquii*	P1	Southeastern U.S.	Caves, trees, buildings, mines, wells near forests	Poorly known life history and ecology and low numbers
Marsh Rabbit *Sylvilagus palustris*	P2	Coastal Plain of southeastern U.S.	Bottomland forests near marshes and swamps	Specialized habitat requirements and peripheral distribution, poorly known life history and ecology
Southeastern Pocket Gopher *Geomys pinetis*	P2	Southeastern U.S.	Dry, sandy ridges and hammocks	Low fecundity, loss of habitat, fragmentation of populations
Long-tailed Weasel *Mustela frenata*	P2	Southern Canada to Bolivia	Dense understories, edges and riparian zones	Habitat loss/degradation, recent steep declines in numbers
Eastern Spotted Skunk *Spilogale putorius*	P2	Gulf Coast and southern Appalachian Mountains	Usually dry, rocky, shrubby forested areas with extensive cover and dense understory with sufficient prey	Poorly known life history and ecology and declining populations

[1]P1–Priority 1, P2–Priority 2 (Alabama); E–Federally listed Endangered; T–Federally listed Threatened; C–Candidate for federal protection (national).

FRESHWATER MUSSELS

RAYED CREEKSHELL *Anodontoides radiatus*

This species occurs in eastern Gulf of Mexico drainages from Louisiana east to the Apalachicola River basin, including the Mobile River basin and coastal tributaries and in Yazoo River tributaries of the Mississippi River basin in northern Mississippi. It is usually found in small to medium-sized coastal plain streams but records exist for larger streams as well. It prefers sand or silt substrata with low to moderate flow. It is still widely distributed in a large part of its historic range, but remaining populations are few in number, small, and widely distributed. Habitat degradation and declining population trends lead this species to be of highest conservation concern (Haag, 2004a).

FLUTED ELEPHANTEAR *Elliptio mcmichaeli*

This species is endemic to the Choctawhatchee River system in Alabama and Florida and it has suffered recent declines within that distribution. It prefers areas with moderate current over sand or sand and gravel substrata. Its restricted distribution, vulnerability to habitat degradation and recent population declines lead to is classification as a species of highest conservation concern in Alabama (McGregor, 2004a).

SOUTHERN SANDSHELL *Lampsilis australis*

This species is endemic to Gulf Coast drainages, occurring in the Escambia, Yellow and Choctawhatchee River systems in southern Alabama and western Florida. It is usually found in clear, medium sized creeks to rivers, with slow to moderate current and sandy substrata. It has a very restricted distribution, is somewhat rare, and has experienced recent declines in habitat. Some workers have considered it to be endangered in Alabama for 30+ years. More recently it was classified as threatened or endangered throughout its range. It is listed as imperiled in Alabama and currently is considered a candidate for federal protection. It is considered to be a species of highest conservation concern in Alabama (Blalock-Herod, 2004a).

HADDLETON LAMPMUSSEL *Lampsilis haddletoni*

This species is known only from the two type specimens in the West Fork Choctawhatchee River. This is a medium sized river consisting of sculptured bedrock, gravel, and mixed gravel and sand substrata at the type locality. It was previously considered a category 2 candidate species for listing as a federally endangered species, but that protection was never given due to a lack of current distributional data. Blalock-Herod and others (in press) consider this species to be endangered, possibly extinct.

ALABAMA MOCCASINSHELL *Medionidus acutissimus*

This species is distributed throughout the Mobile Basin in Alabama, Georgia, Mississippi, and Tennessee. Specimens from Gulf Coast drainages west of the Apalachicola Basin are tentatively identified as *M. acutissimus*. However, comparative anatomical and genetic studies may prove them to represent an undescribed species. Several populations of *M. acutissimus* in Alabama appear healthy, including those in Sipsey Fork in Bankhead National Forest and Sipsey River. However, this species appears to be extirpated from much of its former distribution, including Gulf coast tributaries. It occurs in a wide variety of stream types from small, upland streams to large Coastal Plain rivers with at least moderate flow and is most frequently encountered in swift, gravel-bottomed shoals or riffles. It is a federally listed threatened species and is considered to be a species of high conservation concern in Alabama (Haag, 2004b).

OVAL PIGTOE *Pleurobema pyriforme*

This species is found from the Econfina Creek system east to the Suwannee River system in Alabama and Florida. In Alabama it was historically confined to the headwaters of the Chipola and lower Chattahoochee River systems, and has been collected recently only in Big Creek in the Chipola River system. It prefers medium sized creeks to small rivers with slow to moderate current in channels with clean sand or gravel substrata, though it will tolerate some silt (McGregor, 2004b).

FUZZY PIGTOE *Pleurobema strodeanum*

This species occurs in the Choctawhatchee, Escambia, and Yellow River drainages in Alabama and Florida. Its preferred habitat is sand substrata in small to large streams with scattered gravel, woody debris, and moderate flow. Its limited distribution and dwindling habitat quality make *P. strodeanum* vulnerable to extinction. It is classified as a species of special concern and in need of protection in Alabama, and currently it is considered a candidate for federal protection. This species is of high conservation concern in Alabama (McGregor, 2004c).

SOUTHERN KIDNEYSHELL *Ptychobranchus jonesi*

This species distribution includes the Choctawhatchee, Yellow, and Escambia River systems in Alabama and Florida. However, the only recent records are from West Fork Choctawhatchee River. It inhabits medium creeks to small rivers, usually in silty sand substrata and slow current. It can also be found in small, sand-filled depressions in clay substrata. It has suffered severe declines during the recent past and is vulnerable to extinction due to limited distribution and rarity, along with dwindling habitat quality within its distribution. It has been classified as threatened throughout its distribution and imperiled in Alabama and currently is considered a candidate for federal protection. It is considered a species of highest conservation concern in Alabama (McGregor, 2004d).

TAPERED PIGTOE *Quincuncina burkei*

This species is endemic to the Choctawhatchee River system of southern Alabama and western Florida, though it is eliminated from much of its historical range and is now found only in a few locations in the headwaters tributaries. It inhabits medium sized creeks to large rivers in stable sand or sand and gravel substrata, and occasionally silty sand, in slow to moderate current. Its limited distribution, rarity and reduction of quality habitat lead it to be a species of high conservation concern in Alabama (Blalock-Herod, 2004b).

CHOCTAW BEAN *Villosa choctawensis*

Its distribution includes the Choctawhatchee, Escambia, and Yellow River systems in Alabama and Florida. It occurs in small to medium rivers with sand or silty sand substrata in areas with moderate to swift current. Its limited distribution and habitat degradation within its distribution make *V. choctawensis* susceptible to extinction. It is classified as threatened throughout its distribution and imperiled in Alabama. Within drainages, it is considered a species of special concern in the Choctawhatchee River system and endangered in the Escambia and Yellow River systems and currently is considered a candidate for federal protection. This species is of highest conservation concern in Alabama (McGregor, 2004e).

DOWNY RAINBOW *Villosa villosa*

This species is known from eastern Gulf Coast drainages from the Escambia River east throughout peninsular Florida and in the St. Mary's River system in Florida and Georgia. Currently it is known in Alabama only in the Uchee Creek system of the Chattahoochee River drainage and possibly the Eight Mile Creek system in the Choctawhatchee River system. It may be found in a variety of habitats, ranging from spring-fed creeks backwaters with silt, mud, sand, or gravel sustrata in tannic to clear water. Its limited distribution and rarity make it vulnerable to extirpation from Alabama and a species of high conservation concern (Herod, 2004).

FISHES

GULF STURGEON *Acipenser oxyrinchus desotoi*

This species occupies Gulf of Mexico tributaries from the Suwannee River in Florida to Lake Pontchartrain in Louisiana, with sporadic occurrences south to Florida Bay and west to the Rio Grande River, Texas. The Gulf Sturgeon is an anadromous subspecies, with spawning populations in the Suwannee, Apalachicola, Choctawhatchee, Yellow/Blackwater, Escambia, Pascagoula, and Pearl Rivers of Florida, Alabama, Mississippi, and Louisiana, with former spawning populations documented from the Mobile and Alabama Rivers in Alabama, the Ochlockonee River, Florida and the Tchefuncte River, Louisiana. Historic records from the Alabama, Cahaba, Choctawhatchee, Coosa, Mobile, Tallapoosa, and Tombigbee Rivers have been reported. It is now excluded from the Alabama and Tombigbee Rivers upstream of dams at Claiborne and Coffeeville, respectively. Recent (since 1991) collection sites in Alabama include the Choctawhatchee; Pea; Yellow; Conecuh, Alabama; Tombigbee; Tensaw, Blakeley; Fish, and Perdido Rivers; Mobile Bay, Ft. Morgan, and Dauphin Island; and in nearshore Gulf of Mexico near Gulf Shores and Bayou LaBatre. Numbers of Gulf Sturgeon in Alabama are largely unknown. Recent (1999-2001) Choctawhatchee and Yellow River studies estimated the population of adults and subadults as fewer than 3000 and 550, respectively. The Gulf Sturgeon is an anadromous species, inhabiting estuaries, bays, and nearshore waters of the Gulf of Mexico during winter, mostly in waters less than 10 m (33 ft) deep. It migrates into coastal rivers in early spring (March through May) to spawn when water temperatures range from 16.0º to 23.0º C (60.8º to 73.4º F) and remains in river systems the entire summer. It was once abundant in most rivers of the Gulf coast, but numbers declined drastically during the 1900's due to over-fishing and loss of river habitat. Other threats and potential threats include modifications to habitat associated with dredged material disposal, de-snagging, and other navigation maintenance activities; incidental take by commercial fishermen; poor water quality associated with contamination by pesticides, heavy metals, and industrial contaminants; and aquaculture and accidental introductions. Also life history characteristics, late maturation, and spawning periodicity may protract recovery efforts. The Gulf Sturgeon is federally listed as threatened. It is of high conservation concern in Alabama (Hastings and Parauka, 2004).

Segments of the Choctawhatchee, Pea, and Yellow Rivers in Alabama have been designated as critical habitat for the Gulf Sturgeon by the USFWS. Figures 42, 43, 44, and 45 depict critical Gulf Sturgeon habitat.

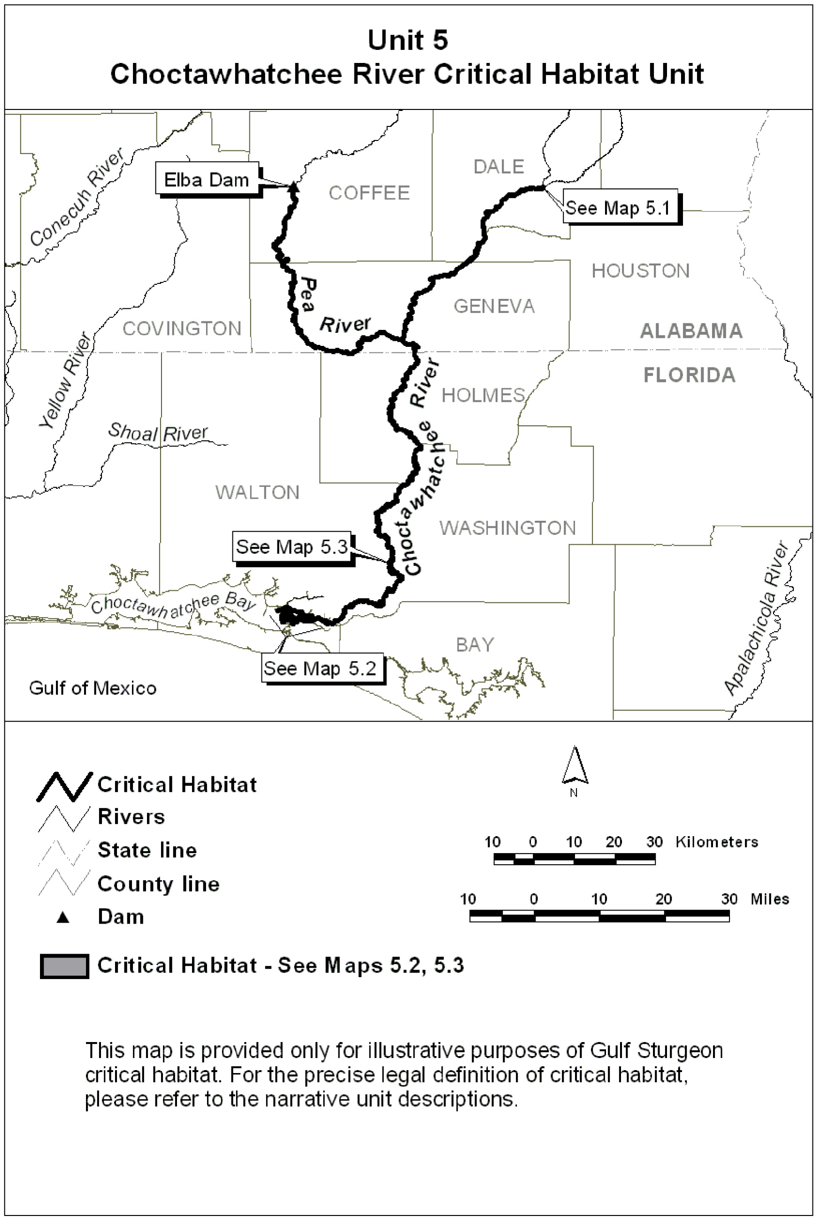


Figure 42.—Critical habitat designated for the Gulf Sturgeon in the Choctawhatchee and Pea Rivers in Florida and Alabama. (map from USFWS)

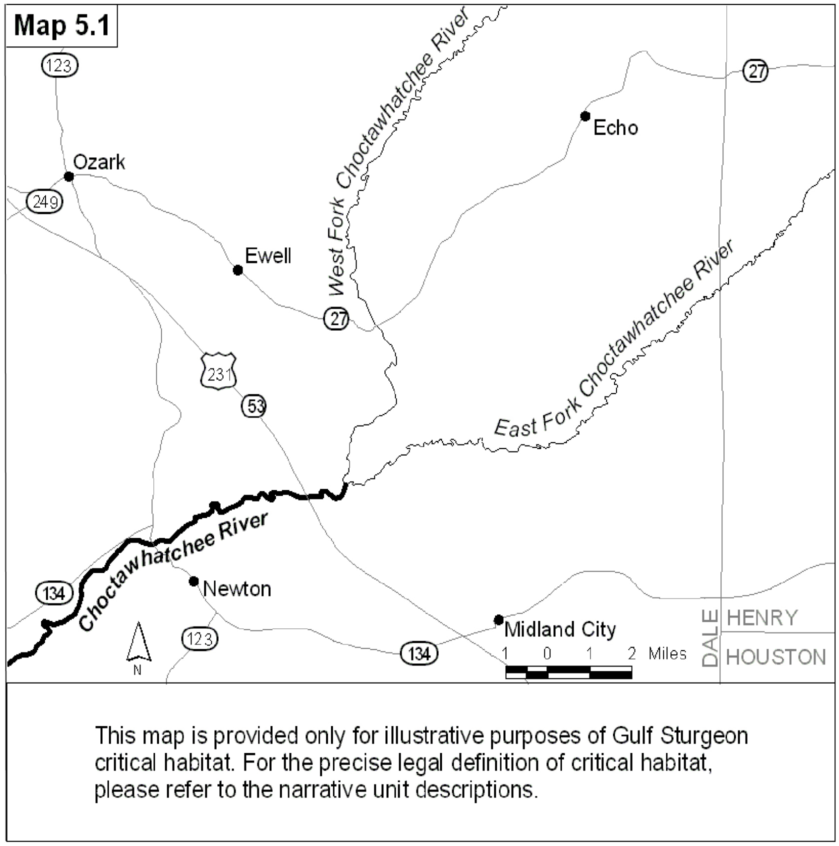


Figure 43.—Upstream portion of critical habitat in the Choctawhatchee River designated for the Gulf Sturgeon. (map from USFWS)

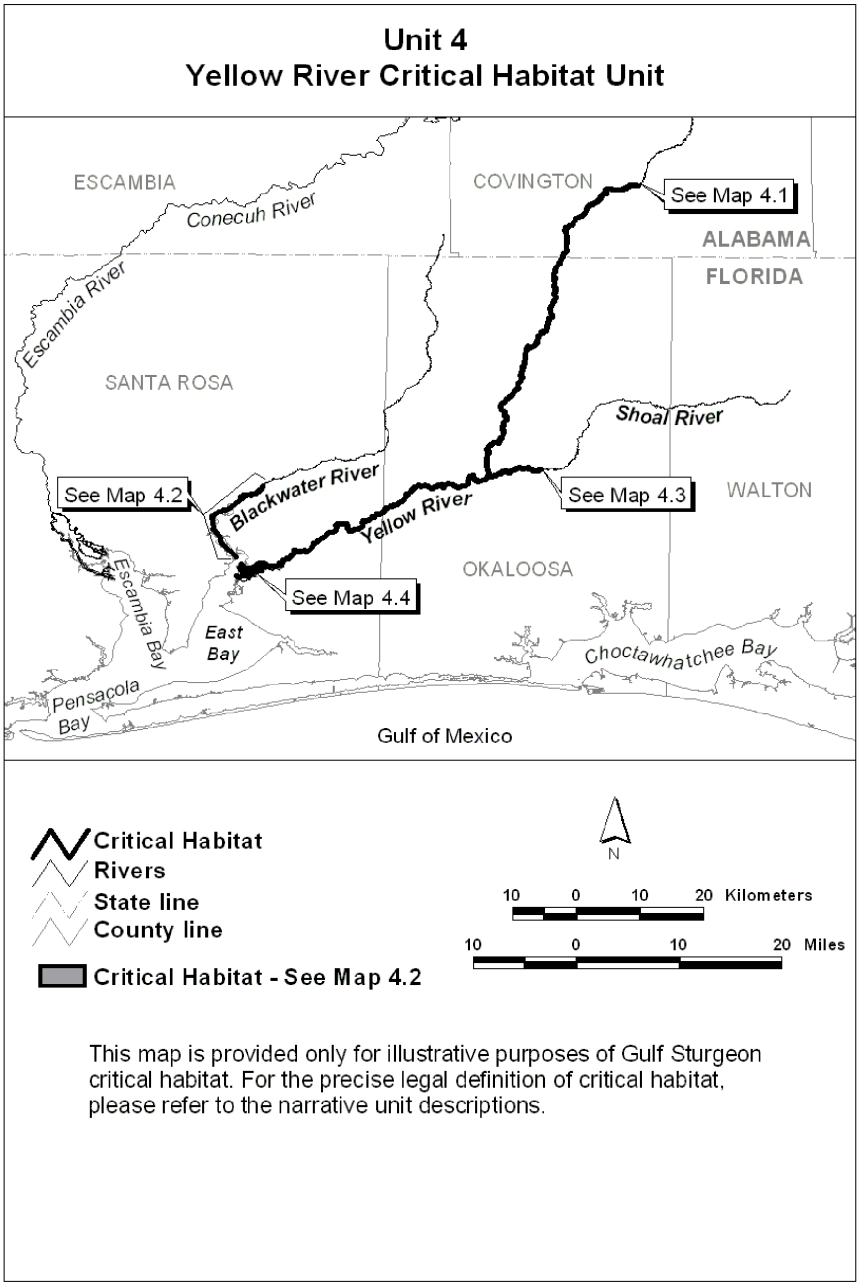


Figure 44.—Critical habitat designated for the Gulf Sturgeon in the Yellow River in Florida and Alabama. (map from USFWS)

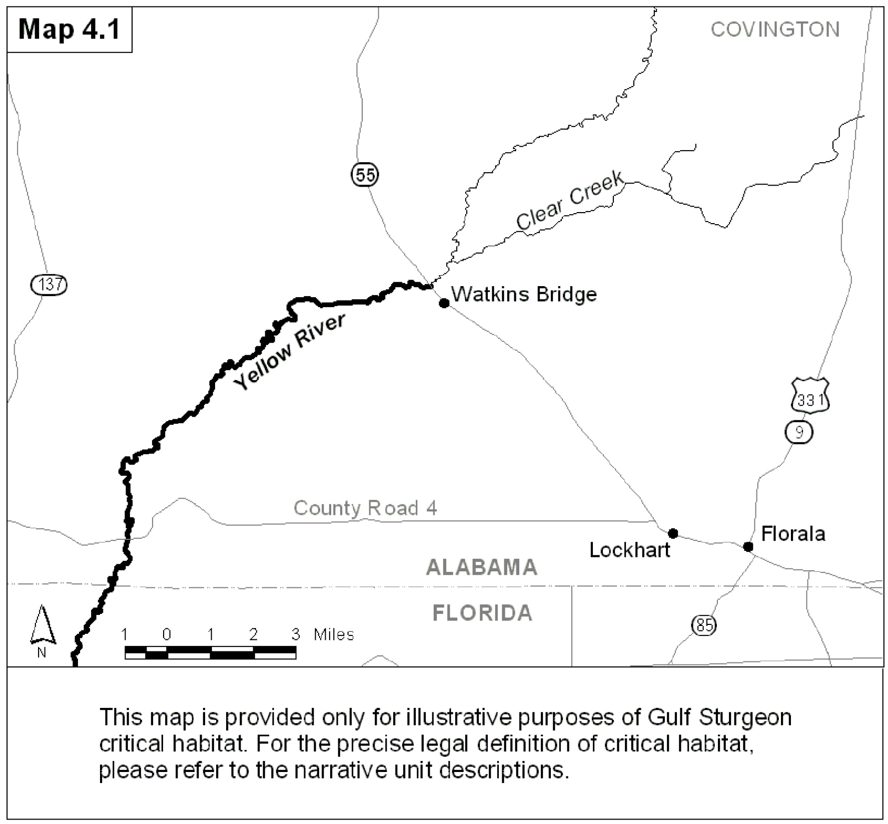


Figure 45.—Upstream portion of the Critical habitat designated for the Gulf Sturgeon in the Yellow River. (map from USFWS)

ALABAMA SHAD *Alosa alabamae*

The Alabama shad has been reported from several major tributaries of the Mississippi River and east in larger Gulf Coast river systems to the Suwannee River in northern Florida. Individuals have previously been collected in upper and lower Tombigbee, Black Warrior, Cahaba, Coosa, and Alabama Rivers within the Mobile Basin as well as the Choctawhatchee and Conecuh Rivers in Alabama. The Alabama shad is an anadromous species, with adults living in marine and estuarine environments most of year and migrating into free-flowing rivers to spawn in spring. High-lift navigational and hydroelectric dams have blocked upstream migrations to inland spawning areas, and dredging and other channel maintenance activities have eliminated other sections of their spawning habitat. As a result, populations have declined throughout much of its distribution. The Alabama Shad may be extirpated from the upper Tombigbee, Cahaba, Coosa, and upper Alabama Rivers in Alabama. Only one individual has been collected in the Black Warrior River since 1896. Only five adults have been collected below Millers Ferry Lock and Dam on the Alabama River in the past 30 years, all of which were collected following spring floods that inundated Claiborne Lock and Dam. The only known self-sustaining populations in Alabama occur in the Choctawhatchee and Conecuh Rivers. Major threats to these populations include increased sedimentation, herbicide and pesticide runoff from agricultural operations, prolonged drought, and possible reservoir construction for water supply on major tributaries. This species is of high conservation in concern in Alabama (Mettee, 2004).

IRONCOLOR SHINER *Notropis chalybaeus*

This species occupies the lowland regions of Atlantic and Gulf seaboards from the lower Hudson River drainage in New York south to vicinity of Lake Okeechobee, Florida, and west to the Sabine River drainage in Louisiana and Texas. Disjunct populations occur farther west to the San Marcos River in Texas and the Red River drainage in extreme southeastern Oklahoma and the lowlands of Arkansas. It ranges north in the Mississippi River Valley to the Wolf River in Wisconsin, and east to the Illinois River system in Illinois and Indiana and to the Lake Michigan drainage in southwestern Michigan. It usually occurs less frequently in western and northern parts of its distribution, but is sometimes locally common. Although widespread throughout

Florida, excluding the peninsula below Lake Okeechobee, it is conspicuously absent from certain streams such as the Econfina and Bear Creek systems and the upper Suwannee River drainage. This species is uncommon in Alabama, but was known in all coastal streams in Florida from the Chipola River west to the Perdido River, as well as the Mobile Delta area and lower Tombigbee and Escatawpa River systems. In Alabama it is associated with small, sluggish but clear creeks with sand substrates and abundant aquatic vegetation, as well as flowing swamps with stained acidic waters typical of coastal areas. The Ironcolor Shiner is rare, endangered, or extirpated in several states on the periphery of its distribution. Habitat degradation in the Mississippi River system may be driving small populations to extinction. Because of limited and degraded habitat, it has disappeared from historically known locations and may be extirpated from Alabama. This species is of highest conservation concern in Alabama (Boschung and Mayden, 2004).

DUSKY SHINER *Notropis cummingsae*

This species is found in blackwater coastal streams along the Atlantic Slope, from the Tar River drainage, North Carolina, to the Altamaha River drainage, Georgia, with additional, disjunct populations in the St. Johns, Aucilla Rivers, Apalachicola, and Choctawhatchee River drainages in Alabama, Florida, and Georgia. Recent records in Alabama are limited to a single tributary of the Chipola River in the Apalachicola system and the Uchee Creek system of the Chattahoochee River drainage. It prefers clear and tannic streams and small rivers with sand and mud substrata and moderate current (Kuhadja, 2004).

BLUENOSE SHINER *Pteronotropis welaka*

The Bluenose Shiner inhabits the St. Johns River, Florida and Gulf Coast drainages from the Apalachicola River system, Florida to the Pearl River system in Mississippi. In Alabama, it is known only from sporadically distributed localities in the Alabama, Cahaba, Chattahoochee, and Tombigbee Rivers and smaller coastal drainages, all below the Fall Line. It prefers small to medium streams with clear or tannic water and is associated with relatively deep, flowing water with vegetation and sand or muck substrate. Its sporadic distribution in Alabama with declining populations, its short life span and probable limited dispersal ability contribute to the vulnerability of this species.

Due to increased habitat fragmentation it is unlikely to re-colonize areas once it is extirpated. This species is of high conservation concern in Alabama (Johnston, 2004).

AMPHIBIANS

RIVER FROG *Rana heckscheri*

The River Frog is peripheral and rare in the southern portion of the Southern Pine Plains and Hills, and (potentially) the Dougherty Plain of the southernmost tier of counties in Alabama. It occurs from the Lumber and Cape Fear Rivers in North Carolina southward through Georgia to north-central Florida and west to southern Alabama and Mississippi. It is documented in Alabama from six old records in Baldwin, Mobile, Escambia and Henry Counties. It occupies land along rivers and smaller streams and in floodplains and associated swamps and overflow pools, cypress-bordered lakes, swamps, bayheads, beaver ponds, and borrow pits. It requires permanent water for breeding. Despite the abundance of appropriate habitat the scarcity of records and disjunct distribution determine its conservation status in Alabama. Loss and degradation of river floodplain habitats, intensive logging and drainage of bottomland forests and swamps and associated affects such as siltation and altered hydrologic regimes, influence to its ability to persist. It is considered to be of highest conservation concern in Alabama (Aresco, 2004).

FLATWOODS SALAMANDER *Ambystoma cingulatum*

The Flatwoods Salamander is known historically from five sites in the low pine flatwoods of the Southern Coastal Plain, the Dougherty Plain, and the Southern Pine Plains and Hills in Alabama. It ranges from South Carolina to north-central Florida and west to extreme southern Alabama. It is highly secretive and burrowing and has not been documented in Alabama in over two decades, despite surveys from 1992 to 1995. It may persist in scattered remnants of intact habitat, which continue to decline through fire suppression, development, and conversion of forest type. The flatwoods salamander is considered to be of highest conservation concern in Alabama and is a federally listed endangered species (Means, 2004a).

ONE-TOED AMPHIUMA *Amphiuma pholeter*

The One-Toed Amphiuma occurs from the eastern Gulf Coast near Tampa, Florida west to the Pascagoula River, Mississippi. It is found primarily in swampy floodplains close to the coast. It is rare, poorly known, and peripheral in Alabama. It is known from one locality each in the Southern Coastal Plain and Southern Pine Plains and Hills in Mobile and Baldwin Counties. It potentially occurs in the southern portion of the Dougherty Plain and inhabits deep liquid organic muck of alluvial soils along streams. It is considered to be of high conservation concern in Alabama (Means, 2004b).

SOUTHERN DUSKY SALAMANDER *Desmognathus auriculatus*

The Southern Dusky Salamander ranges from east Texas to North Carolina on the Coastal Plain. It is rapidly declining and possibly endangered due to unknown causes. In Alabama, it is known only from a few localities in the southernmost tier of counties where it occurs in mucky areas in gum swamps, sphagnum bogs, and forested sluggish stream floodplains. It is considered to be of highest conservation concern in Alabama (Means, 2004c).

REPTILES

COAL SKINK *Eumeces anthracinus* ssp.

The Coal Skink is found in a broad region of the eastern U.S. from Lake Erie south to the Florida panhandle and west to eastern Kansas, Oklahoma, and Texas. Two subspecies co-mingle but are rare and infrequently encountered in Alabama. It is widely distributed but limits of its distribution are incompletely known. Most Alabama records are from the Coastal Plain, but it is also documented from the Southwestern Appalachians and Ridge and Valley. It inhabits hilly terrain in mixed pine-hardwood forests, usually near water, and likely inhabits pitcher plant bogs in southern Alabama as do nearby populations in the Florida Panhandle. Some Alabama populations are *E. a. pluvialis* (Southern Coal Skink) while others are intergradient with *E. a. anthracinus* (Northern Coal Skink). It is considered to be of high conservation concern (Means, 2004d).

SOUTHEASTERN FIVE-LINED SKINK *Eumeces inexpectatus*

The Southeastern Five-lined Skink ranges from southern Maryland, Virginia, and Kentucky south to the Florida Keys and southwest to Louisiana. It is most abundant in the Coastal Plain but occurs in other regions as well. It was formerly common statewide in Alabama but is believed to be declining and potentially threatened, especially in southern Alabama. Reasons for this downward trend are unknown. It prefers relatively open, dry forestlands and is easily confused with the Common Five-lined Skink. It is of high conservation concern in Alabama (Hughes, 2004).

EASTERN INDIGO SNAKE *Drymarchon couperi*

The Eastern Indigo Snake's historic range is from South Carolina to Mississippi, but no natural populations have been documented from Alabama, Mississippi or South Carolina in recent years. It was reported historically from the Southern Pine Plains and Hills in Mobile, Baldwin, and Covington counties in extreme southern Alabama, but has not been documented from natural populations in the state since 1954. Recent reports may be from several experimental introductions in late 1970s and 1980s. It shows a seasonal preference for habitats with xeric sand ridges preferred during winter and moist forested stream bottom thickets in summer. One specimen was recently observed in southern Coffee County near Enterprise. It is a federally listed endangered species and is of highest conservation concern in Alabama (Godwin, 2004a).

RAINBOW SNAKE *Farancia erytrogramma erytrogramma*

The Rainbow Snake occurs in the Coastal Plain from Maryland and Virginia to Mississippi and Louisiana and into central Florida. It is rare and seldom encountered in its known range, which includes the Coastal Plain and possibly adjacent regions above the Fall Line Hills in Alabama. It is a large, semi-aquatic burrowing snake of rivers, large creeks, and occasionally ponds that has been recorded from fewer than 10 locations in Alabama. Because American Eels (*Anguilla rostrata*) are a major prey item, some populations may have suffered as eel numbers declined following construction of locks and dams on Alabama's rivers. It is considered to be of high conservation concern (Hughes and Nelson, 2004).

SOUTHERN HOGNOSE SNAKE *Heterodon simus*

The Southern Hognose Snake was once known from portions of the Coastal Plain and Ridge and Valley from southeastern North Carolina south to peninsular Florida and west to the Pearl River in Mississippi, but is now possibly extirpated from Alabama. It is a small, secretive snake of sandy woods, fields, and other upland habitats. Although at least 10 records from Alabama exist, none are known since 1975. Reasons for this apparent decline are unknown. The Southern Hognose Snake is declining throughout its range, but still occurs in parts of southern Georgia, South Carolina, and Florida, and may persist in very low numbers in Alabama. It is considered to be of highest conservation concern in Alabama (Jensen, 2004).

EASTERN KINGSNAKE *Lampropeltis getula getula*

The Eastern Kingsnake is found in the eastern U.S. from New Jersey to northern Florida. It is rare to uncommon, and its continued existence is possibly threatened. In Alabama, it inhabits the south-central and eastern portions of the Coastal Plain and adjacent Piedmont and is also known from Dauphin Island. It is a large, diurnal, conspicuous ground-dwelling snake of most terrestrial habitats, especially terrestrial habitats with relatively open canopies, and was once one of Alabama's most commonly encountered snakes. Along with the Speckled Kingsnake, a relative, it has declined markedly for reasons not well understood, but probably related to loss of habitat through urbanization and agricultural and silvicultural practices. It is considered to be of high conservation concern in Alabama (Means, 2004e).

EASTERN CORAL SNAKE *Micrurus fulvius*

The Eastern Coral Snake range extends from southeastern North Carolina southward through South Carolina and Georgia, all of Florida, and southern Alabama and Mississippi to extreme southeast Louisiana. It is a colorful, venomous snake principally occurring in the Coastal Plain from the Buhrstone/Lime Hills southward, but is also known from disjunct localities in the southern Ridge and Valley (Bibb and St. Clair counties) and the Piedmont (Coosa County). It spends much time underground, emerging to forage in early morning and late afternoon and inhabits a variety of terrestrial habitats having loose, friable soils. A few recent observations may indicate that this secretive species has experienced a decline in Alabama. Two more common and similarly patterned non-venomous snakes, the Scarlet Kingsnake and the Scarlet Snake, are frequently mistaken for Coral Snakes. It is considered to be of high conservation concern in Alabama (Nelson, 2004).

EASTERN DIAMONDBACK RATTLESNAKE *Crotalus adamanteus*

The Eastern Diamondback Rattlesnake is found in the Coastal Plain of the southeastern U.S. from North Carolina south through Georgia, throughout Florida and west to southeastern Mississippi, and formerly southeastern Louisiana, but probably extirpated from Louisiana. Alabama's largest venomous snake, it exploits a variety of upland habitats from extreme southern portions of the Gulf Coastal Plain to the Gulf of Mexico coast, favoring relatively dry pine flatwoods and longleaf pine-turkey oak sandhills. It overwinters in stump holes and Gopher Tortoise burrows, where it is vulnerable to "gassing" by snake hunters. It is infrequently encountered where formerly common, and is now absent from many areas of historic occurrence, probably due to modification of preferred habitat through urbanization and agricultural and silvicultural practices. It is considered to be of high conservation concern in Alabama (Means, 2004g).

ALLIGATOR SNAPPING TURTLE *Macrochelys temminckii*

The Alligator Snapping Turtle occurs in river systems from southeastern Georgia and the Florida panhandle west through most of Alabama and all of Mississippi and Louisiana. It is very rare in the Tennessee River system, uncommon to rare in streams south of the Tennessee River, and most common in the Coastal Plain in Alabama. It inhabits rivers, oxbows, and sloughs, and occasionally occurs in medium-sized creeks. It is a very large turtle that is recovering from historic commercial harvest for food, and also suffers as by-catch in commercial fishing activities. Other threats to its existence include dredging and other habitat alteration in rivers and pollution. It's relatively slow growth rate to sexual maturity and low fecundity also hinder its ability to recover to sustainable numbers. It is considered to be of high conservation concern in Alabama (Soehren and Godwin, 2004).

GOPHER TORTOISE *Gopherus polyphemus*

The Gopher Tortoise occurs in disjunct populations from southeastern South Carolina south through Georgia and peninsular Florida and west through the Florida panhandle to southern Alabama and Mississippi. It is greatly reduced from its historic abundance and is locally common in only a few protected areas. It is a large burrowing land turtle of open sandy areas in the Coastal Plain south of the Black Belt and extreme eastern Fall Line Hills. Habitat loss and degradation as well as overharvest for meat and as collateral victim of "rattlesnake roundups" threaten its continued existence. Further threats to recovery of this federally listed threatened species include slow growth to sexual maturity, low fecundity, and high incidence of egg and juvenile mortality from predation. It is considered to be of high conservation concern in Alabama (Aresco and Guyer, 2004).

BARBOUR'S MAP TURTLE *Graptemys barbouri*

Barbour's Map Turtle was until recently thought to be restricted to the Apalachicola River system, but since 1997 has been documented in the Pea and possibly Choctawhatchee Rivers. It inhabits flowing rivers almost exclusively, with greatest numbers in stretches with exposed limestone and abundant snags and stumps for basking. Occasionally found in swamps or impoundments. Alterations to occupied drainages systems makes the species very vulnerable, and impoundment and other alterations of rivers have seriously affected the species, as have pollution and depredation by humans for food and as pets. It is considered to be of high conservation concern (Godwin, 2004b).

BIRDS

RED-COCKADED WOODPECKER *Picoides borealis*

Red-cockaded Woodpeckers are endemic to pine forests of the southeastern United States and occur in highly fragmented populations from south Florida to east Texas and northward into southeast Oklahoma, south-central Kentucky, and southeast Virginia. In Alabama, Red-cockaded Woodpeckers are restricted to a few isolated areas south of the Tennessee River. The estimated population of Red-cockaded Woodpeckers in Alabama during 1990 was 157 active clusters (one or more active cavity trees maintained by one or more birds), and 120 of these clusters were in a single area - Oakmulgee District of the Talladega National Forest. Red-cockaded Woodpeckers require mature, open pine forests that are maintained by frequent (1-5 years) burning. Although extensive pine woodlands that may contain younger trees and mixed hardwoods are required for foraging, the most critical resource required is living, old-growth pines for construction of cavities. Red-cockaded Woodpeckers only nest in cavities constructed in living pines. A pine suitable for construction of a cavity must be relatively mature (≥ 80 years-old) and have been infected with red heart fungus, which causes the heartwood to become spongy and allows the woodpeckers to excavate the cavity chamber. Nesting cavities may be used for decades, but Red-cockaded Woodpeckers will abandon cavity trees if the trees die. Furthermore, the immediate area surrounding cavity trees must be free of a midstory. Red-cockaded Woodpeckers will abandon cavity trees if the crowns of smaller trees reach the height of the cavity; thus, frequent fire is important to prevent the development of a midstory. It is considered a species of highest conservation concern in Alabama (Tucker and Robinson, 2004).

HENSLOW'S SPARROW *Ammodramus henslowii*

Henslow's Sparrow breeds in grasslands that contain tall, dense grasses, a high percent coverage of standing dead vegetation, and relatively few shrubs. Henslow's Sparrows in Illinois have been found to occupy both native and non-native grasslands, and size of grasslands appears more important than vegetation composition - grasslands smaller than 100 ha (247 acres) were rarely occupied by Henslow's Sparrows. The eastern subspecies primarily breeds in drier margins of salt marshes and wet meadows. Wintering habitats of Henslow's Sparrow predominantly consist of open longleaf pine savannas, primarily coastal savannas and pitcher plant bogs. Habitats occupied by Henslow's Sparrows during both the breeding and non-breeding seasons require frequent disturbances to maintain a dense herbaceous ground cover and to prevent encroachment of shrubs. Densities of Henslow's Sparrows wintering on pitcher plant bogs in south Alabama and northwest Florida have been found to be greatest the first winter after burning. Although Henslow's Sparrows were commonly found on bogs during the second winter after growing season fires, they were rarely found on bogs burned during winter except during the first winter post-burning. Productivity of grass seeds and density of forbs appeared to be the most influential factors affecting presence of Henslow's Sparrows on pitcher plant bogs. Data from the North American Breeding Bird Survey indicate that Henslow's Sparrows have suffered some of the most drastic population declines of any bird species in North America for over 30 years. Although most of these declines can be attributed to loss of breeding habitat, loss of wintering habitat may also be a contributing factor. For example, over 97% of Gulf Coast pitcher plant bogs, a major wintering habitat of Henslow's Sparrows, have been destroyed or severely altered. Primary winter habitats are coastal savannas and pitcher plant bogs. It is considered a species of highest conservation concern in Alabama (Tucker, 2004a).

AMERICAN KESTREL *Falco sparverious*

American Kestrels are widely distributed throughout North America. Their wintering distribution covers approximately the southern half of the breeding distribution; some birds in the southern portions of their distribution do not migrate and are permanent residents. The distribution of *F. s. paulus* extends from southern Louisiana east through Mississippi and Alabama to Florida (except for the extreme southern tip) and Georgia, and north into South Carolina. Within all these states, except Florida, *F. s. paulus* is generally confined to the coastal plain. American Kestrels use a myriad of open to semi-open habitat types including woodland borders, meadows, grasslands, deserts, early old field succession, open parkland, farmlands, cities, and suburbs. Prime breeding habitats generally include large or small patches of short ground vegetation with sparsely distributed woody vegetation. Suitable nesting trees with cavities and perches are required. *F. s. paulus* appears to have been restricted to the longleaf pine-turkey oak-wire grass and sandhill communities originally. These were maintained by periodic fire that resulted in a dynamic mosaic of openings suitable for foraging and large pine snags for nesting. With introduction of readily used nest boxes, Kestrels currently breed in a variety of previously unoccupied habitats characterized by good foraging quality (openings with short ground vegetation), but lacking nest cavities (e.g., expansive prairies, boreal forest-tundra ecotones, drained wetlands, clear-cuts, reclaimed areas, airports). In Alabama, resident populations of *F. s. paulus* have dwindled from being "locally common" during the early 1900's to "rare to uncommon" by the 1970's to virtually nonexistent today. Exact causes of the population decline are unknown, but loss of breeding sites (cavities for nesting) and foraging habitat (openings with short ground vegetation) are suspected. Much of the habitat deterioration in southern Alabama can most likely be attributed to the loss of the longleaf pine-turkey oak-wire grass community, and the nesting snags and foraging sites produced in this fire-maintained successional disclimax. Other human activities such as shooting, pesticide and toxin use, and collisions with both stationary and moving objects also may have contributed to decreasing numbers. Although American Kestrels are the most abundant North American falcons and are secure throughout most of their geographical distribution, the southeastern subspecies (*F. s. paulus*) was formerly designated Category II by the U. S. Fish and Wildlife Service before Category II listings were eliminated in 1996. Currently the subspecies is listed as Threatened in Florida and a Species of Special Concern in Mississippi. It is considered a species of high conservation concern in Alabama (Mirarchi and Shelton, 2004a).

AMERICAN WOODCOCK *Scolopax minor*

The American Woodcock ranges throughout eastern boreal forests of North America from Manitoba to Labrador, south to Florida, and west to eastern Texas. It winters irregularly throughout southern portions of this region based on food availability and accessibility. It usually winters from Maryland to eastern Virginia and south. It breeds primarily in the northern region of its distribution. It is considered a local, uncommon permanent resident in Alabama. It inhabits fields and various openings for roosting, feeding and breeding, depending on time of day and season. Prime breeding habitats include young forests and abandoned farmlands mixed with forests. It nests in lowland floodplains in open grown, mixed pine-hardwood forests. It generally feeds in hardwood forests with dense understory and rich soils. Regional trend data suggest populations are decreasing quickly, due to losses of habitats on breeding and wintering grounds, changes in land use patterns, weather, and possibly hunting, as in the rest of its range. It is considered a species of high conservation concern in Alabama (Mirarchi and Shelton, 2004b).

NORTHERN HARRIER *Circus cyaneus*

The breeding range for the Northern Harrier is large but often highly discontinuous. In North America, the range is from northern Alaska to northern Saskatchewan and southern Quebec; south to northern Baja California, southern Texas, southern Missouri, West Virginia, southeastern Virginia, and North Carolina (formerly Florida). The Northern Harrier also breeds widely in Eurasia. The Northern Harrier has a wintering range in North America from southern Canada or the northern contiguous U. S. south through the U. S., Central America, and the Antilles to northern Colombia, Venezuela, and Barbados. In Alabama, this hawk is fairly common in winter, spring, and fall in all regions of Alabama. Breeding habitats are open wetlands, including marshy meadows; wet, lightly grazed pastures; old fields; freshwater and brackish marshes; also dry uplands, including upland prairies, mesic grasslands, drained marshlands, croplands, cold desert shrub-steppe, and riparian woodlands. In both wetland and upland areas, densest populations are typically associated with large tracts of undisturbed habitats dominated by thick vegetation growth. Wintering harriers use a variety of open habitats dominated by herbaceous cover, including deserts, coastal sand dunes, dry plains, upland and lowland grasslands, salt- and freshwater marshes, croplands, pasturelands, abandoned fields, and open-habitat floodplains. Harriers select habitats on the basis of availability and abundance of prey species. Christmas Bird Count and Breeding Bird Survey data indicate population declines of Northern Harriers in North America in the 20^{th} century. Declines are primarily attributed to habitat degradation (e.g., draining of wetlands, monotypic farming, and reforestation of farmlands.) Harrier populations in North America have also been negatively affected by organocholorine pesticides. The declines of both breeding and migrating harriers and the occurrence of behavioral changes coincided with the heavy use of DDT in North America. The status designation of high conservation concern in Alabama is based on scores for three factors, namely relative abundance, threats to breeding populations, and population trend. This species occurs in low relative abundance in all parts of its breeding and wintering ranges. Severe deterioration in the future suitability of breeding conditions in the Appalachian Mountains, Central Hardwoods, and Piedmont is expected. Christmas Bird Count data indicate a possible moderate decrease of wintering Northern Harrier populations in

Alabama. Harrier hunting habitats must be capable of providing an adequate prey base for breeding, wintering, and migrating birds. The maintenance of early successional stages is recommended. Burning, grazing, mowing, and disking may be used to encourage early successional stages. Small mammals prefer abandoned fields and other disturbed habitats with vegetation cover consisting of dense grasses and weeds. In contrast, extensive croplands and hayfields that are subject to several annual cuttings may depress small mammal populations. It is considered a species of high conservation concern in Alabama (Kittle, 2004a).

AMERICAN BLACK DUCK *Anas rubripes*

In Canada, American Black Ducks breed from Hudson Bay in northeast Manitoba throughout Ontario, Quebec, and the Maritime Provinces, and locally in southern Saskatchewan, southwest British Columbia, and Alberta. In the U.S., it breeds from the Canadian border south to northeast Minnesota, northern Wisconsin, southern Michigan, northern Ohio, northeast West Virginia, Maryland, Delaware, and coastal areas of Virginia and North Carolina. A few pairs breed locally at Wheeler National Wildlife Refuge in northwest Alabama. It winters from the southern portion of its breeding range south to northern Florida and the Gulf Coast, and west to parts of Iowa, north and eastern Missouri, eastern Arkansas, and Mississippi. It is rarely observed west of Mississippi and eastern Arkansas. American Black Ducks wintering in Alabama can be found throughout the state, but are most common at Wheeler National Wildlife Refuge and throughout the Tennessee Valley region. American Black Ducks use a variety of habitats during the breeding season. In coastal areas they use salt marshes, coastal meadows, brackish and freshwater impoundments, and riverine marshes. Inland they use most types and sizes of freshwater woodland wetlands, including beaver ponds, shallow lakes with emergent vegetation, bogs, and wooded swamps. Females with broods use shallow, permanent wetlands with emergent and floating-leaved plants. Brackish marshes are used by broods in the Chesapeake Bay region, along the Atlantic coast, and in the St. Lawrence Estuary. During migration and in winter, American Black Ducks use river floodplains with forested wetlands, agricultural fields, and palustrine wetlands. In the New England states and Maritime Provinces, tidal habitats are used exclusively in winter. Fresh and brackish impoundments, salt marsh, and tidal habitats are used in the mid-Atlantic region. Survey results indicate that Black Duck numbers declined 63% in the Mississippi Flyway and 43% in the Atlantic Flyway from the late 1950s to the early 1990s. Numbers stabilized and began to increase when restrictive harvest regulations were imposed. Christmas Bird Count data suggest that Black Duck numbers have declined in Alabama since the 1970s. Black Ducks and Mallards readily hybridize, and hybridization with Mallards may be partly responsible for the decline of Black Ducks. It is considered a species of high conservation concern in Alabama (Hepp, 2004).

SWALLOW-TAILED KITE *Elanoides forficatus*

Two subspecies of Swallow-tailed Kites are recognized and debated, *E. f. forficatus* and *E. f. yetapa*, with only the nominate race occurring in the southeastern United States. The northern subspecies (*E. f. forficatus*) formerly bred throughout the southeast and along the major drainages of the Mississippi Valley as far north as Minnesota, and as far east as Ohio, encompassing as many as 21 states. Today, they breed locally in seven southeastern states from South Carolina south to the upper Florida Keys, and west along the Gulf coastal plain to Louisiana and east Texas. In Alabama, they are found primarily in the floodplain forests along the lower Alabama and lower Tombigbee Rivers, and Mobile-Tensaw River Delta. It winters locally in the northern two-thirds of South America. The Swallow-tailed Kite requires tall, accessible trees for nesting adjacent to open areas for foraging. A myriad of habitats may be used, but essential key features include uneven-aged forest stands adjacent to mosaics of freshwater wetland areas where there is an abundance of small prey items. Physical structure of landscape is more important than specific plant community types. Edges of pine forest adjacent to riparian and swamp forest are especially important. In Alabama, Swallow-tailed Kites prefer tall deciduous trees on natural levees along major river floodplain systems and in mature cypress-hardwood swamps within the Mobile-Tensaw River Delta for nesting. Swallow-tailed Kites forage on the wing and have a diet consisting of insects, frogs, lizards, nestling birds, snakes, and small mammals. The U.S. population of Swallow-tailed Kites has declined significantly in size and distribution since the early 20th century, and trends for the remaining, disjunct populations in the seven southeastern states where they are still known to occur are presently unknown. Loss of habitat, indiscriminate shooting, and low reproductive rates are believed to be the primary reasons for the species decline. Probably no more than 5,000 individuals, including nonbreeding adults and fledged young, remain at the end of each nesting season. The greatest threat to Swallow-tailed Kites in Alabama is the loss or degradation of habitat. Their social behavior and strong philopatry to specific breeding and roost areas also makes them especially sensitive to disturbance. The Swallow-tailed Kite is currently listed as extirpated from Arkansas, endangered in South Carolina, threatened in Florida and Texas, rare in Georgia, imperiled in Mississippi, and a species of conservation concern in Louisiana. The status designation in Alabama is based on its low relative abundance, locally clumped distribution, specialized habitat requirements, and the potential threats of disturbance or destruction to its breeding and communal roost locations. It is a species of high conservation concern in Alabama (Soehren, 2004a).

WOOD STORK *Mycteria americana*

In North America the Wood Stork is a resident of the southeast. It occurs along the Gulf coast from eastern Texas to Florida and along the Atlantic coast from Florida to South Carolina. Some individuals, especially juveniles, wander north after breeding up the Mississippi Valley to Arkansas and west Tennessee, along the Atlantic coast to North Carolina, and even occasionally as far north as Canada. In Central America, it resides from southern Sonora south along coastal lowlands and islands to South America. In the West Indies, it occurs in Cuba and Hispaniola. In South America, it is found in western Ecuador, eastern Peru, Bolivia, and northern Argentina. Wood Storks are found primarily in freshwater habitats, such as marshes, swamps, lagoons, ponds, and flooded fields and ditches. During extended drought, depressions in marshes and brackish wetlands have an increased importance. Nesting colony sites are usually freshwater and marine-estuarine forested habitats. Nests primarily in upper parts of bald cypress, mangroves, or dead hardwoods over water. The U. S. Wood Stork populations have declined precipitously in the last fifty years, especially in Florida. Causes for Wood Stork decline in south Florida include habitat degradation due to urban and agricultural expansion, and unnatural water management practices. In central Florida, the loss of cypress swamps that are used for nesting has affected Wood Stork populations. The wetlands of the Coastal Plain of Alabama provides important habitat for Wood Storks that disperse from breeding areas in late May and during times of drought and disturbance. Although Wood Stork breeding has not been documented in Alabama, it may breed in the state. Full recovery of the Wood Stork in the U. S. will require the protection of breeding areas and important foraging sites. Although breeding colonies in northern Florida, Georgia, and South Carolina are important, the colonies are small and somewhat vulnerable to failure. It is considered a species of high conservation concern in Alabama (Major, 2004).

SHORT-EARED OWL *Asio flammeus*

This is one of the world's most widely distributed owls. In North America, the breeding range is from northern Alaska and Canada south to the eastern Aleutian Islands, southern Alaska, central California, northern Nevada, Utah, northeastern Colorado, Kansas, Missouri, southern Illinois, western Kentucky, southern Indiana, central Ohio, Pennsylvania, New Jersey, and northern Virginia. The Short-eared Owl has a wintering range in North America from southern Canada to southern Baja California, Oaxaca, Puebla, Veracruz, the Gulf coast, southern Florida, and the Greater Antilles and Cayman Islands. In Alabama, this owl is rare in winter, spring, and fall in the Tennessee Valley and Inland Coastal Plain regions and is casual in the Gulf Coast region. Breeding habitats are in open country, and include prairie, meadows, tundra, shrub-steppe, marshes, agricultural areas, and savanna. Wintering habitats are also primarily in open country, and include tall grass, weedy fields, savannas, stubble fields, and shrub thicket. Short-eared Owls have declined in many regions of North America, especially the northeastern United States, apparently due mostly to loss of habitat from human activities. The status designation in Alabama is based on three factors, namely relative abundance, threats to nonbreeding populations, and winter population trend. This species occurs in low relative abundance in all parts of its breeding and wintering ranges. Severe deterioration in the future suitability of nonbreeding conditions is expected in all bird conservation regions that occur in Alabama. Population trend data for wintering Short-eared Owls indicate a large population decrease in all bird conservation regions that occur in Alabama. Short-eared Owl hunting habitats must be capable of providing an adequate prey base for breeding, wintering, and migrating birds. It is considered a species of high conservation concern in Alabama (Kittle, 2004b).

WOOD THRUSH *Hylocichla mustelina*

The breeding range of the Wood Thrush is from southeastern North Dakota and central Minnesota across the northern U.S. and adjacent southern Canada to Nova Scotia; south to eastern Texas, the Gulf of Mexico coast, and northern Florida; and west to eastern South Dakota, central Nebraska, central Kansas, and eastern Oklahoma. The Wood Thrush winters mostly in primary, broad-leaved forests at lower elevations from southern Texas south through eastern Mexico and Central America to Panama and northwestern Colombia. In Alabama, this species is common in spring, summer, and fall in all regions. In the Gulf coast region, it is occasional in early winter. The breeding habitats are deciduous or mixed forests with a dense tree canopy and a fairly well-developed understory, especially where moist. Bottomlands and other rich hardwood forests are prime habitats. The Wood Thrush also frequents pine forests with a deciduous understory and well-wooded residential areas. In migration and winter, habitats include forests and woodlands of various types from humid lowland to arid or humid montane forest, also scrub and thickets. Breeding Bird Survey data indicate a significant population decrease over much of its range since the late 1970s. Habitat degradation and fragmentation in both breeding and wintering areas are the biggest threats to this species. With loss of habitat and increased conversion to agriculture and pine plantations, both brood parasitism and nest predation increase. The Brown-headed Cowbird is a serious threat, causing significant population declines throughout much of the range. Loss of tropical forests may also contribute significantly to regional declines in temperate North America.

The status designation is based on three factors, namely distribution of non-breeding populations, threats to non-breeding populations, and population trend. This species has a relatively narrow non-breeding distribution, and non-breeding populations are threatened because human alteration of tropical, broadleaved forests is expected. Breeding Bird Survey data demonstrate a large population decrease in the Central Hardwoods Bird Conservation Region, and possible or moderate population decreases in the Appalachian Mountains, Piedmont, and Southeastern Coastal Plain bird conservation regions. Additionally, in the Appalachian Mountains, severe deterioration in the future suitability of breeding conditions is expected. The key habitat requirement is mature forest with an understory of deciduous shrubs or saplings. Bottomland or other rich hardwood forests are prime examples, although pine forests with a deciduous understory and well-wooded residential areas are also used. The importance of protecting large unfragmented forests for breeding habitat cannot be overstated. Where possible, forest preserves should be on the order of 100+ ha with few road cuts, with much larger preserves preferred. Silvicultural practices that open the canopy will probably be detrimental. It is considered a species of high conservation concern in Alabama (Kittle, 2004c).

WORM-EATING WARBLER *Helmitheros vermivorus*

The breeding range of the Worm-eating Warbler is discontinuous from northeastern Kansas and southeastern Nebraska east across the southern Great Lakes region to southern New England, south to northeastern Texas, southcentral Alabama, northwestern Florida, and South Carolina. The Worm-eating Warbler winters from sea level to 1,500 m in southern Mexico and on the Atlantic and Pacific slopes of Central America south to central Panama. It also winters on Bermuda and in the West Indies (Bahamas, Greater Antilles, Virgin Islands, Cayman Islands). In Alabama, this species is uncommon in spring, summer, and fall in the Tennessee Valley and Mountain regions. In the Inland Coastal Plain region, it is uncommon in spring and fall, and rare in summer. In the Gulf Coast region, it is fairly common in spring, uncommon in fall, and rare in late summer. This species breeds in large tracts of deciduous and mixed forest, particularly those with moderate to steep slopes and patches of dense understory shrubs, although breeding populations also occur in low elevation coastal forests. In migration, it occurs in various forest, woodland, scrub, and thicket habitats. In winter, it inhabits shrub and subcanopy layers of a variety of forest types. The status designation is based on three factors, namely relative abundance, distribution of non-breeding populations, and threats to non-breeding populations. For all regions that are found in Alabama this species occurs in low relative abundance and populations appear to be patchily distributed. It has a relatively narrow non-breeding distribution, and non-breeding populations are threatened because human alteration of tropical, broadleaved forests is expected. This species is highly vulnerable to population decreases because of its dependency on large tracts of unfragmented forest for nesting. In the Central Hardwoods, severe deterioration in the future suitability of breeding conditions is expected. The Worm-eating Warbler probably requires large (300-1,000 ha) tracts of deciduous forest for successful reproduction and high productivity. The species is probably tolerant of many different forest management and logging practices except for large-scale clear cutting. It is considered a species of high conservation concern in Alabama (Kittle, 2004d).

SWAINSON'S WARBLER *Limnothlypis swainsonii*

Swainson's Warbler breeds locally from southeastern Oklahoma, southern Missouri, and southern Illinois east to west Tennessee, north Alabama, and into the southern Appalachian Mountains of north Georgia, east Tennessee, and western North Carolina, north to eastern Kentucky and southern West Virginia, east to southeastern Maryland, and south throughout the Atlantic and Gulf Coastal Plains from Virginia to north Florida to eastern Texas. It winters primarily in the West Indies and Central America. In Alabama, Swainson's Warbler breeding distribution is statewide wherever suitable habitat exists except in the southern portions of Mobile and Baldwin Counties. Swainson's Warbler is found in greatest densities in floodplain forests that have extensive understory thickets containing vegetation such as saplings, vines, shrubs and giant cane. The species prefers areas with moist organic soils that are covered with an abundance of leaf litter, shaded at ground level, and not flooded during the breeding season. Although large canebrakes in bottomland forests provide prime breeding habitat, other prime breeding areas have been found to contain little or no giant cane. Additional habitats include: fragments of old growth bottomland forests, early seral stages of deciduous bottomland forests, young pine plantations with deciduous components, second growth bottomland forest with scrub palmetto undergrowth, dense thickets of rhododendron, mountain-laurel in the Appalachian Mountains, and hardwood cove forests in the Appalachians. It winters in montane forests, humid bottomland forests, and mangroves where dense undergrowth and extensive leaf litter exists. As denizens of canebrakes and swampy tangles, Swainson's Warblers remain one the most secretive and poorly known species of all North American songbirds. Habitat destruction resulting from extensive timber harvest, conversion of bottomland hardwood forests and canebrakes to agriculture fields, pine plantations, reservoirs, and housing developments has negatively impacted local populations. Further, increased forest fragmentation resulting from clear-cutting, power and gas line right-of-ways, and creation of roads has probably increased the incidence of brood parasitism by the Brown-headed Cowbird. Currently, Swainson's Warbler is listed as a species of concern in most states throughout its breeding range and is considered by some the second most endangered breeding songbird in the southeast. The status designation of high conservation concern in Alabama is based on its low relative abundance, its limited breeding and wintering distribution, and current and future threats to breeding and wintering habitats. It is considered a species of high conservation concern in Alabama (Soehren, 2004b).

KENTUCKY WARBLER *Oporonis formosus*

Kentucky Warblers breed virtually throughout the eastern U.S. extending north to Wisconsin, Michigan and New York and west to Texas, Oklahoma and the edge of Nebraska. They are absent as breeders from the Florida peninsula. Based on breeding bird survey data, the centers of abundance of Kentucky Warblers are the Ohio River Valley and the south-central U.S. including Arkansas, Louisiana, and Mississippi. Kentucky warblers winter in Central America from the Atlantic states of Mexico to Panama. Kentucky Warblers require relatively large patches of forest. In Missouri, at least 500 ha of continuous habitat are required for successful breeding, with a preferred habitat of mature bottomland hardwoods with an open midstory and dense understory. Kentucky warblers are not generally found in dense young riparian stands, and they are generally absent from the dry oak/hickory/pine forests. However, in Bankhead National Forest, Alabama, Kentucky Warblers have been found to be common in upland, 20-year-old loblolly pine stands that supported a dense layer of poplar/sweetgum 0.5 to 1.5 m in height. Soil moisture will likely dictate whether pine plantation lands have the potential to support breeding Kentucky Warblers, with the ability to develop a densely vegetated groundcover the key determining factor. In Alabama, Kentucky Warblers have declined steadily in abundance over the past four decades. It remains a relatively common and widespread bird, existing in increasingly localized populations with virtually the entire habitat in the state at risk for development or timber extraction. If the present declines continue, the species will certainly rise in priority ranking and possibly receive higher status designation. The status designation is based on its low relative abundance, limited wintering distribution, and significantly decreasing population trend. Of greatest concern for the conservation of the Kentucky Warbler and other hardwood forest birds in Alabama is the ongoing conversion of hardwood forest to pine plantation, which permanently destroys habitat for Kentucky Warblers. The clear cutting of hardwood forests for wood chips for paper production causes short-term loss of habitat, but may in fact be an incentive to allow more acres of hardwood forest to grow. It is considered a species of high conservation concern in Alabama (Hill, 2004).

BACHMAN'S SPARROW *Aimophila aestivalis*

Bachman's Sparrow inhabits the southeastern United States. Most breeding populations occur in the Coastal Plain and Piedmont from southeast Virginia to central Florida and west into Arkansas and eastern Texas, but small populations breed in south central Missouri, Kentucky, and Tennessee. The species expanded its range northward in the late 1800's and early 1900's, coinciding with heavy destruction of longleaf pine forests in the South and abandonment of farmlands in the North. The range began contracting by 1930 and is now similar to the historical range, but many populations are relatively small and isolated. Northern populations are migratory and spend the winter with resident populations in the Gulf of Mexico states from east Texas to Florida and north along the Atlantic Coast into North Carolina. Nonbreeding populations are very secretive, so the status of winter populations is not precisely known. Bachman's Sparrows are most frequently found in open pine forests that contain a diverse ground cover of herbaceous vegetation. Bachman's Sparrows may also occur in clearcuts the first 4-7 years after cutting, but clearcuts soon become unsuitable as they become dominated by trees and shrubs; furthermore, clearcuts are unlikely to become colonized unless they are in close proximity to stands that contain breeding Bachman's Sparrows. A key component determining habitat suitability for Bachman's Sparrows is a high percentage of ground cover composed of perennial grasses that grow in distinctive clumps. Pine forests with a relatively open canopy (≤ 50%) and frequent burning (every 2-3 years) are the habitats supporting the largest populations of Bachman's Sparrows. Although most populations probably were found in longleaf pine forests during historic times, Bachman's Sparrows also do well in relatively young (≥ 15 years-old) stands of other southern pines if the stands are managed to maintain an open canopy and are frequently burned. Frequent burning to prevent the understory from becoming dominated by woody vegetation (trees, shrubs, and vines) is the key to maintaining the diverse ground cover of herbaceous vegetation required by Bachman's Sparrows. Threats to Bachman's Sparrow in Alabama are similar to threats throughout its range. Although common in many areas with suitable habitat, many areas with apparently suitable habitat are unoccupied by Bachman's Sparrows because of habitat fragmentation and isolation from breeding populations. Range-wide, over 95% of the primary habitat of Bachman's Sparrows (i.e., longleaf pine forests) have been lost and much of the remaining habitat has been degraded by suppression of fire. The loss of suitable habitat has resulted in declining populations of Bachman's Sparrows, and many remaining populations are threatened by small population sizes, fire suppression, and direct loss to changing land uses. Although eventual re-establishment of longleaf pines should be a goal, vast acreages of off-site pine forests could be managed to benefit Bachman's Sparrows and many other associates of longleaf pine communities by implementing programs that include thinning canopy trees and frequent prescribed burning. It is considered a species of high conservation concern in Alabama (Tucker, 2004b).

MAMMALS

BLACK BEAR *Ursus americanus*

The Black Bear once ranged over most of North America but now is restricted to rugged, isolated habitats where human densities are low. The subspecies found in south Alabama, *Ursus americanus floridanus*, occurs in patches along the Gulf of Mexico coast and in Florida and southern Georgia. Preferred habitats of black bears in south Alabama are dense thickets along waterways and swamps, though habitat preferences change with seasonal food shifts and water levels. Declining available habitat due to human encroachment and inbreeding are primary threats to the restricted population in Alabama. It is a species of highest conservation concern in Alabama (Mitchell, 2004).

GRAY MYOTIS *Myotis grisescens*

The Gray Myotis, or Gray Bat, ranges from Illinois to northern Florida and from eastern Oklahoma to western Virginia and western North Carolina. It is common in

Alabama only near the Tennessee River, but populations do occur in central and south Alabama. The Gray Myotis generally roosts in caves, but has been reported to roost in barns, dams, and storm drains. It is generally found near water where it drinks and forages for insects. In winter it hibernates in deep, vertical caves with large rooms acting as cold air traps, and in summer it forms colonies of a few hundred individuals in large caves with streams. Maternity colonies are found in caves that trap warm air or have configurations that permit the bats to share body heat. Disturbance by humans and vandalism, as well as large-scale destruction of habitat and pesticide pollution, are reasons for its decline not only in Alabama but throughout its range. About 95 percent of Gray Myotis hibernate in nine caves, only one of which occurs in Alabama (Fern Cave, Jackson County). It was federally listed as endangered in 1973, and is a species of highest conservation concern in Alabama (Best, 2004a).

LITTLE BROWN MYOTIS *Myotis lucifugus*

The Little Brown Myotis is the most widespread Myotis in North America, ranging from northern Alaska to northern Florida and from the Atlantic to the Pacific Oceans, absent only in the lower Great Plains, extreme southwest, and coastal reaches of North and South Carolina. It is uncommon throughout the southern portion of its range, including Alabama, where it has not been observed in 15 years. Based on its broad distribution in Alabama and abundance elsewhere, it should be common in Alabama. It nests in tree cavities, beneath rocks, in woodpiles, crevices, caves, and man made structures. It is a species of high conservation concern in Alabama (Best, 2004b).

SOUTHEASTERN MYOTIS *Myotis austroriparius*

The Southeastern Myotis ranges from South Carolina south to northern Florida and west to east Texas and Oklahoma, and up the Mississippi River Valley to southern Illinois and Indiana. In Alabama it appears to be restricted to the Coastal Plain during the summer, but has been collected in caves in north and south Alabama during the winter. It prefers riparian zones and edge habitats, and may roost in buildings, culverts, wells, tree cavities, and bridges. Maternity colonies are restricted to a few limestone caves in the

Coastal Plain. Its life history is poorly known and it is a species of high conservation concern in Alabama (Lewis, 2004).

NORTHERN YELLOW BAT *Lasiurus intermedius*

The Northern Yellow Bat is primarily known in the Coastal Plain and ranges from South Carolina to Central America in that habitat, with a few disjunct populations in that habitat in New Jersey, Virginia, and North Carolina. It is closely identified with Spanish Moss and therefore is probably restricted to the extreme southern portion of Alabama. It is usually found in mixed forests near water, and it roosts under dead fronds of cabbage palm trees and in Spanish Moss in live oaks or longleaf pine and turkey oaks. It is known to forage over large fields, marshes and savannah-like habitats in Florida. Lack of substantial data on life history and ecology of this species in Alabama make it a species of high conservation concern in Alabama (Henry, 2004).

BRAZILIAN FREE-TAILED BAT *Tadarida brasiliensis*

The eastern subspecies of the Brazilian Free-tailed Bat, *Tadarida brasiliensis cynocephala* is found primarily in the Coastal Plain and Piedmont in Alabama and other portions of the southeastern U.S., ranging from southeastern Virginia to east Texas. It rarely if ever uses caves, and is almost totally dependent on human-made structures for summer and winter roosts. It is frequently found in attics and walls of masonry and wooden structures, and in expansion joints of bridges and sports stadiums. It has been found in large, hollow trees and in mangrove trees in Louisiana and Florida. Throughout the southeastern U.S. the species is locally common, but few secure roost sites are known. It has suffered from deliberate destruction of colonies by man, from exclusion from buildings, from destruction of abandoned buildings, and from pesticide exposure. It is a species of high conservation concern in Alabama (Kiser, 2004).

RAFINESQUE’S BIG-EARED BAT *Corynorhinus rafinesquii*

Rafinesque’s Big-Eared Bat ranges from central Illinois and Indiana south to the Gulf of Mexico and from eastern Oklahoma and Texas to the Atlantic Ocean. It once ranged throughout Alabama and was found in a variety of forested habitats from tupelo gum-bald cypress swamps near Mobile Bay to pine-deciduous forests in north Alabama.

It uses caves, trees, and other natural places for roosts but has been known to occupy abandoned buildings and other man made structures, sometimes partially lighted. It hibernates in caves, mines, cisterns, and wells. It is uncommon throughout its range, including Alabama, and its habitats and life history needs are poorly known. It is a species of highest conservation concern in Alabama (Best, 2004c).

MARSH RABBIT *Sylvilagus palustris*

The Marsh Rabbit is found in the Coastal Plain from southeastern Virginia to Mobile Bay, including peninsular Florida. In Alabama scattered records exist from the very southern tier of counties along the Florida border. It occupies habitats supporting brackish marshes in coastal areas and barrier islands and freshwater marshes along rivers, lakes, and swamps as well as wet bottomlands and dense hammocks. Very little information on life history and ecology exists for Alabama populations and most information available is from museum records from the early 1900s to 1981. Most Alabama populations exist in southern Baldwin County. Specialized habitat requirements, peripheral distribution in Alabama, and preference for undisturbed marshes make the species persistence or ability to disperse tenuous. It is considered a species of high conservation concern in Alabama (Hart, 2004).

SOUTHEASTERN POCKET GOPHER *Geomys pinetis*

The Southeastern Pocket Gopher is found in the southeastern U.S. and ranges from central and northern Florida across southern and central Alabama and Georgia. In Alabama it is restricted to the Coastal Plain east of Mobile Bay and in the vicinity of the Tombigbee and Black Warrior River systems. It inhabits dry, sandy ridges or xeric hammocks with longleaf pine, turkey oak, and live oak overstory. Low reproductive capacity, diminishing range due to changing land use patterns and intensified agricultural and silvicultural practices, and fragmentation of populations have caused the decline or elimination of populations of the Southeastern Pocket Gopher across its former distribution. One important factor is the reduction in occurrences of fire, which favors overstory and reduces the availability of preferred foods such as grasses, legumes and other herbaceous species. It is considered a species of high conservation concern in Alabama (Jordan, 2004).

LONG-TAILED WEASEL *Mustela frenata*

The Long-tailed Weasel occurs from southern Canada to Bolivia with the exception of northern Maine and a large section of the arid southwestern U.S. and Mexico. The subspecies found in Alabama also occurs in Mississippi, Georgia, South Carolina, and northern Florida. Its preferred habitats include dense understories, edges and areas along waterways, but its occupation of these habitats is driven by availability of prey species. Little is known of this species due to its secretive nature. It was formerly known statewide but recently (since 1988) has been documented only in rural counties with rugged, hilly terrain in north Alabama or with dense bottomland forests in south Alabama. It is considered a species of high conservation concern in Alabama (Mitchell and Sievering, 2004a).

EASTERN SPOTTED SKUNK *Spilogale putorius*

The Eastern Spotted Skunk occurs from the Gulf Coast northward along the southern Appalachian Mountains into Pennsylvania. It inhabits rocky, shrubby, and forested areas with extensive vegetative cover and an abundance of dense understory, ground litter, and insects and rodents. It prefers dry habitat but also occupies palmetto thickets and barrier islands. Declining populations and dearth of life history and ecological information make this a species of high conservation concern in Alabama (Mitchell and Sievering, 2004b).

HABITAT QUALITY

The type and quality of habitat in aquatic environments is a major factor determining biological conditions. Poor and (or) degraded habitat will result in poor biological conditions, reduced fishery potential, and loss of sensitive species. Habitat has many characteristics but some of the more important are amount of available in-stream cover, the quality of bottom substrates in pool environments, presence of a diverse selection of pool environments (large/shallow, large/deep, small/shallow, small/deep), the volume of sediment accumulation in pools resulting from deposition, the degree to which a channel is filled with water, the degree of channel alteration for flood control or irrigation, stability of the stream banks from erosive forces, the degree to which stream banks are vegetated, and the degree of riparian cover around a stream.

Streams in the CPYRW display varying degrees of these habitat characteristics and vary from streams with very poor habitat quality to streams that support a variety and abundance of aquatic organisms. Stream channels throughout the system are generally sand-filled with a slight mud or silt veneer in pools and clean sands in the higher velocity areas. Although clean sand deposits may appear sterile, they are an important part of the Coastal Plain aquatic ecosystem harboring unique assemblages of aquatic organisms. Debris and log snags in small streams and large river channels provide much of the habitat diversity in the Choctawhatchee system and are important components of habitat quality supporting a diversity of fishes. Limestone outcrops along some stream channels provides hard substrate for invertebrates to colonize. Streams in this region can be severely affected by poor land use practices, poor maintenance of unpaved county roads, and poor management of agricultural activities shown in figure 46. Urban areas also contribute contaminated storm runoff and large volumes of sediment eroded from poorly managed construction sites as shown in figures 47 and 48. These activities generally lead to large volumes of bedload sediments and higher stream turbidity during storm events. A short-term investigation of the biological effects of sediment runoff from an unpaved road in Lightwood Knot Creek tributary watershed site 1C in northeastern Covington County was conducted from January 2001 through January 2002. Five sample sets were collected upstream and downstream of an unpaved county road crossing over the stream. The results indicate significant degrading impacts to benthic macroinvertebrate communities and their associated habitats from sediment runoff as shown in table 17. Number of taxa was similar between upstream and downstream samples, but other community metrics were substantially different between the sites. Catch was higher and the EPT index was lower downstream. The Hilsenhoff index indicated good to excellent biological conditions upstream and only fair conditions downstream .

Faunal composition also reflected the impacts of sediment downstream of the road crossing shown in table 18. Dipterans were almost twice as common downstream compared to upstream (24 percent and 56 percent, respectively), mayflies were common upstream (24 percent) but much reduced downstream (1.3 percent), stoneflies were present upstream (0.7 percent) but no specimens were collected downstream, and caddisflies were also more common upstream (1.8 percent) compared to downstream (0.3 percent). The family Chironomidae was very common downstream comprising a large part of the fauna at 53 percent, compared to only 20 percent upstream. A very revealing statistic about faunal differences is the relative abundance of the most common taxon collected. The mayfly *Paraleptophlebia* was the most common taxon upstream of the road crossing at 21 percent whereas the chironomid *Tribelos* was most common downstream at 35 percent. Habitat downstream of the road crossing reflected the effects of excessive sediment loading. Pools were sand-filled and the only habitat of any quality remaining for macroinvertebrates was along the stream margins. Snag patches or accumulations of coarse detritus offered occasional areas of habitat but the majority of the stream substrate was covered by deep sand deposits. Habitat scores were consistently in the good range upstream and in the fair range downstream.

Habitat quality scores were reduced 30 percent due directly to road sedimentation, and the percent of substrate coverage by sediment, primarily sand, increased 100 percent over the upstream control. Biological condition shifted from good to excellent upstream to fair in the sediment impacted zone. Unpaved roads are a significant source of sediment in southeast Alabama, and these results illustrate that stream water quality and biology is directly affected. Road crossings act essentially as point sources of pollution funneling and concentrating sediment along both sides of the road from ridge tops, and from the road bed itself, to a single point at the bridge crossing.

photograph courtesy of Mr. Michael Mullin

Figure 46—Effects of cattle access to stream in the CPYRW.

photograph courtesy of Mr. Michael Mullin

Figure 47.—Erosion from construction site in the CPYRW.

photograph courtesy of Mr. Michael Mullin

Figure 48.—Poorly installed and maintained erosion control BMPs in the CPYRW.

Table 17. Summary results for benthic macroinvertebrates collected upstream and downstream of an unpaved road, Covington County, Alabama.

Benthic invertebrate community metric	Upstream site	Downstream site
	average (range) N=5	
Number of taxa	35.8 (29-44)	34.0 (29-40)
Catch	273 (212-353)	398 (249-506)
Hilsenhoff biotic index	5.7 (4.6-6.6)	7.2 (6.7-7.5)
EPT index	4.2 (2-6)	2.6 (1-3)
Total taxa	73	74
Total catch	1,366	1,991
Total EPT	11	7
Chironomidae genera	18	19
Chironomidae catch	275 (20.1 %)	1,062 (53.3%)
Most common taxon	*Paraleptophlebia* (21.4%)	*Tribelos* (35.0%)
Collector-filterers (%)	5.2 (0.7-9.9)	6.8 (0.9-26.1)
Collector-gatherers (%)	44.8 (28.7-67.1)	47.2 (21.0-76.1)
Piercers (%)	0	2.3 (0.2-8.3)
Predators (%)	43.7 (28.6-62.2)	40.7 (19.1-76.4)
Scrapers (%)	1.1 (0-2.4)	0.6 (0.2-1.2)
Shredders (%)	5.2 (0.8-10.1)	2.3 (0.2-8.0)

1- Samples collected from January 2001 through January 2002

Table 18. Benthic macroinvertebrate percent composition upstream and downstream of an unpaved road crossing, Lightwood Knot Creek, Covington County, Alabama.

Taxon	Sampling site	
	Upstream	Downstream
Annelida	0.29	0.40
Acarina	3.07	7.03
Crustacea	11.27	7.28
Coleoptera	5.27	4.32
Diptera	24.08	55.65
Ephemeroptera	23.94	1.26
Hemiptera	1.39	2.71
Megaloptera	2.71	1.21
Odonata	25.04	19.19
Plecoptera	0.73	0.00
Trichoptera	1.83	0.30
Mollusca	0.37	0.65

STATUS OF SURFACE WATER CLASSIFICATION AND QUALITY

STATE/FEDERAL WATER-USE CLASSIFICATIONS AND STREAM WATER-QUALITY CLASSIFICATIONS

Stream or river water-use classifications are applied to stream segments based on water-quality criteria adopted for particular uses. These classifications are based on existing utilization, uses reasonably expected in the future, and those uses not now possible because of pollution but which could be made if the effects of pollution were controlled or eliminated. Of necessity, the assignment of use classifications must take into consideration the physical capability of waters to meet certain uses (ADEM, 2004). Table 19 provides a listing of streams and rivers classified in the CPYRW. Uses in the watershed include swimming and fish and wildlife.

Table 19. —Water use stream classifications in the CPYRW

Hydrologic Unit name and no.	Stream Name	From	To	Classification*
Upper Choctawhatchee River 03140201	East Fork of Choctawhatchee River	Choctawhatchee River	Blackwood Creek	F&W
	Seabes Creek	East Fork of Choctawhatchee River	Its source	F&W
	Clearwater Creek	Pea River	Its source	F&W
	Hurricane Creek	Choctawhatchee River	Its source	F&W
	Beaver Creek	Newton Creek	Dothan WWTP	F&W
	Dowling Branch	Cox Mill Creek	Its source	
	UT to Harrand Creek	Harrand Creek	Its source	F&W
Pea River 03140202	Pea River	Choctawhatchee River	Its source	F&W
	Walnut Creek	Troy WWTP	Downstream of Pike Co Rd 59	F&W
Yellow River 03140103	UT to Jackson Lake 2-S	W.F. Jackson Lake	Its source	F&W
	Yellow River	AL-FL state line	North Creek	F&W

* F&W- Fish and wildlife

TOTAL MAXIMUM DAILY LOADS (TMDL)

Water quality standards are set by the states and consist of two components 1) use classifications and 2) criteria to protect assigned use classifications. The CWA requires all waters to be classified according to intended use (e.g. drinking water, recreational purposes). State standards must 1) aim at achieving fishable, swimmable waters wherever possible and 2) maintain both intended and current uses.

Section 303(d) of the CWA requires states to identify waters for which technology based limitations of pollutants are not stringent enough to achieve water quality standards. These water bodies must be assigned priority rankings based on severity of pollution and intended uses of the waters. TMDLs must be developed for these listed waters and be submitted to EPA for approval. A TMDL is an estimate of the total load of pollutants (from point, non-point, and background sources) that a segment of water can receive without exceeding applicable water quality criteria. Once a TMDL is established, the permitting authority must allocate this total amount among the various sources discharging into the water body. Table 20 lists the 303(d) impaired streams in the watershed and their TMDL status.

Table 20. - Streams in the CPYRW included on the 2002 Section 303(d) list of impaired waters

Waterbody ID and River Basin	Waterbody Name	Rank	County	Uses	Causes	Sources	Date of Data	Length	TMDL Date
AL/03140201-110_01 Choctawhatchee	Hurricane Creek	H	Dale	F&W	Pathogens	Agriculture	1991	8.5 mi.	2005
AL/03140201-130_01 Choctawhatchee	Dowling Branch	H	Geneva	F&W	OE/DO Pathogens	Urban runoff/Storm sewers, Municipal	1991	2.1 mi.	2005
AL/03140201-130_02 Choctawhatchee	Beaver Creek	H	Houston	F&W	Nutrients OE/DO	Municipal, Urban runoff/Storm sewers	1977-1986	2.5 mi.	2005
AL/03140201-150_01 Choctawhatchee	UT to Harrand Creek	M	Coffee	F&W	Nutrients	Urban runoff/Storm sewers	1985-1986	4.0 mi.	2005
AL/03140202-060_01 Choctawhatchee	Walnut Creek	M	Pike	F&W	Unknown toxicity	Municipal	1997	3.0 mi.	2005
AL/03140103-020_01 Perdido-Escambia	UT to Jackson Lake 2-S	H	Covington	F&W	OE/DO Pathogens	Int. animal feeding operation, Pasture grazing	1996-1997	1.3 mi.	2005
AL/03140103-020_02 Perdido-Escambia	UT to Jackson Lake 3-C	H	Covington	F&W	OE/DO Pathogens	Int. animal feeding operation, Pasture grazing	1996-1997	0.2 mi.	2005

GENERAL CAUSES OF IMPAIRMENTS AND FUTURE THREATS TO NATURAL RESOURCE QUALITY

Major threats to water quality and failure of streams to maintain current and intended uses in the Choctawhatchee, Pea, and Yellow Rivers watershed are primarily controlled by land use practices and the presence of excessive nutrients (ammonia, nitrate, and phosphorus), high bacteria counts, excessive sedimentation, and excessive concentrations of toxic metals and organic compounds.

More than 19,000 samples have been collected from 34 different streams, stream segments, and lakes in the CPYRW between 1968 and 2005, to determine current water quality and biotic habitat conditions and the magnitude of future threats to these vital natural resources. Most of the available data were collected by the GSA, ADEM, USGS, County SWCD, and the Troy University Center for Environmental Research and Service. Table 20 lists the 303(d) impaired streams in the watershed and their TMDL status.

NUTRIENTS

Nutrients are substances and compounds that contribute to plant and animal growth and development. However, excessive amounts of these substances (primarily nitrogen and phosphorus) in water bodies cause deterioration of water quality. Sources of these potential pollutants include agricultural runoff from farm fields and feedlots, fertilizers and nutrients from urban runoff, discharges from industrial and municipal wastewater treatment facilities, and on-site sewage treatment systems.

Nutrient enrichment may cause reduced water clarity, algal blooms, and adverse effects on aquatic plants. These are symptoms of a process called eutrophication. Eutrophication is measured by Carlson’s Trophic State Indices (TSI), which provide a qualitative index for classifying surface water quality (Carlson, 1996). TSI were derived from a combination of secchi disc readings, surface-water chlorophyll a and total phosphorus concentrations for a specified group of North American lakes. TSI is measured on a scale varying from 0–100. Lakes with a TSI of 70 or greater are considered to be hypereutrophic and in need of regulatory action for protection and restoration of the water body. A TSI value of 50-70 indicates eutrophic conditions. A TSI value from 40-50 indicates mesotrophic conditions and a value of less than 40 indicates oligotrophic conditions.

AMMONIA

Concentrations of ammonia (NH_3 as N) in uncontaminated streams may be as low as 0.01 mg/L. Concentrations of ammonia in contaminated streams and in streams downstream from wastewater discharges are generally from 0.5 to 3.0 mg/L. Concentrations higher than 0.5 mg/L may cause significant ammonia toxicity to fish and other organisms (Maidment, 1993).

NITRATE

The U.S. EPA Maximum Contaminant Level (MCL) for nitrate in drinking water is 10 mg/L. Typical nitrate (NO_3 as N) concentrations in streams vary from 0.5 to 3.0 mg/L. Concentrations of nitrate in streams without significant nonpoint sources of pollution vary from 0.1 to 0.5 mg/L. Streams fed by shallow ground water draining agricultural areas may approach 10 mg/L (Maidment, 1993). Nitrate concentrations in streams without significant nonpoint sources of pollution generally do not exceed 0.5 mg/L (Maidment, 1993).

PHOSPHORUS

The origin of phosphorus in streams is the mineralization of phosphates from soil and rocks, or drainage containing fertilizer or other industrial products. The principal components of the phosphorus cycle involve organic phosphorus and inorganic phosphorus, in the form of orthophosphate (PO_4) (Maidment, 1993). Orthophosphate is soluble and considered to be the only biologically available form of phosphorus. The natural background concentration of total dissolved phosphorus is approximately 0.025 mg/L. Phosphorus concentrations as low as 0.01 to 0.005 mg/L may cause excessive algae growth, but the critical level of phosphorus necessary for excessive algae is around 0.05 mg/L. Although no official water quality criterion has been established in the United States for phosphorus, to prevent the development of biological nuisances, total phosphorus should not exceed 0.05 mg/L in any stream or 0.025 mg/L within a lake or reservoir (Maidment, 1993).

PATHOGENS

Microorganisms are present in all surface waters and include viruses, bacteria, fungi, algae, and protozoa. Analyses of bacteria levels may be used to assess the quality of water and to indicate the presence of human and animal waste in surface and ground water. Fecal coliform and fecal streptococcus groups of bacteria are used as the primary indicator organisms of this type of water pollution. The limit for fecal coliform bacteria, established for surface waters classified as Fish and Wildlife, is 2,000 colonies per 100 milliliter sample for single samples (ADEM, 1992).

SEDIMENTATION

Much of south Alabama and portions of the CPYRW are well known for the presence of erodable soils and large rates of stream sedimentation. Sedimentation is a process by which eroded particles of rock are primarily transported by moving water from areas of relatively high elevation to areas of relatively low elevation where the particles are deposited. Upland sediment transport is primarily accomplished by overland flow and rill and gully development. Lowland or floodplain transport occurs in varying order streams where upland sediment joins sediment eroded from floodplains, stream banks and streambeds. Erosion rates are accelerated by human activity related to agriculture, construction, timber harvesting, unimproved roadways or any activity where soils or geologic units are exposed or disturbed. Sedimentation is detrimental to water quality, destroys biologic habitat, reduces storage volume of water impoundments, impedes the usability of aquatic recreational areas, and causes damage to structures. Sediment loads in streams are primarily composed of relatively small particles suspended in the water column (suspended solids) and larger particles that move on or periodically near the streambed (bedload).

ORGANIC COMPOUNDS

Organic compounds are commonly used in our society today. Frequently, these compounds are found in streams and groundwater aquifers. Many of these compounds have been found to be harmful to human health and the health of the aquatic environment. Man-made organic compounds are present in trace amounts in virtually all ground and surface waters due to pollution. More commonly known as contaminants, these compounds are considered toxic when found in high enough concentrations to pose a health threat to humans, organisms, or ecosystems. Bioaccumulation may lead to chronic toxicity effects in the liver and kidneys, as well as be responsible for nervous systems problems in animals and humans. Contaminants are highly varied in chemical composition and behavior. These compounds can be toxic based on their chemical makeup (chain, branches, or rings of carbon atoms) and concentration levels. Principal types of man-made organic compounds of concern include:

- Pesticides, herbicides, fungicides
- Volatile organic chemicals (VOC's)
    - Cleaning solvents used in degreasing and dry cleaning
    - Unchlorinated (e.g. benzene) and chlorinated (e.g. trichloroethylene)
- Other industrial chemicals (e.g. PCB's, [polychlorinated biphenyls] and PAH's, [polyaromatic hydrocarbons])
- Trihalomethanes (by-products of chlorine disinfection)

Trace metals may occur naturally in ground water in very small amounts and may include arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver and zinc. These metals may also be introduced into ground and surface water through industrial processes and waste disposal. In small amounts these are harmless and in some cases even beneficial to health. Amounts over drinking water standards may have serious health effects. The EPA has set maximum contaminant levels (MCL) for metals including arsenic, barium, cadmium, chromium, lead, copper, mercury, selenium, nickel, thallium, antimony, and beryllium.

DOCUMENTED IMPAIRMENTS AND FUTURE THREATS TO NATURAL RESOURCE QUALITY

VIOLATION OF ADEM SURFACE WATER QUALITY

Evaluations of analytical data are one of the primary methods to determine the current status of water quality and biological conditions and to estimate future threats to the vital natural resources of the CPYRW. Much of the available data are synoptic but give some measure of water quality conditions at the time the data were collected.

Table 21 contains evaluations of water-quality data collected in the CPYRW between 1968 and 2005. With more than 19,000 parameters analyzed at 102 sampling stations in the watershed, the table is an attempt to provide an interpretive summary of this large data set in a form that may be used to determine magnitudes of water-quality impairment in monitored streams. Analytical data were evaluated against published standards or limits for selected physical and chemical parameters or in some cases the maximum concentration or count was reported for parameters with no established standard or limit. The table reports analytical parameters, established standard or limit, sampled stream, monitoring agency or group, location of sampled site, year of sample collection, total numbers of samples collected at each site and the number of samples that exceeded the standard or limit or the maximum concentration or count for each parameter. Although the suite of analytical parameters is different for almost every sampled site, the data allow identification of the most pervasive contaminants, and allows for some limited prioritization of streams based on magnitude of water quality impairment. Annual loadings of contaminants provide the best data for comparison of impairment magnitude. However, streams monitored by the GSA are the only ones with loading estimates.

An assessment of the data indicates that impaired water quality is primarily caused by elevated concentrations of nitrate and phosphorus, excessive bacteria counts, and sedimentation. Analysis of nitrate concentrations was performed for 1,248 samples collected from 102 different streams or stream segments in the watershed. Fifty-three percent of these samples contained concentrations above 0.5 mg/L. Nine hundred fifty-six samples were collected and analyzed for total phosphorus. Seventy-six percent had total phosphorus concentrations above 0.05 mg/L. The 2,000 colonies per 100 milliliter limit for fecal coliform bacteria was exceeded in 13 percent of 858 samples collected in the CPYRW.

Nutrient and sediment loading estimates were determined for nine streams in the watershed by the GSA. These data indicate that Little Choctawhatchee River has the largest maximum annual loads with 257 tons of nitrate, 267 tons of phosphorus, 19,461 tons of suspended sediment, and 33,000 tons of bedload sediment. However, when the data are normalized Lightwood Knot Creek tributary site 3-C and Lightwood Knot Creek have the largest annual nitrate loads with 2,219 and 1,420 pounds per square mile (lbs./mi^2), respectively. Lightwood Knot Creek has the largest annual normalized total phosphorus load with 180 lbs./mi^2. Lightwood Knot Creek tributary site 1-C has the largest annual normalized suspended sediment load (443 lbs./mi^2). Lightwood Knot Creek tributary site 4-S has the largest annual normalized bedload (825 lbs./mi^2).Average annual loads for nine evaluated streams were 3,206 tons of nitrate, 32.3 tons of phosphorus, 3,206 tons of suspended sediment, and 4,720 tons of bedload sediment. Although a limited number of water samples were collected in some monitored streams in the CPYRW, evaluation of water-quality data included in table 21 identifies streams that are most impaired. Thirty-three sites on 23 streams in the CPYRW have significant impairments, primarily related to concentrations of nitrate and phosphorus. Only limited sedimentation data are available. However, four of nine streams in which sediment loads were calculated by the GSA had significant sediment impairment.

Detectable concentrations of numerous metallic constituents were found in sampled streams in the CPYRW. Some metals such as aluminum and iron occur in streams naturally while others are introduced to water bodies by man's activities and may be highly toxic. Of these toxic metals, only three samples contained concentrations that exceeded established standards as shown in table 21. The standard for cadmium was exceeded in one sampled collected from GSA site 3-C tributary to Lightwood Knot Creek in Covington County. The standard for lead was exceeded in one sample collected by GSA at Lake Frank Jackson in Covington County and in one sample collected by CERS from Little Choctawhatchee River at Houston County Road 59.

Unpaved roads in the CPYRW are primarily constructed on soils composed of fine- to coarse-grained sand and clay. Available material for unpaved road surfaces is sandy and easily eroded into streams and contributes large volumes of sediment that causes impaired water quality and habitat.

Table 21.—Analysis of water-quality data collected in the CPYRW with respect to exceedence of published limits or standards.

Site and Collector	Location	Date	Temp 32.3º C	pH 6 to 9	DO 5 mg/L	BOD 5 mg/L	COD 100 mg/L	TOC 10 mg/L	Turbidity Max mg/L	TSS t/y
			Parameter, Limit or Standard and Exceedence Occurance							
Bear Creek	Highway 84 Houston Co.	2003	0	0	0				9	
Samples			3	3	3					
Beaverdam Creek (CERS)	Coffee Co. 353	1994	0	0	0				12	
Samples			1	1	1				1	
Beaverdam Creek (CERS)	Geneva Co. 21	1994	0	0	0				10	
Samples			1	1	1				1	
Big Creek (CERS)	Coffee Co. 342	1994-1995	0	0	0				5	
Samples			4	4	4				4	
Big Creek (CERS)	Near Mossy Grove	1995	0	0	0				59	
Samples			3	3	3				3	
Big Sand Creek (CERS)	Barbour Co. 9	1995	0	0	0				11	
Samples			1	1	1				1	
Big Sandy Creek (CERS)	Bullock Co. 8	1994-1995	0	0	0				17	
Samples			4	4	4				4	
Blackwood Creek (GSA)	Dale Co. Road 67	1998	0	1	0	0	19		115	1,388
Samples			28	28	28	28	28		28	28
Blackwood Creek (ADEM)	Highway 13 Henry Co.	1968	0	0	0	0				
Samples			13	13	13	13				
Blackwood Creek (ADEM)	852120 312233	1988	0	0	3	0			32	
Samples			5	5	5	5			5	
Tributary to Blackwood Creek (ADEM)	852012 312145 Henry Co.	1988	0	1	0	0			17	
Samples			5	5	5	5			5	
Blanket Creek (CERS)	New Bypass	1994	0	0	0					
Samples			1	1	1					
Blue Spring (CERS)	Blue Spring State Park	1994-1995	0	0	1				<1	
Samples			4	4	1				1	
Bowden Mill Creek (CERS)	Pike Co. 73	1994	0	0	0				7	
Samples			1	1	1				1	
Buckhorn Creek (CERS)	Hwy. 130	1995	0	0	0				40	
Samples			2	2	2				1	
Buckhorn Creek (CERS)	Pike Co. 38	1994	0	0	0				15	
Samples			1	1	1				1	
Campbell Creek (CERS)	Hwy. 10	1995	0	0	0				22	
Samples			1	1	1				1	

Site and Collector	Location	Date	Parameter, Limit or Standard and Exceedence Occurance							
			Temp 32.3º C	pH 6 to 9	DO 5 mg/L	BOD 5 mg/L	COD 100 mg/L	TOC 10 mg/L	Turbidity Max mg/L	TSS t/y
Choctawhatchee River (CERS)	Hwy. 52 Geneva	1994-1995	0	0	0				80	
Samples			5	5	5				5	
Choctawhatchee River (CERS)	Waterford	1994-1995	0	0	0				120	
Samples			4	4	4				4	
Claybank Creek (CERS)	Dale Co. 36	1994-1995	0	0	0				17	
Samples			3	3	3				3	
Claybank Creek (CERS)	Hwy. 134	1994-1995	0	0	0				70	
Samples			4	4	4				4	
Clearwater Creek (CERS)	Pike Co. 59	1994	0	0	0				9	
Samples			1	1	1				1	
Conners Creek (CERS)	Pike Co. 97	1994	0	0	0				5	
Samples			2	2	2				1	
Corner Creek (CERS)	Geneva Co. 54	1995	0	0	0				12	
Samples			1	1	1				1	
Corner Creek (CERS)	McPhail Farm Road	1994-1995	0	0	7				30	
Samples			10	10	10				8	
Double Bridges Creek (CERS)	Geneva Co. Road 58	1995	0	0	0				124	
Samples			1	1	1				1	
Double Bridges Creek (CERS)	Geneva Co. Road 65	1994	0	0	0				35	
Samples			1	1	1				1	
Double Bridges Creek (GSA)	Coffee Co. Road 663	1998	0	1	0	0	20		180	4,939
Samples			25	25	157	25	25		25	25
Double Bridges Creek (ADEM)	855728 311248 Coffee Co.	1984-1986	0	1	0	0	0		38	
Samples			13	13	13	13	13		12	
Double Bridges Creek (ADEM)	855141 310233 Geneva Co.	1968	0	0	0	0				
Samples			13	13	13	13				
Dunham Creek (GSA)	Henry Co. Road 16	2004	0	0	0		2	0	18	
Samples			3	3	2		2	2	3	
E. Fork Choctawhatchee River (CERS)	Highway 10	1995	0	0	0				34	
Samples			1	1	1				1	
E. Fork Choctawhatchee River (CERS)	Highway 27 Henry Co.	1994-1995	0	0	0				12	
Samples			4	4	4				4	
Five Runs Creek @ Covington Co. (GSA)		2001	0	2	0	0			85	12.4
Samples			24	24	24	23			24	24

Site and Collector	Location	Date	Temp 32.3º C	pH 6 to 9	DO 5 mg/L	BOD 5 mg/L	COD 100 mg/L	TOC 10 mg/L	Turbidity Max mg/L	TSS t/y
			Parameter, Limit or Standard and Exceedence Occurance							
Flat Creek (CERS)	Coffee Co. 479	1995	0	0	0				11	
Samples			1	1	1				1	
Halis Creek (CERS)	Coffee Co. 114	1994	0	0	0				13	
Samples			1	1	1				1	
Harrison Mill Creek (CERS)	Houston Co. Road 56	2003	0	0	0				22	
Samples			3	3	3				3	
Hayes Creek (CERS)	Coffee Co. 189	1995	0	0	0				25	
Samples			1	1	1				1	
Hurricane Creek (CERS)	Geneva Co. 41	1994-1995	0	0	0				70	
Samples			4	4	4				4	
Hurricane Creek (CERS)	Highway 123 Geneva Co.	1995	0	0	0				16	
Samples			1	1	1				1	
Lake Jackson (CERS)	Back Lake Pier	1994	0	0	0				10	
Samples			3	3	3				2	
Lake Jackson (CERS)	Swimming Pier	1994-1995	0	0	0				15	
Samples			7	7	7				7	
Lightwood Knot Creek (GSA)	Covington Co. Road 73	2003	0	9	0	0	13	1	286	2,871
Samples			19	19	6	11	13	12	14	14
Lightwood Knot Creek Tributary Site 1-C, (GSA)	Covington Co.	1996-2002	0	87	32	0	75		>1,000	166
Samples			277	277	239	152	152		277	277
Lightwood Knot Creek Tributary Site 2-S, (GSA)	Covington Co.	1996-2002	0	94	116	2	71		>1,000	1.6
Samples			262	262	262	114	114		262	262
Lightwood Knot Creek Tributary Site 3-C, (GSA)	Covington Co.	1996-2002	0	1	34	1	84		370	4.4
Samples			250	250	222	118	118		250	250
Lightwood Knot Creek Tributary Site 4-S, (GSA)	Covington Co.	1996-2002	0	7	12	2	72		780	12.3
Samples			269	269	221	122	120		277	277
Lake Frank Jackson (GSA)	near Opp, Covington Co.	2003	0	3	0	0	9	3	15	
Samples			16	15	15	11	11	11	16	
Little Beaverdam Creek (CERS)	Geneva Co. 75	1994	0	0	1				15	
Samples			2	2	2				1	
Little Choctawhatchee River (CERS)	Houston Co. 59	1994-1995	0	0	0				21	
Samples			5	5	5				5	
Little Choctawhatchee River (CERS)	Highway 123	1994-1995	0	0	0				75	
Samples			4	4	4				4	

Site and Collector	Location	Date	Temp 32.3º C	pH 6 to 9	DO 5 mg/L	BOD 5 mg/L	COD 100 mg/L	TOC 10 mg/L	Turbidity Max mg/L	TSS t/y
			Parameter, Limit or Standard and Exceedence Occurance							
Little Choctawhatchee River (CERS)	Highway 84	2003	0	0	0				120	
Samples			12	12	12				12	
Little Choctawhatchee River (CERS)	Dale Co. Road 9	2003	0	0	0				95	
Samples			12	12	12				12	
Little Choctawhatchee River (CERS)	Houston Co. Road 59	2003	0	0	0				50	
Samples			12	12	12				12	
Little Choctawhatchee River (GSA)	Highway 84	1998	0	0	0	0	21		115	19,461
Samples			26	26	26	26	25		26	26
Little Choctawhatchee River (ADEM)	854007 311543 Dale Co.	1988	0	0	0	0			33	
Samples			5	5	5	5			5	
Little Choctawhatchee River (ADEM)	853710 311627 Dale Co.	1988	0	0	0	0			31	
Samples			5	5	5	5			5	
Little Choctawhatchee River (ADEM)	853412 311544 Houston Co.	1988	0	0	0	0			27	
Samples			5	5	5	5			5	
Little Choctawhatchee River (ADEM)	852519 311536 Houston Co.	1988	0	0	0	0			22	
Samples			5	5	5	5			5	
Little Choctawhatchee River (ADEM)	853147 311507 Dale Co.	1984-1986	0	2	0	0	0		15	
Samples			10	11	11	11	22		11	
Little Choctawhatchee River (ADEM)	852851 311438 Dale Co.	1974-1986	0	4	13	1	0		145	
Samples			121	121	121	55	13		119	
Little Choctawhatchee River (ADEM)	853711 311622 Highway 123	1968	0	0	0	0				
Samples			13	13	13	13				
Little Claybank Creek (CERS)	U. S. 231	1994-1995	0	0	0				35	
Samples			4	4	4				4	
Little Double Bridges Creek (GSA)	Coffee Co. Rd. 636	1998	0	4	0	0	22		170	
Samples			26	26	26	26	26		26	
Little Double Bridges Creek (ADEM)	855730 311620 near Enterprise	1985-1991	0							
Samples			18							
Little Double Bridges Creek (ADEM)	855707 311517 Coffee Co.	1985-1986	0	3	0	0	0		56	
Samples			12	12	12	12	12		12	
Mims Creek (CERS)	Pike Co. 59	1994-1995	0	0	0				20	
Samples			2	2	2				2	
Mossy Camp Branch (CERS)	Dale Co. Road 55	2003	0	0	0				120	
Samples			3	3	3				3	

Site and Collector	Location	Date	Temp 32.3º C	pH 6 to 9	DO 5 mg/L	BOD 5 mg/L	COD 100 mg/L	TOC 10 mg/L	Turbidity Max mg/L	TSS t/y
			Parameter, Limit or Standard and Exceedence Occurance							
Newton Creek (CERS)	Highway 84 Houston Co.	2003	0	0	0				8	
Samples			3	3	3				3	
Panther Creek (CERS)	Covington Co. 59	1995	0	0	0				6	
Samples			1	1	1				1	
Panther Creek (CERS)	Panther Creek Road	2003	0	0	0				13	
Samples			3	3	3				3	
Pea Creek (CERS)	Coffee Co. 330	1994	0	0	0				8	
Samples			1	1	1				1	
Pea River (CERS)	Bullock Co. Road 34	1994-1995	0	0	3				30	
Samples			18	18	18				18	
Pea River (CERS)	Coffee Co. Road 107	1994	0	0	0				8	
Samples			1	1	1				1	
Pea River (CERS)	Coffee Co. Road 246	1994	0	0	0				8	
Samples			1	1	1				1	
Pea River (CERS)	Coffee Co. Road 342	1995	0	0	0				38	
Samples			1	1	1				1	
Pea River (CERS)	Coffee Co. Road 147	1994-1995	0	0	0				22	
Samples			4	4	4				4	
Pea River (CERS)	Hwy. 130	1995	0	0	0				25	
Samples			1	1	1				1	
Pea River (CERS)	Hwy. 239	1994-1995	0	0	9				40	
Samples			18	18	18				18	
Pea River (CERS)	Hwy. 27	1994-1995	0	0	0				22	
Samples			4	4	4				4	
Pea River (CERS)	Hwy. 84 Elba	1994-1995	0	0	0				17	
Samples			3	3	3				3	
Pea River (CERS)	Pike Co. 44	1994-1995	0	0	0				22	
Samples			4	4	4				4	
Pea River (CERS)	U. S. 231	1994-1995	0	0	0				18	
Samples			4	4	4				4	
Providence Creek (CERS)	Hwy. 85 Geneva Co.	1994	0	0	0				7	
Samples			1	1	1				1	
Richland Creek (CERS)	Hwy. 10 Pike Co.	1994	0	0	0				9	
Samples			1	1	1				1	

Site and Collector	Location	Date	Parameter, Limit or Standard and Exceedence Occurance							
			Temp 32.3º C	pH 6 to 9	DO 5 mg/L	BOD 5 mg/L	COD 100 mg/L	TOC 10 mg/L	Turbidity Max mg/L	TSS t/y
Richland Creek (CERS)	Hwy. 29 Pike Co.	1995	0	0	0				14	
Samples			1	1	1				1	
Richland Creek (CERS)	Hwy. 81 Pike Co.	1994	0	0	0				13	
Samples			1	1	1				1	
Sandy Run Creek (CERS)	Hwy. 81 Pike Co.	1994	0	0	0				12	
Samples			1	1	1				1	
Sandy Run Creek (CERS)	Hwy. 10 Pike Co.	1994	0	0	0				11	
Samples			2	2	2				1	
Stinking Creek (CERS)	Hwy. 239 Barbour Co.	1994-1995	0	0	0				15	
Samples			4	4	4				4	
Tight Eye Creek (CERS)	Hwy. 79 Geneva Co.	1994	0	0	0				10	
Samples			1	1	1				1	
Unnamed Stream (CERS)	Hwy. 28 Pike Co.	1995	0	0	0				27	
Samples			1	1	1				1	
W. Fork Choctawhatchee River (CERS)	Highway 36 Dale Co.	1994-1995	0	0	0				34	
Samples			11	11	11				11	
Walnut Creek (CERS)	Hwy. 32 Pike Co.	1994	0	0	0				10	
Samples			1	1	1				1	
Walnut Creek (CERS)	Hwy. 59 Pike Co.	1994-1995	0	0	0				45	
Samples			7	7	7				7	
Walnut Creek (GSA)	Highway 231	1998	0	0	6	0	22		64	
Samples			26	26	26	26	26		26	
Whitewater Creek (CERS)	Hwy. 224 Coffee Co.	1994-1995	0	0	0				60	
Samples			11	12	12				11	
Whitewater Creek (CERS)	Hwy. 26 Pike Co.	1994	0	0	0				12	
Samples			1	1	1				1	
Whitewater Creek (CERS)	Hwy. 59 Pike Co.	1994-1995	0	0	0				15	
Samples			2	2	2				2	
Wilkerson Creek (CERS)	Hwy. 723 Coffee Co.	1994	0	0	0				9	
Samples			1	1	1				1	
Wilson Creek (CERS)	Hwy. 719 Coffee Co.	1994	0	0	0				9	
Samples			1	1	1				1	
Yellow River (GSA)	Highway 55	2001	0	0	0	0			42	
Samples			28	28	28	28			27	

Site and Collector	Location	Date	TSS t/y/mi2	Bedload t/y	Bedload t/y/mi2	NH3-N .5 mg/l	NH3-N t/y	NH3-N lbs/y/mi2	NO3-N 0.5 mg/l	NO3-N t/y
Bear Creek	Highway 84 Houston Co.	2003				0			2	
Samples						3			3	
Beaverdam Creek (CERS)	Coffee Co. 353	1994								
Samples										
Beaverdam Creek (CERS)	Geneva Co. 21	1994								
Samples										
Big Creek (CERS)	Coffee Co. 342	1994-1995				1			1	
Samples						4			4	
Big Creek (CERS)	Near Mossy Grove	1995							0	
Samples									1	
Big Sand Creek (CERS)	Barbour Co. 9	1995								
Samples										
Big Sandy Creek (CERS)	Bullock Co. 8	1994-1995				2			0	
Samples						4			4	
Blackwood Creek (GSA)	Dale Co. Road 67	1998	33	3,000	71	0	2.6	126	25	104
Samples			28	28	28	28	28	28	28	28
Blackwood Creek (ADEM)	Highway 13 Henry Co.	1968								
Samples										
Blackwood Creek (ADEM)	852120 312233	1988				0			2	
Samples						5			5	
Tributary to Blackwood Creek (ADEM)	852012 312145 Henry Co.	1988				0			5	
Samples						5			5	
Blanket Creek (CERS)	New Bypass	1994								
Samples										
Blue Spring (CERS)	Blue Spring State Park	1994-1995								
Samples										
Bowden Mill Creek (CERS)	Pike Co. 73	1994								
Samples										
Buckhorn Creek (CERS)	Hwy. 130	1995								
Samples										
Buckhorn Creek (CERS)	Pike Co. 38	1994								
Samples										
Campbell Creek (CERS)	Hwy. 10	1995								
Samples										

Site and Collector	Location	Date	TSS t/y/mi2	Bedload t/y	Bedload t/y/mi2	NH3-N .5 mg/l	NH3-N t/y	NH3-N lbs/y/mi2	NO3-N 0.5 mg/l	NO3-N t/y
Choctawhatchee River (CERS)	Hwy. 52 Geneva	1994-1995				0			4	
Samples						4			4	
Choctawhatchee River (CERS)	Waterford	1994-1995				1			3	
Samples						4			4	
Claybank Creek (CERS)	Dale Co. 36	1994-1995				2			1	
Samples						3			3	
Claybank Creek (CERS)	Hwy. 134	1994-1995				1			4	
Samples						3			4	
Clearwater Creek (CERS)	Pike Co. 59	1994								
Samples										
Conners Creek (CERS)	Pike Co. 97	1994								
Samples										
Corner Creek (CERS)	Geneva Co. 54	1995								
Samples										
Corner Creek (CERS)	McPhail Farm Road	1994-1995								
Samples										
Double Bridges Creek (CERS)	Geneva Co. Road 58	1995								
Samples										
Double Bridges Creek (CERS)	Geneva Co. Road 65	1994								
Samples										
Double Bridges Creek (GSA)	Coffee Co. Road 663	1998	247	4,100	105	0	3.9	197	83	35
Samples			25	25	25	25	25	25	157	25
Double Bridges Creek (ADEM)	855728 311248 Coffee Co.	1984-1986				3			13	
Samples						7			13	
Double Bridges Creek (ADEM)	855141 310233 Geneva Co.	1968								
Samples										
Dunham Creek (GSA)	Henry Co. Road 16	2004				0			2	
Samples						2			2	
E. Fork Choctawhatchee River (CERS)	Highway 10	1995								
Samples										
E. Fork Choctawhatchee River (CERS)	Highway 27 Henry Co.	1994-1995				1			0	
Samples						4			4	
Five Runs Creek @ Covington Co. (GSA)		2001	1.7	50	7	0	1.9	54	0	8.8
Samples			24	24	24	23	23	23	23	23

Site and Collector	Location	Date	TSS t/y/mi2	Bedload t/y	Bedload t/y/mi2	NH3-N .5 mg/l	NH3-N t/y	NH3-N lbs/y/mi2	NO3-N 0.5 mg/l	NO3-N t/y
Flat Creek (CERS)	Coffee Co. 479	1995								
Samples										
Halis Creek (CERS)	Coffee Co. 114	1994								
Samples										
Harrison Mill Creek (CERS)	Houston Co. Road 56	2003				0			3	
Samples						3			3	
Hayes Creek (CERS)	Coffee Co. 189	1995								
Samples										
Hurricane Creek (CERS)	Geneva Co. 41	1994-1995				2			4	
Samples						4			4	
Hurricane Creek (CERS)	Highway 123 Geneva Co.	1995								
Samples										
Lake Jackson (CERS)	Back Lake Pier	1994								
Samples										
Lake Jackson (CERS)	Swimming Pier	1994-1995								
Samples										
Lightwood Knot Creek (GSA)	Covington Co. Road 73	2003	69	2,091	50	0			0	29.5
Samples			14	14	14	13			13	13
Lightwood Knot Creek Tributary Site 1-C, (GSA)	Covington Co.	1996-2002	443			2			9	
Samples			277			152			252	
Lightwood Knot Creek Tributary Site 2-S, (GSA)	Covington Co.	1996-2002	13.8			9			38	
Samples			262			114			114	
Lightwood Knot Creek Tributary Site 3-C, (GSA)	Covington Co.	1996-2002	19.1	5.6	23.7				102	0.26
Samples			250	250	250				105	105
Lightwood Knot Creek Tributary Site 4-S, (GSA)	Covington Co.	1996-2002	44.2	229	825	3			104	0.13
Samples			277	277	277	122			122	122
Lake Frank Jackson (GSA)	near Opp, Covington Co.	2003				0			1	
Samples						11			11	
Little Beaverdam Creek (CERS)	Geneva Co. 75	1994								
Samples										
Little Choctawhatchee River (CERS)	Houston Co. 59	1994-1995				1			4	
Samples						4			4	
Little Choctawhatchee River (CERS)	Highway 123	1994-1995				1			4	
Samples						4			4	

Site and Collector	Location	Date	TSS t/y/mi2	Bedload t/y	Bedload t/y/mi2	NH3-N .5 mg/l	NH3-N t/y	NH3-N lbs/y/mi2	NO3-N 0.5 mg/l	NO3-N t/y
Little Choctawhatchee River (CERS)	Highway 84	2003				6			11	
Samples						12			12	
Little Choctawhatchee River (CERS)	Dale Co. Road 9	2003				0			12	
Samples						12			12	
Little Choctawhatchee River (CERS)	Houston Co. Road 59	2003				0			12	
Samples						12			12	
Little Choctawhatchee River (GSA)	Highway 84	1998	122	33,000	207	0	11.3	142	22	257
Samples			26	26	26	25	25	25	25	25
Little Choctawhatchee River (ADEM)	854007 311543 Dale Co.	1988				0			0	
Samples						5			5	
Little Choctawhatchee River (ADEM)	853710 311627 Dale Co.	1988				0			0	
Samples						5			5	
Little Choctawhatchee River (ADEM)	853412 311544 Houston Co.	1988				0			0	
Samples						5			5	
Little Choctawhatchee River (ADEM)	852519 311536 Houston Co.	1988				0			0	
Samples						5			5	
Little Choctawhatchee River (ADEM)	853147 311507 Dale Co.	1984-1986							10	
Samples									11	
Little Choctawhatchee River (ADEM)	852851 311438 Dale Co.	1974-1986							71	
Samples									121	
Little Choctawhatchee River (ADEM)	853711 311622 Highway 123	1968				0			2	
Samples						4			4	
Little Claybank Creek (CERS)	U. S. 231	1994-1995				2			3	
Samples						4			4	
Little Double Bridges Creek (GSA)	Coffee Co. Rd. 636	1998				0			6	
Samples						25			25	
Little Double Bridges Creek (ADEM)	855730 311620 near Enterprise	1985-1991								
Samples										
Little Double Bridges Creek (ADEM)	855707 311517 Coffee Co.	1985-1986							2	
Samples									12	
Mims Creek (CERS)	Pike Co. 59	1994-1995								
Samples										
Mossy Camp Branch (CERS)	Dale Co. Road 55	2003				1			3	
Samples						3			3	

Site and Collector	Location	Date	TSS t/y/mi2	Bedload t/y	Bedload t/y/mi2	NH3-N .5 mg/l	NH3-N t/y	NH3-N lbs/y/mi2	NO3-N 0.5 mg/l	NO3-N t/y
Newton Creek (CERS)	Highway 84 Houston Co.	2003				0			3	
Samples						3			3	
Panther Creek (CERS)	Covington Co. 59	1995								
Samples										
Panther Creek (CERS)	Panther Creek Road	2003				0			3	
Samples						3			3	
Pea Creek (CERS)	Coffee Co. 330	1994								
Samples										
Pea River (CERS)	Bullock Co. Road 34	1994-1995								
Samples										
Pea River (CERS)	Coffee Co. Road 107	1994								
Samples										
Pea River (CERS)	Coffee Co. Road 246	1994								
Samples										
Pea River (CERS)	Coffee Co. Road 342	1995				1			1	
Samples						1			1	
Pea River (CERS)	Coffee Co. Road 147	1994-1995				1			1	
Samples						4			4	
Pea River (CERS)	Hwy. 130	1995								
Samples										
Pea River (CERS)	Hwy. 239	1994-1995								
Samples										
Pea River (CERS)	Hwy. 27	1994-1995				2			0	
Samples						4			4	
Pea River (CERS)	Hwy. 84 Elba	1994-1995				0			1	
Samples						4			3	
Pea River (CERS)	Pike Co. 44	1994-1995				2			0	
Samples						4			4	
Pea River (CERS)	U. S. 231	1994-1995				2			1	
Samples						4			4	
Providence Creek (CERS)	Hwy. 85 Geneva Co.	1994								
Samples										
Richland Creek (CERS)	Hwy. 10 Pike Co.	1994								
Samples										

Site and Collector	Location	Date	TSS t/y/mi2	Bedload t/y	Bedload t/y/mi2	NH3-N .5 mg/l	NH3-N t/y	NH3-N lbs/y/mi2	NO3-N 0.5 mg/l	NO3-N t/y
Richland Creek (CERS)	Hwy. 29 Pike Co.	1995								
Samples										
Richland Creek (CERS)	Hwy. 81 Pike Co.	1994								
Samples										
Sandy Run Creek (CERS)	Hwy. 81 Pike Co.	1994								
Samples										
Sandy Run Creek (CERS)	Hwy. 10 Pike Co.	1994								
Samples										
Stinking Creek (CERS)	Hwy. 239 Barbour Co.	1994-1995				2			1	
Samples						4			4	
Tight Eye Creek (CERS)	Hwy. 79 Geneva Co.	1994								
Samples										
Unnamed Stream (CERS)	Hwy. 28 Pike Co.	1995								
Samples										
W. Fork Choctawhatchee River (CERS)	Highway 36 Dale Co.	1994-1995				2			0	
Samples						7			7	
Walnut Creek (CERS)	Hwy. 32 Pike Co.	1994								
Samples										
Walnut Creek (CERS)	Hwy. 59 Pike Co.	1994-1995				1			4	
Samples						3			4	
Walnut Creek (GSA)	Highway 231	1998				0			0	
Samples						25			25	
Whitewater Creek (CERS)	Hwy. 224 Coffee Co.	1994-1995				2			3	
Samples						4			4	
Whitewater Creek (CERS)	Hwy. 26 Pike Co.	1994								
Samples										
Whitewater Creek (CERS)	Hwy. 59 Pike Co.	1994-1995								
Samples										
Wilkerson Creek (CERS)	Hwy. 723 Coffee Co.	1994								
Samples										
Wilson Creek (CERS)	Hwy. 719 Coffee Co.	1994								
Samples										
Yellow River (GSA)	Highway 55	2001				0			0	
Samples						21			21	

Site and Collector	Location	Date	NO3-N lbs/y/mi2	PO4-P Max mg/l	P-Total 0.05mg/l	P-Total t/y	P-Total lbs/y/mi2	FC Bacteria 2000 c/100 ml	FS Bacteria Max c/100 ml
Bear Creek	Highway 84 Houston Co.	2003			3				
Samples					3				
Beaverdam Creek (CERS)	Coffee Co. 353	1994							
Samples									
Beaverdam Creek (CERS)	Geneva Co. 21	1994							
Samples									
Big Creek (CERS)	Coffee Co. 342	1994-1995		0.06	3				
Samples				4	4				
Big Creek (CERS)	Near Mossy Grove	1995							
Samples									
Big Sand Creek (CERS)	Barbour Co. 9	1995							
Samples									
Big Sandy Creek (CERS)	Bullock Co. 8	1994-1995		0.04	4				
Samples				4	4				
Blackwood Creek (GSA)	Dale Co. Road 67	1998	2.5	ND	7	4.4	0.11	6	48,000
Samples			28	28	28	28	28	28	28
Blackwood Creek (ADEM)	Highway 13 Henry Co.	1968						1	
Samples								13	
Blackwood Creek (ADEM)	852120 312233	1988			5				
Samples					5				
Tributary to Blackwood Creek (ADEM)	852012 312145 Henry Co.	1988			0				
Samples					5				
Blanket Creek (CERS)	New Bypass	1994							
Samples									
Blue Spring (CERS)	Blue Spring State Park	1994-1995							
Samples									
Bowden Mill Creek (CERS)	Pike Co. 73	1994							
Samples									
Buckhorn Creek (CERS)	Hwy. 130	1995							
Samples									
Buckhorn Creek (CERS)	Pike Co. 38	1994							
Samples									
Campbell Creek (CERS)	Hwy. 10	1995							
Samples									

Site and Collector	Location	Date	NO3-N lbs/y/mi2	PO4-P Max mg/l	P-Total 0.05mg/l	P-Total t/y	P-Total lbs/y/mi2	FC Bacteria 2000 c/100 ml	FS Bacteria Max c/100 ml
Choctawhatchee River (CERS)	Hwy. 52 Geneva	1994-1995		0.07	4				
Samples				4	4				
Choctawhatchee River (CERS)	Waterford	1994-1995		0.14	4				
Samples				4	4				
Claybank Creek (CERS)	Dale Co. 36	1994-1995		0.04	3				
Samples				3	3				
Claybank Creek (CERS)	Hwy. 134	1994-1995		0.28	4				
Samples				4	4				
Clearwater Creek (CERS)	Pike Co. 59	1994							
Samples									
Conners Creek (CERS)	Pike Co. 97	1994							
Samples									
Corner Creek (CERS)	Geneva Co. 54	1995							
Samples									
Corner Creek (CERS)	McPhail Farm Road	1994-1995							
Samples									
Double Bridges Creek (CERS)	Geneva Co. Road 58	1995							
Samples									
Double Bridges Creek (CERS)	Geneva Co. Road 65	1994							
Samples									
Double Bridges Creek (GSA)	Coffee Co. Road 663	1998	0.89	ND	16	14.1	0.36	7	87,000
Samples			25	25	25	25	25	25	25
Double Bridges Creek (ADEM)	855728 311248 Coffee Co.	1984-1986		0.52				0	
Samples				13				4	
Double Bridges Creek (ADEM)	855141 310233 Geneva Co.	1968						4	
Samples								13	
Dunham Creek (GSA)	Henry Co. Road 16	2004		ND	0				
Samples				2	2				
E. Fork Choctawhatchee River (CERS)	Highway 10	1995							
Samples									
E. Fork Choctawhatchee River (CERS)	Highway 27 Henry Co.	1994-1995		0.05	4				
Samples				4	4				
Five Runs Creek @ Covington Co. (GSA)		2001	260	ND	0	1.1	120	4	11,600
Samples			23	23	23	23	23	24	24

Site and Collector	Location	Date	NO3-N lbs/y/mi2	PO4-P Max mg/l	P-Total 0.05mg/l	P-Total t/y	P-Total lbs/y/mi2	FC Bacteria 2000 c/100 ml	FS Bacteria Max c/100 ml
Flat Creek (CERS)	Coffee Co. 479	1995							
Samples									
Halis Creek (CERS)	Coffee Co. 114	1994							
Samples									
Harrison Mill Creek (CERS)	Houston Co. Road 56	2003			3				
Samples					3				
Hayes Creek (CERS)	Coffee Co. 189	1995							
Samples									
Hurricane Creek (CERS)	Geneva Co. 41	1994-1995		0.34	4				
Samples				4	4				
Hurricane Creek (CERS)	Highway 123 Geneva Co.	1995							
Samples									
Lake Jackson (CERS)	Back Lake Pier	1994							
Samples									
Lake Jackson (CERS)	Swimming Pier	1994-1995							
Samples									
Lightwood Knot Creek (GSA)	Covington Co. Road 73	2003	1,420	0.3	4	3.7	180	1	11,600
Samples			13	13	13	13	13	10	10
Lightwood Knot Creek Tributary Site 1-C, (GSA)	Covington Co.	1996-2002		0.07	8			3	18,100
Samples				252	252			252	252
Lightwood Knot Creek Tributary Site 2-S, (GSA)	Covington Co.	1996-2002		0.07	47			10	>100,000
Samples				114	114			114	114
Lightwood Knot Creek Tributary Site 3-C, (GSA)	Covington Co.	1996-2002	2,219		77	0.01	85.3	20	76,000
Samples			105		108	108	108	133	133
Lightwood Knot Creek Tributary Site 4-S, (GSA)	Covington Co.	1996-2002	960	0.24	26	0.004	25.6	25	>200,000
Samples			122	122	122	122	122	122	122
Lake Frank Jackson (GSA)	near Opp, Covington Co.	2003		0.22	4			0	18
Samples				11	11			9	9
Little Beaverdam Creek (CERS)	Geneva Co. 75	1994							
Samples									
Little Choctawhatchee River (CERS)	Houston Co. 59	1994-1995		0.04	4				
Samples				4	4				
Little Choctawhatchee River (CERS)	Highway 123	1994-1995		0.22	4				
Samples				4	4				

Site and Collector	Location	Date	NO3-N lbs/y/mi2	PO4-P Max mg/l	P-Total 0.05mg/l	P-Total t/y	P-Total lbs/y/mi2	FC Bacteria 2000 c/100 ml	FS Bacteria Max c/100 ml
Little Choctawhatchee River (CERS)	Highway 84	2003			12				
Samples					12				
Little Choctawhatchee River (CERS)	Dale Co. Road 9	2003			12				
Samples					12				
Little Choctawhatchee River (CERS)	Houston Co. Road 59	2003			12				
Samples					12				
Little Choctawhatchee River (GSA)	Highway 84	1998	1.6	0.09	24	267	0.13	4	33,000
Samples			25	25	25	25	25	25	25
Little Choctawhatchee River (ADEM)	854007 311543 Dale Co.	1988			5				
Samples					5				
Little Choctawhatchee River (ADEM)	853710 311627 Dale Co.	1988			5				
Samples					5				
Little Choctawhatchee River (ADEM)	853412 311544 Houston Co.	1988			5				
Samples					5				
Little Choctawhatchee River (ADEM)	852519 311536 Houston Co.	1988			0				
Samples					5				
Little Choctawhatchee River (ADEM)	853147 311507 Dale Co.	1984-1986		0.78					
Samples				11					
Little Choctawhatchee River (ADEM)	852851 311438 Dale Co.	1974-1986		1.03					
Samples				121					
Little Choctawhatchee River (ADEM)	853711 311622 Highway 123	1968		0.99				1	
Samples				4				12	
Little Claybank Creek (CERS)	U. S. 231	1994-1995		0.05	4				
Samples				4	4				
Little Double Bridges Creek (GSA)	Coffee Co. Rd. 636	1998		0.07	9			7	24,000
Samples				25	25			25	25
Little Double Bridges Creek (ADEM)	855730 311620 near Enterprise	1985-1991							
Samples									
Little Double Bridges Creek (ADEM)	855707 311517 Coffee Co.	1985-1986		0.12				0	
Samples				12				3	
Mims Creek (CERS)	Pike Co. 59	1994-1995							
Samples									
Mossy Camp Branch (CERS)	Dale Co. Road 55	2003			3				
Samples					3				

Site and Collector	Location	Date	NO3-N lbs/y/mi2	PO4-P Max mg/l	P-Total 0.05mg/l	P-Total t/y	P-Total lbs/y/mi2	FC Bacteria 2000 c/100 ml	FS Bacteria Max c/100 ml
Newton Creek (CERS)	Highway 84 Houston Co.	2003			3				
Samples					3				
Panther Creek (CERS)	Covington Co. 59	1995							
Samples									
Panther Creek (CERS)	Panther Creek Road	2003			3				
Samples					3				
Pea Creek (CERS)	Coffee Co. 330	1994							
Samples									
Pea River (CERS)	Bullock Co. Road 34	1994-1995							
Samples									
Pea River (CERS)	Coffee Co. Road 107	1994							
Samples									
Pea River (CERS)	Coffee Co. Road 246	1994							
Samples									
Pea River (CERS)	Coffee Co. Road 342	1995		0.04	1				
Samples				1	1				
Pea River (CERS)	Coffee Co. Road 147	1994-1995		0.04	4				
Samples				4	4				
Pea River (CERS)	Hwy. 130	1995							
Samples									
Pea River (CERS)	Hwy. 239	1994-1995							
Samples									
Pea River (CERS)	Hwy. 27	1994-1995		0.06	4				
Samples				4	4				
Pea River (CERS)	Hwy. 84 Elba	1994-1995		0.1	3				
Samples				3	3				
Pea River (CERS)	Pike Co. 44	1994-1995		0.06	4				
Samples				4	4				
Pea River (CERS)	U. S. 231	1994-1995		0.06	4				
Samples				4	4				
Providence Creek (CERS)	Hwy. 85 Geneva Co.	1994							
Samples									
Richland Creek (CERS)	Hwy. 10 Pike Co.	1994							
Samples									

Site and Collector	Location	Date	NO3-N lbs/y/mi2	PO4-P Max mg/l	P-Total 0.05mg/l	P-Total t/y	P-Total lbs/y/mi2	FC Bacteria 2000 c/100 ml	FS Bacteria Max c/100 ml
Richland Creek (CERS)	Hwy. 29 Pike Co.	1995							
Samples									
Richland Creek (CERS)	Hwy. 81 Pike Co.	1994							
Samples									
Sandy Run Creek (CERS)	Hwy. 81 Pike Co.	1994							
Samples									
Sandy Run Creek (CERS)	Hwy. 10 Pike Co.	1994							
Samples									
Stinking Creek (CERS)	Hwy. 239 Barbour Co.	1994-1995		0.03	4				
Samples				4	4				
Tight Eye Creek (CERS)	Hwy. 79 Geneva Co.	1994							
Samples									
Unnamed Stream (CERS)	Hwy. 28 Pike Co.	1995							
Samples									
W. Fork Choctawhatchee River (CERS)	Highway 36 Dale Co.	1994-1995		0.03	6				
Samples				7	7				
Walnut Creek (CERS)	Hwy. 32 Pike Co.	1994							
Samples									
Walnut Creek (CERS)	Hwy. 59 Pike Co.	1994-1995		0.16	3				
Samples				3	3				
Walnut Creek (GSA)	Highway 231	1998		ND	6			1	17,000
Samples				25	25			25	25
Whitewater Creek (CERS)	Hwy. 224 Coffee Co.	1994-1995		0.05	4				
Samples				4	4				
Whitewater Creek (CERS)	Hwy. 26 Pike Co.	1994							
Samples									
Whitewater Creek (CERS)	Hwy. 59 Pike Co.	1994-1995							
Samples									
Wilkerson Creek (CERS)	Hwy. 723 Coffee Co.	1994							
Samples									
Wilson Creek (CERS)	Hwy. 719 Coffee Co.	1994							
Samples									
Yellow River (GSA)	Highway 55	2001		ND	0			2	5,600
Samples				21	21			21	21

Table 22.—Probable impaired streams and contaminants in the CPYRW.

Stream	Nitrate	Total Phosphorus	Sediment	Bacteria
Bear Creek Highway 84 Houston Co.	X	X		
Big Creek Coffee Co. 342		X		
Big Sandy Creek Bullock Co. 8		X		
Blackwood Creek Dale Co. Road 67	X		X	X
Tributary to Blackwood Creek Henry Co.		X		
Choctawhatchee River Hwy. 52 Geneva	X	X		
Choctawhatchee River Waterford	X	X		
Claybank Creek Dale Co. 36		X		
Claybank Creek Hwy. 134	X	X		
Double Bridges Creek Coffee Co. Road 663		X	X	
Dunham Creek Henry Co. Road 16	X			
E. Fork Choctawhatchee River Hwy 27 Henry Co.		X		
Harrison Mill Creek Houston Co. Road 56	X	X		
Hurricane Creek Geneva Co. 41	X	X		
Lightwood Knot Creek Tributary Site 1-C Covington Co.			X	
Lightwood Knot Creek Tributary Site 3-C Covington Co.	X	X		
Lightwood Knot Creek Tributary Site 4-S Covington Co.	X	X		
Little Choctawhatchee River Dale Co. Road 9	X	X		
Little Choctawhatchee River Houston Co. Road 59	X	X		
Little Choctawhatchee River Hwy 84	X	X	X	
Little Claybank Creek U. S. 231	X	X		
Mossy Camp Branch Dale Co. Road 55	X	X		
Newton Creek Highway 84 Houston Co.	X	X		
Panther Creek Panther Creek Road	X	X		
Pea River Coffee Co. Road 342	X	X		
Pea River Coffee Co. Road 147		X		
Pea River Hwy. 27		X		

Pea River Hwy. 84 Elba		X
Pea River Pike Co. 44		X
Pea River U. S. 231		X
Stinking Creek Hwy. 239 Barbour Co.		X
W. Fork Choctawhatchee River Highway 36 Dale Co.		X
Walnut Creek Hwy. 59 Pike Co.	X	X
Whitewater Creek Hwy. 224 Coffee Co.	X	X

Table 23.—Summary of analytical results for selected metallic, nonmetallic inorganic, and organic constituents in streams in the CPYRW.

Parameter	Standard	Streams sampled	Total samples	Exceeds standard
Arsenic	.010 mg/L	3	28	0
Barium	2 mg/L	5	59	0
Beryllium	.004 mg/L	3	31	0
Cadmium	.005 mg/L	14	93	1
Chromium	.1 mg/L	5	54	0
Copper	1.3 mg/L	5	51	0
Lead	.015 mg/L	15	117	2
Mercury	.002 mg/L	13	89	0
Selenium	.05 mg/L	2	24	0
Thallium	.002 mg/L	2	24	0
Zinc	5 mg/L	6	78	0
Cyanide	.2 mg/L	2	15	0
Phenolics	.3 mg/L	2	24	0

VIOLATION OF ADEM GROUNDWATER QUALITY

Groundwater quality data is available from ADEM for each public-water supply system in the CPYRW. Water systems are required to provide water sample analysis on a regular schedule; this sampling schedule is primarily based on the population served or on observed patterns of past quality violations. As can be seen in table 24, coliform bacteria was the only water quality parameter violated by any water system.

Table 24.— Public-water supply systems in the CPYRW and their water quality violations since 2000

System	County	Source	Population served	Water quality violations (since 2000)
Bakerhill Water Authority	Barbour	Groundwater	6,954	None
Blue Springs Water Works	Barbour	Groundwater	609	None
Clayton Water Works and Sewer	Barbour	Groundwater	2,850	Coliform Bacteria January, 2001
Clio water Works	Barbour	Groundwater	1986	Turbidity January, 2004
	Barbour	Groundwater		
South Bullock County Water Authority	Bullock	Groundwater	8,430	None
Union Springs Utility Board	Bullock	Groundwater	4,338	None
Coffee County Water Authority	Coffee	Groundwater	2,748	None
Elba Water Works	Coffee	Groundwater	5,976	None
Enterprise Water Works	Coffee	Groundwater	39,000	None
Jack Water System, Inc.	Coffee	Groundwater	1,080	None
Kinston Water Works	Coffee	Groundwater	2,088	None
New Brockton Water Department	Coffee	Groundwater	2,946	None
New Hope Water System	Coffee	Groundwater	1,500	None
Pilgrims Pride Corp. of Delaware	Coffee	Groundwater	1,000	None
Wayne Farms LLC	Coffee	Groundwater	550	None

Table 24.— Public-water supply systems in the CPYRW and their water quality violations since 2000

System	County	Source	Population served	Water quality violations (since 2000)
Ariton Water Works	Dale	Groundwater	1,200	None
Florala Water Works and Sewer Board	Covington	Groundwater	3,285	January, 2002 Coliform Bacteria August, 2002 Coliform Bacteria 2003 Chlordane, Ethylene dibromide, 1-2 dibromo-3-chloropropane, Polychloronated biphenyls, Pentachlorphenol, Benzo pyrene, Hexachlorobenzene, 2-4-5-TP Silex, 2,4-D, Heptachlor epoxide, Heptachlor, Alachlor Lasso, Atrazine, Aldacarb, Carbofuran, Aldicarb sulfone, Aldicarb sulfoxide, Hexachlorocyclopentadiene, Dinoseb, Picloram, Di (2-ethylhexy) phthalate, Simazine, Oxamyl Vydate, Di (2-ethylhexy) adipate, Glyphosate, Endothall, Diquat, Dalapon, Toxophene, Methoxychlor, Gamma-BHC Lindane, Endrin
Lockhart Water Works	Covington	Groundwater	744	None
Florala Rest Area (US 331)	Covington	Groundwater	500	None
Dale County Water Authority	Dale	Groundwater	6,006	None
Daleville Water & Sewer Board	Dale	Groundwater	7,500	Coliform Bacteria June 2003

Table 24.— Public-water supply systems in the CPYRW and their water quality violations since 2000

System	County	Source	Population served	Water quality violations (since 2000)
Fort Rucker American Water	Dale	Groundwater	11,000	None
Level Plains Water System	Dale	Groundwater	3,042	None
Midland City Water Department	Dale	Groundwater	3,000	None
Napier Field Water System	Dale	Purchased Groundwater	2,139	None
Newton Water Works Board	Dale	Groundwater	2,160	None
Ozark Utilities Board	Dale	Groundwater	18,897	None
Pinkard Water Department	Dale	Groundwater	1,026	Coliform Bacteria November 2001
ECH AAF	Dale	Groundwater	30	None
Range Control	Dale	Groundwater	40	None
Bellwood Water and Fire Authority	Geneva	Groundwater	390	None
Black Water Works	Geneva	Groundwater	369	Coliform Bacteria July 2000
Coffee Springs Water System	Geneva	Groundwater	516	None
Geneva Water Works	Geneva	Groundwater	5,613	None
Hartford Water Works	Geneva	Groundwater	3,690	None
Malvern Water Department	Geneva	Groundwater	1,200	None
North Geneva County Water Authority	Geneva	Groundwater	393	None
Samson Water Works	Geneva	Groundwater	2,564	None
Slocomb Water Works and Sewer Board	Geneva	Groundwater	3,600	None
Camp Victory	Geneva	Groundwater	170	None
Geneva Motel	Geneva	Groundwater	32	None
High Bluff AAF	Geneva	Groundwater	30	None
Dothan Water Department	Houston	Groundwater	89,802	None
Allen AAF	Houston	Groundwater	30	None
Toth AAF	Houston	Groundwater	30	None
Banks Water System	Pike	Groundwater	1,212	None

Table 24.— Public-water supply systems in the CPYRW and their water quality violations since 2000

System	County	Source	Population served	Water quality violations (since 2000)
Pike County Water Authority	Pike	Groundwater	17,670	Coliform Bacteria April 2000
Troy Utilities Department	Pike	Groundwater	17,829	None
Brundidge Water Department	Pike	Groundwater	3,438	None

HUMAN HEALTH THREATS

PATHOGENS

Pathogens are microorganisms that cause illnesses; they represent a threat to human health if present in drinking water supplies or where humans come in contact with contaminated water. Scientists often use bacteria as indicators of fecal contamination and pathogen presence.

The pathogens associated with the waterborne diseases originate in the wastes of humans and other warm-blooded animals. Because most point sources are treated to eliminate pathogens, contamination of water supplies is most often a result of pollutants discharged in run-off containing human or other animal wastes to surface water or ground water from diffuse, or nonpoint, sources. These sources may include failed septic systems and surface run-off from agricultural and developed land. In some instances, combined sewer overflows can discharge untreated human wastes into surface waters used as public water supplies. These same nonpoint sources of pathogens can put recreational users of surface waters at risk of becoming ill when contaminated water is ingested, primarily while swimming.

Without monitoring, it is difficult to know whether a water body is safe for swimming or if a particular ground or surface water is safe for drinking as there are usually few visible signs of contamination.

SEPTIC TANKS

Onsite sewage systems are effective at treating household sewage if designed and installed properly in appropriate soil and maintained regularly. In typical onsite sewage systems, the wastewater from toilets and other drains flows from your house into a tank that separates the solids and scum from the liquid. Bacteria help break down the solids into sludge. The liquid flows out of the tank into a network of pipes buried in a disposal field of gravel and soil. Holes in the pipes allow the wastewater to be released into the disposal field. The soil, gravel and naturally occurring bacteria in the soil filter and cleanse the wastewater.

Onsite systems that are poorly planned, constructed or maintained present substantial threats to water quality in the watershed. Onsite sewage systems can fail and untreated wastewater can be carried to nearby waterbodies threatening human health, causing excessive algal growth and harming aquatic life. A system that is not properly designed or that does not have an appropriate depth of suitable soil may not fully treat the wastewater. The wastewater can seep down into the groundwater polluting drinking water supplies or rise to the surface and flow over land into nearby waterbodies. If the system does not function properly, the solids and scum can flow into the drainfield and plug it up. If the drainfield gets clogged, untreated wastewater can rise to the surface, threatening human health, reducing the value of your property, and creating odors and the need for costly repairs. Heavy use of strong disinfectants can kill the beneficial bacteria in the soil around the disposal field and reduce the natural cleansing function of the system. Finally, excessive water use in the home can cause wastewater to be flushed out too quickly so that solids can flow into the drainfield, causing it to plug.

FISH CONSUMPTION ADVISORIES FOR THE YELLOW RIVER WATERSHED

Toxic chemicals are present in some lakes and rivers in Alabama. Some of these chemicals can accumulate in fish. With some of the materials, higher levels of contaminants can be found in older and/or larger fish. When chemical concentrations are elevated in fish, they can pose health risks to people who eat them.

The advisories are developed to inform fishermen the species of fish and the water bodies that may present an elevated health hazard. They explain the potential health hazards associated with ingesting certain contaminants. The advisories also inform how to reduce contamination ingestion by changing the way the fish is prepared.

The advisories are designed to provide sufficient information to permit individuals to make an informed choice concerning the risk assumed from consuming fish that may be contaminated. Fish consumption advisories are issued by the Alabama Department of Public Health (ADPH), after review of analytical data provided by ADEM. ADPH issues two types of advisories. A Limited Consumption Advisory states that women of reproductive age and children less than 15 years of age should avoid eating certain species of fish from certain water bodies. Other people should limit consumption to one meal per month. A No Consumption Advisory recommends that everyone should avoid eating certain fish species from the defined area. Table 25 contains the water bodies with current fish consumption advisories in the CPYRW.

Table 25 — Fish consumption advisories for water bodies in the CPYRW

Water Body	**HUC name and no.**	**County**	**Location**	**Species**	**Pollutant**	**Level of Advisory**
Yellow River	Yellow River (03140103)	Covington	CR 4 Bridge crossing ~ 1.5 mi. upstream of AL/FL line	Largemouth Bass	Mercury	No Consumption

MANAGEMENT PLAN IMPLEMENTATION

GOAL

The goal of the Choctawhatchee, Pea, and Yellow Rivers Watershed Clean Water Partnership is to protect, improve and maintain water quality/quantity in Alabama's Choctawhatchee, Pea and Yellow River Basins by meeting the goals of the CWA through basin-wide public/private partnerships while maintaining the balance between protecting the environment and promoting the economy.

OBJECTIVES

The following objectives will be implemented to meet the above goal. The objectives were determined through public input, stakeholder surveys and stakeholder meeting discussions. Prioritization of objectives must be based on individual watershed land uses and impairments.

1. Increase citizen awareness and education of watershed protection.
2. Evaluate available physical, chemical and biological data for surface and groundwater to determine if additional data is needed and to utilize data to identify current and potential environmental issues and problems.
3. Reduce pollution from construction and other land disturbance activities.
4. Reduce pollution from domestic onsite sewage disposal systems.
5. Reduce pollution from illegal waste dumping sites and littering.
6. Reduce pollution from agricultural activities.
7. Reduce pollution from forestry activities.
8. Reduce pollution from unimproved roadways.
9. Reduce nonpoint source pollution from urban sources including stormwater runoff and wastewater disposal.
10. Reduce pollution from industrial processes.
11. Protect groundwater resources through conservation and pollution prevention.
12. Protection of wetlands, faunal habitats, and other critical areas.
13. Assess the effectiveness of the CPYWMP.

The Goal and 13 Objectives were developed by the CPYRW Management Plan sub basin and steering committees and citizen input. The strategies to achieve the objectives are based on water quality data, land use/land cover information, and best professional judgment of the CPYRWMA, GSA, Wiregrass RC&D Council, SWCD, NRCS, ADEM, AFC and ACES professional staff. Action items are proposed for the accomplishment of each strategy and measures of progress and success are proposed for each strategy and action. Protection measures attempt to address, at a minimum, the pollutants for which TMDLs will be developed for water bodies on the 2002 Section 303(d) List of Impaired Waters. However, review of available scientific data for streams in the CPYRW indicates that numerous additional streams and pollutants must be addressed. Protection strategies promote a voluntary rather than a regulatory approach. A combination of education and outreach efforts and installation of on-the-ground BMPs will be used to expedite pollutant load reductions, improve, protect and maintain water quality, and ultimately lead to delisting of Section 303(d) water bodies in the CPYRW, add additional streams to the Section 303(d) list and remediate other streams for which impairments have been identified.

OBJECTIVE 1: INCREASE CITIZEN AWARENESS AND EDUCATION OF WATERSHED PROTECTION

The purpose of this objective is to increase citizen awareness and education for watershed protection, and develop long-term support and involvement of citizens for watershed planning and protection. Strategies for successfully attaining this objective are discussed below.

STRATEGY A

Accomplishment of objective 1 will be facilitated by coordinating implementation of this basin management plan with the CWP, the CPYRCWP, the general public, and other stakeholders. One of the primary purposes of this plan and the CPYRCWP is to consider the varied ideas and interests of stakeholders and to develop them into strategies to accomplish goals for water-quality improvement. This process begins with public education concerning water-quality issues and basic understanding of scientific principles related to environmental protection and enhancement. Coordination is needed to assure that stakeholders cooperatively achieve the objectives of this management plan using specific action items listed below.

Responsible Parties: CPYRCWP
Cooperators: All stakeholders
Potential Funding: Unknown
Schedule: Ongoing, beginning first quarter, 2006
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Facilitate inclusive partnerships to ensure that participation efforts meet the needs of all stakeholders
2. Maintain lines of communication that ensure inclusive participation
3. Incorporate citizen-based input into resource agency decision-making processes
4. Provide stakeholders with opportunities to engage in basin-wide protection plan implementation efforts
5. Provide stakeholders with education and outreach and training to illustrate opportunities for personal involvement to provide solutions to river basin problems
6. Coordinate funding, technical assistance, and technology transfer to resolve watershed environmental issues
7. Develop and implement new and innovative methods of stakeholder education
8. Assisting in development of subwatershed management plans that incorporate watershed plan objectives
9. Cooperatively develop and implement new and innovative, and proven-effective protection practices
10. Implement corrective actions in priority areas including Section 303(d) listed waters, areas with threatened and endangered species, wetlands, critical habitats, threatened groundwaters, and specific land uses

PROGRESS AND SUCCESS CRITERIA

1. Many and varied stakeholders represented in watershed protection activities and decisions
2. Responsive and reliable lines of communication established
3. Citizen input used in decision-making processes
4. Stakeholders volunteer to implement components of the watershed management plan
5. Education and outreach provided to illustrate the need for citizens to take responsibility for solutions to problems identified in the river basin
6. Funding, technical assistance, and technology transfer provided to resolve basin-wide environmental and economic issues

7. New and innovative environmental education opportunities provided throughout the watershed
8. Subwatershed management plans incorporated as addendum's into this basin management plan
9. New and innovative, and proven-effective protection practices developed and implemented
10. Corrective actions are implemented in priority areas including Section 303(d) listed waters, areas with threatened and endangered species, wetlands, critical habitats, threatened groundwaters, and specific land uses

STRATEGY B

Solicit stakeholder input in updates of this watershed management plan. It is very important to have buy-in from CPYRW stakeholders including landowners, agencies, governmental units, planners, engineers, and citizens. Interaction between interest groups and resource agencies with a stake in the health and productivity of the watershed is critical to long-term protection. Opportunities for coordination and interaction are needed to build mutual trust and understanding.

Responsible Parties: CPYRCWP
Cooperators: Any stakeholder
Potential Funding: Section 319, CWP
Schedule: Ongoing, beginning first quarter, 2006
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Conduct public meetings in counties and communities throughout the watershed
2. Make available draft and final management plans to interested citizens for comment.
3. Conduct an annual progress review of management plan implementation successes and needs and update the management plan as needed
4. Individuals and groups providing or contributing human and financial resources to watershed management objectives will be publicly recognized

PROGRESS AND SUCCESS CRITERIA

1. Public meetings conducted throughout the river basin
2. Opportunities for the public to comment on draft and final watershed management plans provided
3. Reviews of management plan implementation successes and needs included in management plan update

4. Individuals and groups providing or contributing human and financial resources to watershed management objectives publicly recognized

STRATEGY C

Promote, develop or expand environmental education and outreach in public and private schools, and citizenry groups. Environmental education materials, projects, and outreach programs for schools, educators and others involved in environmental education should be collected, developed, evaluated and distributed. Materials and projects are needed that are relevant to the CPYRW and instill a sense of pride, interest and participation in environmental protection. Education materials and projects should be grade level appropriate.

Responsible Parties: CPYRCWP facilitator and education committee
Cooperators: Legacy, ADEM, public and private school districts, academia, Wiregrass RC&D Council, CPYRWMA, ARWA
Potential Funding: Legacy, Wiregrass RC&D Council, CPYRWMA, Section 319, private donations
Schedule: Ongoing, beginning first quarter, 2006
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. The CPYRCWP facilitator will research availability, acquire and distribute education resources and coordinate projects to public and private school teachers and students
2. The CPYRCWP facilitator will provide presentations and recruit volunteers to do presentations for classes and youth groups
3. Promote the construction and use of outdoor environmental education learning centers, classrooms, and projects
4. Promote and coordinate county groundwater festivals
5. Design and print brochures and other materials describing the scope, extent, goals, and objectives of the CPYRWMP
6. Develop presentations to present to educators, civic organizations, businesses, homebuilders associations, county and city personnel, etc., to promote the watershed and management plan objectives

PROGRESS AND SUCCESS CRITERIA

1. Education resources distributed to public and private school teachers and students
2. Presentations provided to classes and youth groups
3. Outdoor environmental education learning centers, classrooms, and projects constructed and used throughout the river basin

4. Sponsor a ground-water festival in each of 10 counties in the watershed
5. Distribute brochures and other materials
6. Numerous presentations given to educators, civic organizations, businesses, homebuilders associations, county and city personnel, etc.

STRATEGY D

Promote watershed protection activities through the news media, web sites, environmental agency programs, and other sources to increase citizen awareness. Presenting accurate, meaningful, and timely information to a large sector of the population in a cost-effective and timely manner is important. Knowledge, concerns, and perceptions are important components to watershed wide protection and environmental awareness. Mass communication is effective in increasing participation and interest in targeted specific groups. Widespread information exchange is needed to deliver information to watershed stakeholders that makes sense to them and relates to their various interests and values.

Responsible Parties: CPYRCWP facilitator
Cooperators: News media, environmental agencies, citizens
Potential Funding: Section 319, Legacy, CPYRWMA
Schedule: Ongoing, beginning first quarter, 2006
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Publish articles in newspapers and newsletters to update citizens on management plan activities and successes within the CPYRW
2. Use radio and television media public service announcements (PSA's) for CPYRW activities
3. Promote Clean Water Partnership PSAs
4. Develop or enhance web sites to display watershed management information

PROGRESS AND SUCCESS CRITERIA

1. Articles published in newspapers and newsletters
2. Radio and television media public service announcements announcing CPYRW activities
3. Clean Water Partnership PSAs used throughout the basin
4. Development of CPYRCWP

STRATEGY E

Place "Choctawhatchee, Pea, and Yellow Rivers Watershed" signs on major roads entering and leaving the Basin. Citizens need to be aware geographic extent of the watershed, the unique resources that are available, and the need to maintain and protect them for future generations. Roadside signs or billboards need to be installed along major roads to encourage pride and "ownership" for residents and to promote the environmental protection concepts to visitors.

Responsible Parties: CPYRCWP
Cooperators: SWCD's, County Commissions, ALDOT, CPYRWMA
Potential Funding: Section 319, city and county governmental units, water boards and utilities, CPYRWMA
Schedule: Third quarter, 2006
Load Reduction Estimates: Intrinsic
Estimated Cost: $200 per sign

ACTION ITEM

1. Install CPYRW specific signage along major roads to encourage basin and watershed pride and "ownership" for residents and visitors

PROGRESS AND SUCCESS CRITERION

1. Signage installed along major roads entering the watershed

OBJECTIVE 2: INVENTORY, EVALUATE, AND MONITOR THE PHYSICAL, CHEMICAL AND BIOLOGICAL PARAMETERS FOR SURFACE AND GROUNDWATER

STRATEGY A

Evaluate and prioritize environmental data and information needed to identify current and potential environmental issues and problems and improve watershed plan implementation effectiveness. As the management plan is developed and implemented, existing data will be utilized and new information will become available. Currently, a large data set is available and may be utilized to help stakeholders protect public health and welfare, water quality, aquatic and upland species, and enhancement of recreational benefits. Additional monitoring may be needed to evaluate specific issues or problems for future planning; decision making; management plan practice implementation; developing indicators, status and trends; and measuring success.

Extensive stakeholder participation and consensus should be used to determine assessment processes and implementation prioritization.

Responsible Parties: CPYRCWP
Cooperators: ADEM, GSA, USGS, CPYRWMA, academia, city and county governmental units, water boards, industry, municipalities
Potential Funding: CPYRWMA, ADEM, GSA, USGS
Schedule: Ongoing
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. The CWP facilitator will routinely identify additional data and information needs
2. The CWP facilitator will initiate efforts with technical cooperators to evaluate existing data and develop requirements to acquire additional data
3. The CWP facilitator will develop funding proposals
4. Use scientifically based data and information to prioritize remediation efforts
5. Facilitate evaluation of remedial actions and ecological status and trends to determine measurable improvements

PROGRESS AND SUCCESS CRITERIA:

1. The need for additional data and information is routinely identified
2. Assessment activities coordinated among resource agencies and other stakeholders
3. Secure funding for data evaluation and acquisition
4. Scientifically based data and information is used to establish management practice priorities
5. Measurable improvements and ecological status and trends are documented

STRATEGY B

Develop support and interest in the Alabama Water Watch (AWW) citizens volunteer water quality monitoring program. Citizens are encouraged to be involved in the ecological, socioeconomic, and political aspects of the watershed. The AWW program is an excellent way to involve stakeholders and provide citizens an opportunity to be aware and active in environmental monitoring and decision making processes. The water quality data that citizens collect provides valuable information; however, the knowledge and experience citizens gain in doing so can be a major factor leading to better water quality and water policy.

Responsible Parties: AWW
Cooperators: CPYRCWP, CPYRWMA, schools, environmental protection groups, AWWA, watchdog groups, AARP, League of Woman Voter's, Scouts, church groups
Potential Funding: AWWA, ADEM
Schedule: Ongoing, beginning third quarter, 2006
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Create interest and increase citizen volunteer water quality monitoring throughout the watershed
2. Conduct AWW basic and bacteriological certification workshops
3. Present Advanced Workshops for biological (bacteria and macroinvertebrate) monitoring
4. Compare pre- and post-BMP implementation AWW data to determine measurable improvements in water quality in the watershed
5. Encourage teachers and students to get involved in volunteer water quality monitoring
6. Involve and coordinate management plan implementation with other volunteer activities such as watchdog groups, AARP, League of Woman Voter's, Scouts, church groups, and others with an interest or that report environmental problems
7. Focus volunteer monitoring on Section 303(d) listed waterbodies, other impaired waterbodies such as those identified in the plan, and waterbodies where BMPs have been installed

PROGRESS AND SUCCESS CRITERIA

1. Citizens volunteer to monitor water quality throughout the watershed
2. Certification workshops presented
3. Advanced certification workshops presented
4. AWW data used to document measurable improvements in water quality
5. Teachers and students trained to collect monitoring data
6. Coordination with volunteer groups
7. Volunteer monitoring data collected on Section 303(d) listed waterbodies, other impaired waterbodies, and waterbodies where BMPs have been installed

STRATEGY C

Partner with Troy University, Lurleen B. Wallace Community College, Wallace Community College, and Enterprise-Ozark Community College Aviation to collect and analyze water quality data. Technical expertise and research interest is critical to implementation. Higher education institutions can provide scientific and academic researchers and expertise. These professionals need to be involved in planning, collection and analyses of environmental data, and implementation.

Responsible Parties: CPYRCWP
Cooperator: Colleges and universities, instructors, students, science clubs
Potential Funding: Colleges and universities
Schedule: Ongoing
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS:

1. Promote the CPYRWMP to colleges and universities
2. Seek and encourage research projects that include environmental data collection and remedial projects
3. Encourage instructors to incorporate applicable components of the CPYRWMP into their curriculum

PROGRESS AND SUCCESS CRITERIA:

1. The CPYRWMP promoted in colleges and universities
2. Research and remedial projects conducted in the watershed
3. Colleges and universities include CPYRWMP components as part of their curriculum

STRATEGY D

Input broad-based watershed and subwatershed-specific data into water quality databases. Easily accessible, user-friendly data and information depository and retrieval systems were developed in a cooperative effort by the CPYRWMA and GSA in 2004. Ongoing updates to these Geographic Information System (GIS) databases are needed to better identify and assess CPYRW problems and to develop solutions.

Responsible Parties: CPYRCWP, CPYRWMA
Cooperators: CPYRWMA, ADEM, GSA, ADECA
Potential Funding: CWP, CPYRWMA ADEM, GSA, ADECA
Schedule: Ongoing
Load Reduction Estimates: Intrinsic
Estimated Cost: $5,000.00 annually

ACTION ITEMS

1. Maintain existing GIS databases

2. Use compiled data to assess Section 303(d) listed waters, and other monitored waterbodies (i.e., determine when data was collected, frequency of data collection, improvement in water quality, possible de-listing of waterbodies, etc.)

PROGRESS AND SUCCESS CRITERIA

1. Updated GIS databases available
2. Data used to assess Section 303(d) listed and other waters

OBJECTIVE 3: REDUCE POLLUTION FROM CONSTRUCTION AND OTHER LAND DISTURBANCE ACTIVITIES

Reduction of pollution and contamination from construction sites and other land disturbance activities reduces sedimentation of streams, erosion, and general water quality degradation.

STRATEGY A

Facilitate education and outreach programs for the construction industry. Education and outreach to the construction industry will promote better understanding, participation and partnerships – keys to long-term water quality and resource protection. Information delivery should use multiple media forms and be presented in user-friendly, non-academic/citizen comprehensible and easily accessible formats.

Responsible Parties: Local or state homebuilders associations, ADEM,
Cooperators: County commissions, HBAA, SWCS, CPYRCWP
Potential Funding: EPA, CPYRWMA, county commissions, city governments, Homebuilders Association of Alabama (HBAA), Alabama General Contractors Association of Alabama (AGCA)
Schedule: Ongoing
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Encourage implementation of pollution control measures using the HBAA and AGCA's Construction Stormwater Management Course
2. Present educational and outreach programs to local governments, builders, and contractors
3. Provide workshops on erosion and sediment control in evening or weekend formats utilizing the interagency/NPDES permit stormwater handbook developed in partnership by NRCS, SWCC, Alabama Soil and Water Conservation Society and ADEM

4. Promote pollution prevention management measures using Business Partners for Clean Water, Nonpoint Source Education for Municipal Officials (NEMO), and other programs

PROGRESS AND SUCCESS CRITERIA:

1. Number of seminars conducted and number of stakeholders trained by the HBAA's Construction Stormwater Management Course
2. Number of educational and outreach programs presented to local governments, builders and contractors
3. Number and type of programs and/or workshops conducted and stakeholders attending

STRATEGY B

Provide sediment and erosion control training for public works employees and others involved in construction related activities. Protection measures are needed to control polluted runoff from construction activities. Pollutant sources are generally site-specific and are affected by economic development, population growth and urban development. Training and education should focus on implementation of a combination of structural and nonstructural protection measures appropriate to the source, location, and pollutant of concern.

Responsible Parties: ADEM, county and municipal public works departments, HBAA
Cooperators: County and municipal governments, ACES, ADEM, SWCD, ALDOT, HBAA, AGCA, SWCS, CPYRCWP committees
Potential Funding: 319 funding, ALDOT, county commissions, CPYRWMA
Schedule: Second quarter 2006
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Assist in workshops and training seminars for the targeted groups
2. Utilize the publication, "*Recommended Practices Manual – A Guideline for Maintenance and Service of Unpaved Roads*" developed by the CPYRWMA
3. Encourage public works departments and developers to hire trained contractors and to provide qualified inspectors
4. Enlist the SWCS and other organizations to present erosion control protection presentations and NEMO training or have a "train the trainers" session to equip others to do presentations

PROGRESS AND SUCCESS CRITERIA:

1. Workshops and training seminars are presented to targeted groups

2. *“Recommended Practices Manual – A Guideline for Maintenance and Service of Unpaved Roads”* developed by the CPYRWMA is made available to targeted groups
3. Trained contractors and inspectors are hired within public works departments
4. Erosion control protection presentations and/or “train the trainers” sessions have been presented to targeted groups

OBJECTIVE 4: REDUCE POLLUTION FROM DOMESTIC ONSITE SEWAGE DISPOSAL SYSTEMS (OSDS)

Impaired water quality as a result of failed OSDS is a significant problem in some areas of the watershed.

STRATEGY A

Identify areas with significant impacts from inadequately treated sewage and wastewater. Improperly treated domestic sewage harbors disease-causing viruses, bacteria and parasites, and is characterized by objectionable odor and appearance. The failure of traditional septic tank systems causes excessive amounts of raw or inadequately treated pollutants to degrade surface and groundwaters. As a septic system-siting requirement, soil evaluations and percolation tests should be conducted to determine the suitability of an absorption field. Adequate treatment of domestic wastewater is needed to protect public health and the environment. An Environmental Daily Action Report (EDAR) database for all permitted onsite systems is currently being used by county health departments.

Responsible Parties: County health departments, CPYRCWP facilitator
Cooperators: Alabama Onsite Wastewater Association, SWCD, water authorities, county commissions, ADEM, Alabama Department of Agriculture and Industies (ADAI)
Potential Funding: EPA Rural Hardship Assistance Program, Section 319, county commissions, ADAI
Schedule: Ongoing, beginning second quarter, 2006
Load Reduction Estimates: Reduced nutrients and pathogens to surface and groundwater
Estimated Cost: Unknown

ACTION ITEMS

1. Coordinate impaired sites and watershed identification efforts with the SWCD 5-year watershed assessment program
2. Assess all known water quality monitoring data to identify areas that are, or suspected to be, impaired by sewage runoff
3. Develop a list of priority impairment sites and timelines for installation of sewage management practices throughout the watershed

4. Assist health departments with updating watershed information in existing EDAR
5. Promote and utilize antibiotic resistance, DNA analyses, and other detection methods to distinguish between human and animal coliform pollutant sources and cooperate with the ADAI in their efforts to develop this technology
6. Promote periodic water quality monitoring to identify impaired waters and to assess the effectiveness of protection practices
7. Facilitate assessments to expedite sewage pollutant load reductions and ultimately lead to restoration of waterbodies, delisting of Section 303(d) waterbodies, and identification of impaired waterbodies

PROGRESS AND SUCCESS CRITERIA:

1. Usage of SWCD Watershed Assessment database sewage information compiled a minimum of every 5 years
2. Water quality monitoring data collected and evaluated to identify surface and groundwaters suspected to be impaired by sewage runoff
3. A list of priority impairment sites and timelines developed for installation of sewage management practices throughout the river basin
4. Watershed information is entered into the EDAR database and updated as needed
5. Utilize programs in-place to distinguish between human and animal coliform pollutant sources
6. Water quality monitoring programs in-place to identify impaired waters and to assess the effectiveness of protection practices
7. Waterbodies restored or delisted from the Section 303(d) List as a result of implementation of sewage treatment management practices and impaired waterbodies identified

STRATEGY B

Promote the use of alternative onsite sewage treatment systems. Some soils in the basin are not suitable for conventional septic tank systems. Sensitive areas, such as lakeshores and adjacent areas to water supply sources, may have suitable soils, but high-density populations make traditional septic tank systems undesirable. Installing alternative OSDSs and decentralized systems should be encouraged as an option to septic tanks to treat wastewater. Alternative systems should be sited, designed, and installed so that impairments to surface and groundwaters will be reduced to the extent practical. Consideration should be provided to areas with poorly drained soils, shallow water tables or high seasonal water tables, nearness to wells and drinking water supplies, areas underlain by fractured bedrock that drains directly to groundwater, floodplains, topography, public health threats, family size, housing density, and seasonal use.

Responsible Parties: CPYRCWP, ADPH, county health departments
Cooperators: Homebuilder associations, county engineers, planners, Alabama Onsite Wastewater Training Center, RC&D council, alternative septic system designers, manufactures, and installers
Potential Funding: County funds, SWCD, Section 319
Schedule: Beginning first quarter, 2007
Load Reduction Estimates: Reduced nutrients and pathogens to surface and groundwater
Estimated Cost: Unknown

ACTION ITEMS

1. Encourage the use of decentralized and alternative OSDSs and certified operators to perform installation, operation and maintenance
2. Promote installation of alternative systems in areas where soil absorption systems will not provide adequate treatment of effluents containing phosphorus, nitrogen, pathogens and other pollutants
3. Expedite alternative and decentralized treatment systems to reduce pollutant load and ultimately lead to de-listing of Section 303(d) waterbodies
4. Assist with OSDS education and outreach
5. Promote county/local resolutions to promote decentralized wastewater treatment
6. Assist with demonstration projects to promote the understanding and acceptance of alternative systems to public health officials, engineers, homebuilders, homeowners, etc.

PROGRESS AND SUCCESS CRITERIA

1. Installation of decentralized and alternative OSDSs in areas not suitable for conventional septic tank systems
2. Installation of alternative OSDSs in areas with inadequate treatment of effluents containing phosphorus, nitrogen, pathogens and other pollutants
3. Waterbodies restored or delisted from the Section 303(d) List as a result of implementation of OSDS management measures
4. OSDS education and outreach promoted throughout the basin
5. County/local resolutions adopted to promote decentralized wastewater treatment
6. Demonstration projects to promote the understanding and acceptance of alternative systems to public health officials, engineers, homebuilders, homeowners, etc. implemented

OBJECTIVE 5: REDUCE POLLUTION FROM ILLEGAL WASTE DUMPING SITES AND LITTERING

Strategies are needed to deter those who engage in illegal dumping.

STRATEGY A

Illegal dumping of waste in rural watersheds is a prevalent source of water quality impairment. Illegal dumping includes animal carcasses, household garbage, appliances, tires, building materials, septic tank pumpage, and lawn waste. Education is a primary tool for reduction.

Responsible Parties: County health departments, local law enforcement
Cooperators: CPYRCWP, PALS, AFC
Potential Funding: County funds, SWCD, Section 319
Schedule: Ongoing, beginning third quarter, 2006
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Promote pollution prevention, recycling, and composting as alternatives for household, lawn, building material disposal, and animal carcass disposal
2. Develop a GPS based list of priority illegal dump sites by county
3. Coordinate illegal site assessment with local health departments and law enforcement
4. Seek funding to provide for site cleanup and law enforcement

PROGRESS AND SUCCESS CRITERIA

1. Produce and distribute education materials that explain the harm of illegal dumping, identify and provide alternatives
2. Development of list of priority sites
3. Assessments of sites for remediation
4. Funding in place for site cleanup and law enforcement

STRATEGY B

Promote clean-up days for lakes and streams in the CPYRW. Routine and coordinated clean-up efforts are needed throughout the entire CPYRW to protect water quality from pollutants and to improve aesthetics and water resource recreational use and value.

Responsible Parties: CPYRCWP
Cooperators: ADEM, County Commissions, Civic Clubs, US Army
Potential Funding: Section 319, governmental units, local merchants
Schedule: Ongoing, initiated second quarter, 2005
Load Reduction Estimates: Reduced solid waste pollutants on waterways and along shorelines
Estimated Cost: Variable on clean-up area size

ACTION ITEMS

1. Continue annual cleanups to include tributaries and other waterways located within the CPYRW
2. Increase number of participants in cleanup event
3. Install signs at clean-up sites to document the effort and date

PROGRESS AND SUCCESS CRITERIA

1. Existing cleanups expanded to include all tributaries and other CPYRW waterways and reduction in the amount of litter and debris collected during annual cleanups
2. Increase in number of volunteers participating in cleanup events
3. Signs installed at clean-up sites

OBJECTIVE 6: REDUCE POLLUTION FROM AGRICULTURAL ACTIVITIES

Agriculture is a major industry in the watershed and a source of water-quality degradation in some areas.

STRATEGY A

Identify and prioritize impaired watersheds. Identification and targeting of priority watersheds with significant agricultural activity will assure that public resources are used wisely, partnering opportunities are maximized, and environmental protection and economic benefits are realized within reasonable time frames. Priority watersheds will generally be prioritized based on available water-quality data and the latest SWCD Watershed Assessments. Subwatersheds that include Section 303(d) listed waters, approved TMDLs, or significant impairments will be ranked highest.

Responsible Entities: SWCC, SWCD, NRCS, ACES, ADEM
Cooperators: CPYRCWP, ADAI
Potential Funding: 319 grant funds, state agricultural cost-share, CPYRWMA
Schedule: First quarter, 2005; every five years thereafter
Load Reduction Estimates: Intrinsic
Estimated Cost: $3,800/SWCD (county) Assessment (2005)

ACTION ITEMS

1. Assist with county-wide watershed assessments to determine priority impaired watersheds
2. Assist with compiling and analyzing watershed data and information
3. CPYRCWP promotes targeting of resources to address priority impaired watersheds

PROGRESS AND SUCCESS CRITERIA:

1. Priority impaired watersheds are identified and BMP implementation plans are developed
2. Data are compiled, analyzed and the need for additional data is determined
3. Use of assessment information and targeted resources in priority watersheds to improve water quality

STRATEGY B

Involve the agricultural sector in management planning processes and activities throughout the CPYRW. Agricultural pollutants are a significant contributor to water quality problems in the CPYRW. Watershed protection plan activities must be coordinated with the agricultural sector to assure landowner buy-in and to promote a "grass roots" approach to decision-making processes. Efforts should be made to provide education resources and an understanding of the numerous conservation programs available.

Responsible Entities: NRCS, ACES, SWCC, RC&D, CPYRCWP
Cooperators: CPYRCWP, farmers, producer/commodity groups
Potential Funding: No additional funds necessary
Schedule: Beginning forth quarter, 2006
Load Reduction Estimates: TBD
Estimated Cost: No additional funding

ACTION ITEMS

1. Coordinate with USDA-NRCS, SWCD and Section 319 funded management practices to address priority impaired watersheds
2. Promote efficiency of installation and maintenance of BMPs to improve water quality
3. Maintain effective lines of communication between agencies and landowners/users using basin wide and local watershed protection approaches

PROGRESS AND SUCCESS CRITERIA:

1. Agricultural sector representation on CWP committees and initiatives
2. Resource agencies target annual funding and technical assistance to prioritized watersheds and problem areas

3. Relationships are established between stakeholders and lines of communication remain open

STRATEGY C

Identify needs and install agricultural BMPs. Implementing agricultural BMPs will significantly reduce erosion, sedimentation, and nutrient loading to the CPYRW. Agricultural BMPs can also protect drinking water supplies and groundwater quality; improve crop and pasture land quality and fertility; prevent some problems with flooding; enhance wetlands and fish and wildlife habitats; and support recreational activities. Agricultural BMPs will be installed according to NRCS technical guidelines and standards.

Responsible Entities: USDA-NRCS/FSA; SWCD; RC&D; CES, ADEM
Cooperators: Farmers; landowners; commodity producer groups; agriculture associations
Potential Funding: State Agricultural Cost Share; EQIP, CRP, Section 319
Schedule: Ongoing
Load Reduction Estimates: reduce erosion from agricultural lands to "T" or less; reduce N and P runoff per TMDLs developed for impaired waterbodies
Estimated Cost: Unknown

ACTION ITEMS

1. Coordinate with USDA-NRCS, SWCD and Section 319 and other funding mechanisms to implement BMPs to address priority impaired watersheds
2. Promote conservation easements to restore impaired waters or protect threatened waters
3. Assist with implementation of protection measures (e.g., types; site selection; timelines, maintenance; effectiveness monitoring)
4. Facilitate a combination of education and outreach efforts and encourage installation of on-the-ground protection practices to expedite agricultural pollutant load reductions and ultimately lead to de-listing of Section 303(d) waterbodies and restoration of other impaired waterbodies

PROGRESS AND SUCCESS CRITERIA

1. Resource agencies cooperatively target annual funding, technical assistance, and technology transfer to prioritized watersheds and problem issues
2. Resource agencies report on implementation success and future needs
3. CWP and citizen advisory committees involved in decision-making processes
4. Waterbodies restored or delisted from the Section 303(d) list

STRATEGY D

Provide education and outreach. Stakeholders must be provided with relevant and sound information. Efforts should be designed to provide education resources and an understanding of the numerous conservation programs and regulations that impact basin stakeholders. Information concerning BMP planning and effectiveness must be conveyed to stakeholders.

Responsible Entities: CPYRCWP, ACES, ADEM, SWCD, RC&D, ADAI
Cooperators: Landowners, 4-H and FFA Clubs, Boy Scouts, environmental clubs and groups, schools and colleges, agricultural sector industries/businesses, Legacy, SWCS
Potential Funding: Legacy, producer groups and organizations, Section 319
Schedule: Ongoing beginning first quarter 2005
Load Reduction Estimates: TBD
Estimated Cost: Unkown

ACTION ITEMS

1. Recognize outstanding farmers who implement effective management practices. This reward for good stewardship will serve as an educational tool and incentive to other landowners. Acknowledgment may be basin wide or watershed-specific.
2. Education of youth is essential for agriculture and long-term health of the watershed. Establish proactive approaches to get youth involved in actual implementation of protection practices
3. Distribute management and protection practices manuals and brochures, and assist in development of videos, databases, and other media to address watershed water quality and natural resource protection issues and concerns
4. Promote conservation buffer, backyard conservation, wetland and groundwater protection, nutrient transfer, and other initiatives
5. Promote erosion control, nutrient management, and other training and certifications
6. Promote BMP demonstration projects on local farms to promote the understanding and adoption of agricultural BMPs
7. Maintain effective and timely lines of communication between urban/rural interface using a watershed wide protection approach

PROGRESS AND SUCCESS CRITERIA

1. Farmers recognized for good stewardship
2. Programs/activities offered and significant number of youth participate
3. Variety of agricultural educational outreach materials produced and distributed
4. Majority of farms develop nutrient management plans, alternative uses, or other pollution prevention measures
5. Number of farmers attending training opportunities or receiving certifications

6. BMP demonstration projects are implemented and many farmers participate
7. Farm/city weeks, fairs/festivals, workshops/conferences, talks/presentations, tours, news releases, and other urban/rural interaction opportunities promoted in each county

STRATEGY E

Promote agricultural pesticide collection and disposal days. Proper use, mixing, application, storage, and disposal of agricultural pesticides and chemicals are paramount to protecting water quality and human and animal health. There are many benefits to using pesticides and chemicals to control pests and enhance production; however, improper use, storage, leaching, and spills can result in significant environmental consequences.

Responsible Entities: ADAI, NRCS
Cooperators: CPYRCWP; ACES, ADEM, County solid waste management departments
Potential Funding: ADAI, Section 319, county, pesticide producers/sellers
Schedule: Annual or as facilitated by ADAI
Load Reduction Estimates: TBD
Estimated Cost: Unknown

ACTION ITEMS

1. Assist in pesticide collection events to collect and properly dispose of pesticides
2. Promote integrated pest management (IPM) and precision farming techniques to eliminate or reduce the need for chemical applications
3. Promote pesticide use training and applicator certifications
4. Promote proper spill, clean-up and disposal training and outreach

PROGRESS AND SUCCESS CRITERIA

1. Collection events scheduled and a significant amount of chemicals properly eliminated
2. Acres incorporating IPM and precision farming (GIS/remote sensing technologies)
3. Applicators trained and certified/re-certified
4. Education opportunities offered and number of stakeholders reached

OBJECTIVE 7: REDUCE POLLUTION FROM FORESTRY ACTIVITIES

Forestry is a major industry in the watershed and a source of water-quality degradation in some areas.

STRATEGY A

Provide education and outreach. Education and outreach will promote stakeholder understanding, participation and partnerships – keys to long-term water quality and resource protection. Information delivery should use multiple media forms and be presented in user-friendly formats. Information concerning BMP planning and effectiveness must be conveyed to stakeholders.

Responsible Entities: AFC, AFA
Cooperators: CPYRCWP, AU-School of Forestry, Alabama Loggers Council, consulting foresters, USDA, Pulp and Paper Industry, Pulp and Paper Council, American Tree Farm System, Alabama TREASURE Forest Association (ATFA), and the Alabama Sustainable Forest Initiative (SFI) Implementation Committee.
Potential Funding: AFC, AFA, Section 319, USDA, SWCD, Pulp and Paper Industry
Schedule: Ongoing beginning first quarter 2006
Load Reduction Estimates: Reduction form erosion from forestry activities by >50%
Estimated Cost: Unknown

ACTION ITEMS

1. Distribute education and outreach to private forest landowners to promote the connection between water quality protection and installation and maintenance of management practices. Continue to use practices such as field days, demonstrations, tours, industry and association meetings, on-site training, and develop new methods.
2. Encourage landowners to voluntarily install management practices according to the, *Alabama Best Management Practices Manual for Forestry*
3. Work with the forest industry to conduct BMP workshops and seminars for loggers, and public and private landowners
4. Identify and implement additional programs to publicly recognize and reward good forest management stewardship such as the Tree Farm Program, ATFA Program, SFI, and the Professional Logger Management Program. Use as an educational tool or as an incentive to encourage other forest landowners to participate
5. Recognize outstanding tree farmers who implement effective management practices. This reward for good stewardship will serve as an educational tool and incentive to other landowners. Acknowledgment may be river basin wide or watershed-specific.
6. Promote forestry as a solution to water quality degradation in rural and urban settings. Promote practices to address erosion and sedimentation, reforestation of abandoned mine lands, streamside management zones, perpetuation of healthy animal populations, habitat restoration, urban "heat sinks," shading and aesthetics
7. Facilitate a combination of education and outreach efforts and installation of on-the-ground management practices to expedite pollutant load reductions and ultimately lead to de-listing of Section 303(d) waterbodies and remediation of other impaired waterbodies.

8. Maintain effective and timely lines of communication between agencies, forestland owners, environmental groups, and industrial sectors using a basin wide management approach
9. Promote aerial BMP monitoring

PROGRESS AND SUCCESS CRITERIA

1. Workshops and seminars developed and scheduled and number of forestry sector stakeholders participating
2. Number of rural and urban BMP projects involving forestry activities
3. Land area (acre, miles) with ongoing pollution prevention and natural resource protection initiatives, CRP acres, and Treasure or Tree Farm acres
4. Miles or areas of waterbodies incorporating forestry management measures that were delisted from the Section 303(d) list or restored
5. Communication between agencies, forestland owners, environmental groups, and industrial sectors using a basin wide management approach is maintained and improved

STRATEGY B

Promote education and outreach to teachers and students. Education of youth is essential for forestry and long-term health of the watershed. A proactive approach to get youth involved in actual implementation of management practices is needed. Efforts that emphasize and deliver materials and opportunities for learning; teach and explore basic concepts; re-examine concepts that were once learned but forgotten; and efforts that reinforce and expand concepts that were learned but are not incorporated into daily life, is needed. The basic premise is – if people, especially students, hear about the benefits of forestry and good forestry practices often enough, it will eventually become a natural part of their mindset and habits.

Responsible Entities: CPYRCWP, AFC, ACES, NRCS
Cooperators: FFA, landowners, 4H Club, local school districts, Alabama Forest Foundation, ATFA, Pulp and Paper Council
Potential Funding: Legacy, AFC, AFA, USDA Forest Service, Southern Group of State Foresters
Schedule: Ongoing beginning first quarter 2006
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Distribute forestry education and outreach materials to K-12 teachers and students to promote the connection between water quality protection and installation and maintenance of BMP practices
2. Present programs to school FFA, 4-H, environmental clubs or other youth organizations
3. Promote and coordinate outreach activities such as FAWN, Project Learning Tree, and Project Wild programs around National Arbor Day or other designated forest awareness days
4. Promote construction of outdoor watershed models to demonstrate effectiveness forests in environmental protection

PROGRESS AND SUCCESS CRITERIA

1. Presentations given and outreach materials provided
2. Programs presented and teachers/students participating
3. Outreach forestry initiatives with statewide/national forest and tree awareness days are coordinated and number of stakeholders participating in special natural resource protection programs
4. Watershed models are constructed and utilized by schools and other organizations

STRATEGY C

Utilize the Treasure Forest and Tree Farm programs to promote forest land stewardship. A forest land stewardship based on sound and sustainable management of forest resources for the benefit of the landowner and future generations is needed. The Alabama Forestry Commission's Timber, Recreation, Environment, Aesthetics, from a Sustainable Useable Resource program and the American Tree Farm System will assure that landowners manage their land in a balanced, ecologically based manner under a multiple use system.

Responsible Entities: AFC, AFA
Cooperators: Landowners, CPYRCWP, ATFA
Potential Funding: AFC, AFA, Pulp and Paper Council, CWPRWMA
Schedule: Ongoing beginning third quarter 2006
Load Reduction Estimates: TBD
Estimated Cost: Unknown

ACTION ITEMS

1. Promote the TREASURE Forest and Tree Farm System programs to recognize citizens and landowners instituting exemplary forestry management measures and

natural resource conservation and protection practices. Public recognition may involve the use of signs or other media to identify outstanding sites

2. Encourage participation in AFTA to promote BMP's within each county

PROGRESS AND SUCCESS CRITERIA

1. Number of TREASURE Forests and Tree Farm Systems recognized in each county in the watershed
2. Establishment of active AFTA Chapters in each county in the watershed

OBJECTIVE 8: REDUCE POLLUTION FROM UNIMPROVED ROADWAYS

One of the most significant sources of impairment of streams in the CPYRW is unpaved roadways due to sedimentation and habitat destruction.

STRATEGY A

Identify and rank dirt roads that contribute most to stream sediment loads. Cooperate with ongoing effort US Fish & Wildlife Service and partners to identify and prioritize unpaved roads and their contribution to water quality problems. Unpaved roads located near 303(d) listed streams will be given highest priority during the ranking process.

Responsible Parties: USFWS, county commissions, CPYRCWP
Cooperators: NRCS, SWCDs, USFWS, county engineers, SWCS
Potential Funding: County commissions, USFWS, CPYRWMA
Schedule: Unpaved roads stream crossings inventory complete, prioritization ongoing
Load Reduction Estimates: Intrinsic
Estimated Cost: To be determined

ACTION ITEMS

1. Identify unpaved road stream crossings and magnitude of sediment contribution to streams to identify subwatersheds most impaired by dirt road erosion
2. Prioritize dirt roads in each county for management practice implementation and coordinate with county commissioners
3. Facilitate unpaved road management practices to roads located in Section 303(d) listed watersheds
4. Promote a combination of education and outreach efforts and installation of on-the-ground protection practices to expedite pollutant load reductions that will lead to de-listing of Section 303(d) waterbodies

PROGRESS AND SUCCESS CRITERIA

1. Utilization of SWCD and other county watershed assessments and USFWS sponsored inventory to identify priority subwatersheds most impaired by unpaved road erosion
2. Miles or segments of unpaved roads improved by protection practices based on priority list
3. Miles or areas of waterbodies restored or delisted from the Section 303(d) list as a result of effective implementation of unpaved road protection measures
4. Numbers of education and outreach efforts and completed installations of on-the-ground protection practices

STRATEGY B

Provide training for public works employees and others involved in unpaved road construction and maintenance. Protection measures are needed to control polluted runoff from unpaved roads. Pollutant sources are generally site-specific and are affected by available funding, available materials, and road use. Training and education should focus on implementation of a combination of structural and nonstructural protection measures appropriate to the source, location, and pollutant of concern.

<u>Responsible Parties:</u> ADEM, county and municipal public works departments
<u>Cooperators:</u> County and municipal governments, ACES, ADEM, SWCD, ALDOT, AGCA, SWCS, CPYRCWP
<u>Potential Funding:</u> 319 funding, ALDOT, county commissions, CPYRWMA
<u>Schedule:</u> Second quarter 2006
<u>Load Reduction Estimates</u>: Intrinsic
<u>Estimated Cost</u>: Substantial

ACTION ITEMS

1. Assist in workshops and training seminars for county officials and employees
2. Utilize the publication, "*Recommended Practices Manual – A Guideline for Maintenance and Service of Unpaved Roads*" developed by the CPYRWMA

PROGRESS AND SUCCESS CRITERIA:

1. Workshops and training seminars are presented to targeted groups
2. "*Recommended Practices Manual – A Guideline for Maintenance and Service of Unpaved Roads*" developed by the CPYRWMA is made available to targeted groups

STRATEGY C

Promote improvement of all unpaved roads to paved roads. The large number of miles of unpaved roads and easily eroded material used in unpaved road construction and maintenance are some of the most significant issues in Southeast Alabama. Erosion and runoff from unpaved roads are significant sources of impairment of water quality in the CPYRW.

Responsible Parties: ADEM, county and municipal public works departments, ALDOT
Cooperators: County, municipal, state, and federal governments, ACES, ADEM, SWCD, ALDOT, AGCA, SWCS, CPYRCWP
Potential Funding: 319 funding, ALDOT, county commissions, state and federal appropriations
Schedule: Ongoing
Load Reduction Estimates: Intrinsic
Estimated Cost: Substantial

ACTION ITEMS

1. Coordinate local, state, and federal officials and agencies to find solutions to improved roadways and to protect water quality and habitat
2. Secure funding for unpaved road improvement
3. Prioritize and initiate paved road construction

PROGRESS AND SUCCESS CRITERIA

1. Responsible groups are formed and solutions are found
2. Funding sources are developed
3. Paved road construction is ongoing

OBJECTIVE 9: REDUCE NONPOINT SOURCE POLLUTION FROM URBAN SOURCES INCLUDING STORMWATER RUNOFF AND WASTEWATER DISPOSAL

STRATEGY A

Assist with and promote implementation of urban management practices to protect water quality. Urban runoff and impervious surfaces accelerate pollutant delivery to waterbodies. In addition, runoff increases flood flows and velocities, contributes to erosion, sedimentation, and degradation of water quality, overtaxes the carrying capacity of streams and storm sewers, greatly increases the costs of public facilities treating water, reduces groundwater recharge, and may threaten public health, welfare and safety. Protection practices are needed to significantly reduce sediment, nutrient, and other urban runoff contaminants from streams and rivers in the CPYRW.

Responsible Parties: NRCS, ADEM, local governments/municipalities, ADOT, EPA
Cooperators: CPYRCWP and facilitator, CAC, OWR
Potential Funding: Section 319, local municipalities, EPA, CPYRWMA
Schedule: Ongoing
Load Reduction Estimates: Reduced sediment and nutrient runoff; TBD
Estimated Cost: Unknown

ACTION ITEMS

1. Facilitate watershed wide management measures using an economically balanced program of education, technical assistance, financial incentives, research, and regulation
2. Coordinate development of a list of potential sites and timelines for installation of urban protection practices in priority areas throughout the watershed
3. Facilitate a combination of education and outreach efforts and installation of on-the-ground protection practices to expedite urban pollutant load reductions and ultimately lead to de-listing of Section 303(d) waterbodies or remediation of other impaired waterbodies

PROGRESS AND SUCCESS CRITERIA

1. Potential sites identified and timelines established for installation of urban management practices in priority watersheds throughout the river basin
2. Return of brownfields sites to economically productive, environmentally conscious uses and determine urban areas that negatively affect water quality
3. Miles or areas of waterbodies restored or delisted from the Section 303(d) list as a result of implementation of urban management measures

STRATEGY B

Coordinate urban management practice demonstration projects. Demonstrations of management practices that promote public understanding and adoption of effective protection measures by those involved in storm-water runoff in developed areas, urban construction, and land-clearing activities are needed.

Responsible Parties: CPYRCWP and CAC
Cooperators: Landowners, SWCD, NRCS, ADEM, local governments, HBAA, AGCA
Potential Funding: Section 319, local governments, HBAA, AGCA
Schedule: Ongoing
Load Reduction Estimates: reduce erosion, nutrients, chemicals, toxic and other polluted runoff; TBD
Estimated Cost: Unknown

ACTION ITEMS

1. Assist in demonstration of on-the-ground protection practices to reduce pollutant loadings that are environmentally protective and cost effective
2. Assist in demonstration protection practices to reduce pollutant loadings that use best technologies available or that are new and innovative
3. Coordinate demonstration projects through resource agencies
4. Increase public awareness and understanding of urban environmental problems and issues

PROGRESS AND SUCCESS CRITERIA

1. Demonstrated, effective protection measures implemented throughout the basin
2. Resource agencies coordinate human and financial capitol for demonstration projects
3. Number and type of entities expressing interest in, touring, or implementing the protection measure

STRATEGY C

Develop and distribute pollution prevention information packet to home and business owners. Households and some businesses produce an assortment of pollutants from a variety of sources. As an efficient and effective way to mass-educate people about responsible homeownership and business management, a homeowner's and business packet is needed that addresses the causes and sources of pollution and offers solutions. The packets may include information on maintaining septic systems, proper disposal of household and business wastes, water conservation, groundwater protection, lawn and gardening polluted runoff prevention tips, and lists of relevant agencies and phone numbers.

Responsible Parties: CPYRCWP
Cooperators: Realtors association, utility companies, master gardeners, HBAA, AGCA, county health departments, environmental groups, ADEM, CES
Potential Funding: Section 319, utilities, realtors, HBAA, AGCA
Schedule: Third quarter, 2007, then on an as needed basis
Load Reduction Estimates: TBD
Estimated Cost: $5000

ACTION ITEMS

1. Compile homeowner and business information packets
2. Distribute packets through local utility companies, realtor associations, ACES, public health departments, or at meetings/conferences
3. Survey a select number of homeowners and business owners as to their interest in receiving the packets and resultant motivation to implement solutions

PROGRESS AND SUCCESS CRITERIA

1. Number of packets delivered to homeowners and businesses
2. Number or percent of homeowners instituting pollution management measure presented in the packets
3. Survey completed

STRATEGY D

Promote Pesticide Collection Days to collect and properly dispose of hazardous pesticides and household chemicals. Proper use, mixing, application, storage, and disposal of household use pesticides and chemicals are paramount to protecting water quality and human and animal health. There are benefits to using pesticides and chemicals in and around homes and yards to control pests and for fertilizing and treating lawns. However, improper use, storage, leaching, and spills can result in significant environmental consequences. Efforts are needed that focus on pollution prevention as a primary management measure.

Responsible Entities: ADAI
Cooperators: CPYRCWP, ACES, ADEM, county solid waste management departments
Potential Funding: ADAI, Section 319, county governments, pesticide producers/sellers
Schedule: Annual or as facilitated by ADAI
Load Reduction Estimates: Reduced polluted runoff from residential areas; TBD
Estimated Cost: $50,000 annually

ACTION ITEMS

1. Assist with establishment of collection events to collect and properly dispose of household hazardous chemicals and pesticides
2. Promote alternative non-hazardous household cleaning and pest control measures, and application of lawn and garden chemicals and fertilizers based on soil test
3. Assist in providing proper spill, clean-up and disposal training and outreach

PROGRESS AND SUCCESS CRITERIA

1. Number of collection events scheduled; lbs. of chemicals properly eliminated
2. Number and types of education opportunities offered and number of stakeholders reached

STRATEGY E

Provide education and outreach to landscape, nursery, and sod farm industries. Businesses and property owners commonly employ commercial landscapers. Since fertilizer and pesticide runoff are major contributors to pollution loadings, educating landscapers about ways to reduce this type of pollution is important.

Responsible Parties: CPYRCWP
Cooperators: AU-Agriculture/Horticulture; ADEM, ACES, producer associations
Potential Funding: Section 319, producer associations
Schedule: First quarter, 2004, annually thereafter

Load Reduction Estimates: TBD
Estimated Cost: Unknown

ACTION ITEMS

1. Assist in workshops, development, and distribution of education and training materials that address pollutant concerns
2. Explore continuous education requirements with environmental protection components for producer business licenses
3. Facilitate a combination of education and outreach efforts and installation of on-the-ground protection practices that expedite pollutant load reductions and ultimately lead to de-listing of Section 303(d) waterbodies and other impaired waterbodies

PROGRESS AND SUCCESS CRITERIA

1. Number of workshops and outreach materials developed and distributed to targeted audiences
2. Implementation of continuous education requirements for producer business licenses
3. Miles or areas of waterbodies restored or delisted from the Section 303(d) list as a result of implementation of landscape, nursery, or sod farm management measures

STRATEGY F

Promote the use of stormwater drain stenciling. Storm-water runoff, or wet weather flows, is often collected by storm drains. This runoff often carries pollutants that are accumulated as it flows across impervious surfaces. In addition, many pollutants such as household chemicals, automobile maintenance products, lawn and garden by-products, and litter are carelessly released or improperly disposed of down storm drains. This pollution prevention and education management measure is a relatively inexpensive and is designed to encourage citizen interest and participation in protecting water quality. This activity uses stencils made out of mylar, other plastic, or other durable materials with phrases such as “DUMP NO WASTE: DRAINS TO STREAMS.”

Responsible Parties: City and county governmental units and CPYRCWP
Cooperators: Girl Scouts, Boy Scouts, educators, students, civic and environmental groups
Potential Funding: Local governmental units, Section 319
Schedule: annual, sustain
Load Reduction Estimates: Reduced runoff of nutrients, pathogens, toxics and other pollutants to surface and groundwater
Estimated Cost: $1500

ACTION ITEMS

1. Provide stencils and promote storm drain stenciling to school groups, scouts, and civic, environmental and other organizations. The use of stencils can also be promoted through various news media as well as using door hangers to educate the public.
2. Use stencils to apply water quality protection phrases on storm drain covers in residential and commercial areas. Stenciling may also be used on bridges in rural areas
3. Promote storm drain stenciling to reduce pollutant loads and that ultimately lead to de-listing of Section 303(d) waterbodies and other impaired waterbodies

PROGRESS AND SUCCESS CRITERIA

1. Stencils provided and groups organized to use stencils in all counties.
2. Water quality protection phrases placed on storm drain covers in residential and commercial areas and on bridges in rural areas
3. Storm drain stenciling strategies implemented that reduce pollutant load amount and quantity, and ultimately lead to de-listing of Section 303(d) waterbodies or restoring waterbodies

OBJECTIVE 10: PROMOTE PROTECTION OF WETLANDS, FAUNAL HABITATS, AND OTHER CRITICAL AREAS

STRATEGY A

Encourage the protection of sensitive and critical areas and habitats through subwatershed specific plans. Wetlands are among the most biologically productive natural ecosystems. Wetlands reduce flood damage by slowing and storing floodwaters, improve water quality by intercepting and retaining nutrients and sediments, and process organics. Poor communication, coordination and planning, urban sprawl and land uses, and inadequate funding contributes to assessment, classification, delineation and mapping deficiencies. A comprehensive wetland, sensitive/critical area, and habitat protection program for the watershed is needed to address restoration and protection, education and outreach, conservation, regulation, and economics.

Responsible Parties: County commissions, planners
Cooperators: COE, ADEM, USDA, USFWS, Natural Heritage Program, Nature Conservancy, ADCNR, ADOT, EPA, CPYRCWP and CAC committees
Potential Funding: County funds, USDA, COE, ADCNR, USFWS, ADEM, APC, EPA
Schedule: Ongoing beginning second quarter 2007
Load Reduction Estimates: Reduced runoff of nutrients, pathogens, toxics and other pollutants to surface and groundwater
Estimated Cost: Unknown

ACTION ITEMS

1. Initiate the development of a cooperative stakeholder protection plan to protect habitat and conserve species of special concern
2. Promote land development measures and other activities that do not impair wetland form and functions
3. Promote a program to assure performance and accountability standards for mitigated wetlands
4. Promote a program to improve wetland protection through permit compliance, increased site inspections, and enforcement
5. Identify and promote stable funding and protection of wetlands, and other biologically significant communities and natural habitats

PROGRESS AND SUCCESS CRITERIA

1. A coordinated and cooperative stakeholder protection plan to protect and conserve species of special concern is developed
2. Land disturbance, construction, and other activities implemented that do not impair wetland form and functions
3. A program to assure performance and accountability standards for mitigated wetlands instituted on a basin wide scale or in priority watersheds
4. Wetlands protected or improved through permit compliance, increased site inspections, and enforcement
5. A stable source of funding identified to protect wetlands, and other biologically significant communities and natural habitats

STRATEGY B

Identify and map sensitive habitats and develop a habitat protection and remediation prioritization ranking system. Sensitive ecosystems, critical areas and habitats protect the growth, survival and reproductive capacity of many and varied species throughout the basin. A map or GIS data layer of sensitive lands and other significant biological features in the CPYRW is needed.

Responsible Parties: Alabama Natural Heritage, FWS, CPYRWMA
Cooperators: ADCNR, ADEM, CPYRCWP
Potential Funding: FWS, Section 319
Schedule: Ongoing beginning third quarter 2007
Load Reduction Estimates: TBD
Estimated Cost: Unknown

ACTION ITEMS

1. Promote the use of the Nature Conservancy's Biological and Conservation Database (BCD) program as a primary information-managing tool to identify threatened and endangered flora and fauna
2. Coordinate efforts with the FWS
3. Assess general public knowledge about the natural resource aspects of the basin (native and exotic species and habitats, ecosystems, threatened and endangered species, or changes that have occurred over time, and what caused those changes)

PROGRESS AND SUCCESS CRITERIA

1. Map or GIS data layer and other management tools of sensitive lands and other significant biological features in CPYRW developed
2. Implementation of applicable components of the CPYRWPP coordinated with the FWS
3. Citizen knowledge and perceptions about the natural resources are used in decision making processes, and encouraging participation in installing protection practices

STRATEGY C

Identify subwatersheds with significant habitat restoration needs and rank valuable parcels for acquisition or other forms of protection. Habitat restoration efforts remain fragmented and incomplete. More and better stakeholder communication, planning, and coordination is needed to identify, assess, and prioritize habitat areas in need of restoration or acquisition.

Responsible Parties: ADCNR, USFWS, NRCS, ADEM, Alabama Natural Heritage Program
Cooperators: CPYRCWP
Potential Funding: FWS, ADCNR, NRCS, Section 319
Schedule: Ongoing beginning fourth quarter 2007
Load Reduction Estimates: TBD
Estimated Cost: Unknown

ACTION ITEMS

1. Develop interagency consensus of basin wide ecological indicators to be used to identify valuable habitats
2. Examine aerial photographs to identify subwatersheds with significant habitat loss
3. Assist with identification of possible areas for restoration based on their benefits for fish and wildlife and/or to mitigate water quality impairments from land use activities
4. Assist in prioritizing areas for habitat restoration and protection

5. Submit potential sites for acquisition to ADCNR – Forever Wild Program; NRCS for conservation easements; or city/county governments as “open-space” protection, etc.,
6. Develop a report and map to justify priority rankings and distribute to stakeholders

PROGRESS AND SUCCESS CRITERIA

1. A set of watershed ecological indicators are used to identify valuable habitats
2. Aerial photographs are obtained and analyzed to identify subwatersheds with significant habitat loss
3. Areas most in need of restoration and protection are identified and prioritized
4. Land area and habitat acres acquired or protected for future generations
5. Stakeholders are provided reports and maps of priority areas

STRATEGY D

Identify sources of cost-share and other incentives to landowners for habitat restoration and protection. Many landowners are not aware that programs are available to protect and restore habitat or do not rank habitat protection as a management priority. Education and outreach is needed to reach audiences that can provide for habitat restoration and protection needs.

Responsible Parties: CPYRCWP
Cooperators: USDA, FWS, ADEM, ADCR, DCNR
Potential Funding: USDA, FWS, Section 319
Schedule: Ongoing beginning first quarter 2007
Load Reduction Estimates: TBD
Estimated Cost: Unknown

ACTION ITEMS

1. Inform landowners of the availability of Federal cost-share assistance and incentives for habitat protection
2. Use Federal programs such as the EQUIP, WRP, WHIP, and the FWS – Partners for Wildlife to protect and restore habitat
3. Provide education and outreach materials, workshops, and press releases
4. Identify and pursue other public and private funding sources for landowner cost-share, and incentives

PROGRESS AND SUCCESS CRITERIA

1. Landowners are provided with education and outreach materials, workshops, and press releases
2. Public and private funding sources for landowner cost-share and incentives are identified and used to restore or protect habitats in the river basin

3. Amount of habitat restored/protected

STRATEGY E

Provide information to watershed residents on tax incentives and other benefits that can be achieved through the use of conservation easements and other land protection programs. As greater developmental pressure is placed on the basin's dwindling natural resources, environmentally protective and economically protective incentives for landowners are needed. Conservation easements and other land protection set-aside programs can provide a balance between environmental and economic benefits. Incentives to landowners may include quality of life and positive public opinion issues.

Responsible Parties: CPYRCWP
Cooperators: FWS, Legacy, Ducks Unlimited, Nature Conservancy, Trust for Public Land, Land Trust Alliance, Forever Wild, SWCDs, Alabama Forest Resources Center, Alabama Land Trust
Potential Funding: Land Trust Alliance, Alabama Forest Resources Center
Schedule: Ongoing beginning third quarter 2007
Load Reduction Estimates: TBD
Estimated Cost: Unknown

ACTION ITEMS

1. Seek to acquire sensitive areas through organizations such as Ducks Unlimited, The Nature Conservancy, etc.
2. Provide education and outreach opportunities for the general public to discuss conservation easements and other land protection strategies
3. Explore the possibility of establishing land trust organizations

PROGRESS AND SUCCESS CRITERIA

1. Sensitive areas acquired (sq. miles, acres, segments, etc.) through organizations such as Ducks Unlimited, The Nature Conservancy, etc.
2. Opportunities provided for watershed stakeholders to discuss conservation easements and other land protection strategies
3. Land trust organizational potential explored or established

STRATEGY F

Review COE permit applications for bulkhead, wetland filling and dredging permits in the CPYRW. Activities that result or may result in a discharge to navigable waters must obtain a CWA Section 404 permit from the COE and a Section 401 state water quality standards certification from ADEM. Stakeholders need to take an active role in ensuring that permitted activities that may result in a discharge do not violate water quality standards.

Responsible Parties: CPYRCWP, COE
Cooperators: ADEM
Potential Funding: Unknown
Schedule: Ongoing beginning first quarter 2007
Load Reduction Estimates: Reduced sediment and pollutant transport
Estimated Cost: Unknown

ACTION ITEMS

1. Review COE permit applications for the CPYRW (COE-Mobile District)
2. Provide comments as applicable during the public comment period on all permits where activities may degrade water quality

PROGRESS AND SUCCESS CRITERION

1. Number of COE permit applications reviewed and commented on

OBJECTIVE 11: PROTECT GROUNDWATER RESOURCES THROUGH CONSERVATION AND POLLUTION PREVENTION

STRATEGY A

Encourage public-water supply systems to become Ground Water Guardian Affiliates. All water systems in the CPYRW use groundwater as their only source of supply. Groundwater is often thought of as "out-of-sight – out of mind" – until wells go "dry" or become unfit for beneficial uses. Groundwater contamination may be very slow to dissipate and very expensive, difficult, or technically impossible to restore. Contaminate sources and causes may be difficult to ascertain, but a significant number of groundwater problems stem from man's landuse activities. Therefore, groundwater protection initiatives are needed to protect groundwater resources.

Responsible Parties: CPYRWMA, OWR, ADAI, ADEM, EPA, water systems, municipalities
Cooperators: CPYRCWP, Ground Water Guardian Program, CES, ADPH, GSA, USGS, AWW, ARWA, Legacy
Potential Funding: CPYRWMA, ADEM, EPA, ADAI, OWR
Schedule: Ongoing
Load Reduction Estimates: Reduced nutrients, pathogens, toxics and other pollutants to groundwaters
Estimated Cost: Unknown

ACTION ITEMS

1. Facilitate workshops, awards, and public recognition to support Groundwater Guardian designation in the CPYRW
2. Coordinate groundwater protection activities and conservation with public-supply systems and others using an aquifer protection approach

PROGRESS AND SUCCESS CRITERIA

1. Public recognition provided to entities for outstanding stewardship of groundwater resources
2. Education and outreach provided so that municipalities and others using groundwater as a drinking water source understand the critical need to protect their drinking source water from contamination

STRATEGY B

Provide ground water education and outreach. The quality of groundwater in the CPYRW is good. However, as the population, industrial and economic growth of the river basin increases, so does the threat to groundwater quality. There is a need to increase public awareness about the status of groundwater (wells and springs) and its susceptibility to contamination.

Responsible Parties: CPYRCWP; ADEM
Cooperators: Academia, city and county governmental units, water boards, EPA, GSA, USGS, ADAI, ADPH, USDA, SWCDs, OWR, ARWA
Potential Funding: City and county government units, water boards, EPA grants
Schedule: Ongoing beginning second quarter 2006
Load Reduction Estimates: Reduced nutrients, pathogens, toxics and other pollutants to groundwaters
Estimated Cost: Unknown

ACTION ITEMS

1. Develop and distribute information highlighting the importance of water conservation and groundwater pollution prevention to homeowners
2. Facilitate Groundwater Festivals to student's throughout the CPYRW
3. Work with teachers to incorporate a groundwater protection component into classroom lesson plans
4. Facilitate basin wide capacity to educate larger and targeted audiences, generate greater stakeholder involvement, and minimize repetition or duplication of outreach activities
5. Provide well closure information that addresses closure of abandoned and unused residential, irrigation, and industrials wells or conversion of abandoned wells to monitoring wells throughout the watershed

6. Coordinate basin wide education and outreach efforts with the EPA approved – ADEM Comprehensive State Groundwater Protection Program; Alabama Above Ground and Underground Storage Tank Trust Fund; the Alabama Underground Storage Tank and Wellhead Protection Act; ADEM Source Water Assessment Program; the GSA/ADEM aquifer vulnerability monitoring and reports, the ADAI State Pesticide Management Plan, ADPH Onsite Sewage Disposal System program; and the SWCD Watershed Assessments

PROGRESS AND SUCCESS CRITERIA

1. Water conservation and groundwater pollution prevention materials developed and distributed to homeowners
2. Groundwater festivals initiated in every county throughout the CPYRW
3. Teachers incorporate a groundwater protection component into classroom lesson plans
4. A holistic education and outreach plan developed to assure limited funds are used wisely
5. Wells that are possible sources of contaminants are closed and other valuable wells are converted to monitoring wells
6. Education and outreach coordinated with agency groundwater assessment, protection, and funding opportunities

STRATEGY C

Protect groundwater from polluted runoff. In some rural areas, isolated dirt roads, streams, and sinkholes become illegal dumps for garbage and other waste materials. These places are eyesores and pose a threat to groundwater quality, especially in groundwater recharge areas. Illegal dumps can also harbor insect and rodent populations that can transmit disease. Hazardous materials, dead animals, and other types of garbage placed in open dug wells or areas characterized by limestone aquifers and sinkholes are particularly susceptible to contamination.

Responsible Parties: County health departments, ADEM
Cooperators: County governmental units, water boards, SWCDs, CPYRCWP
Potential Funding: County governmental units, ADEM
Schedule: Ongoing beginning second quarter 2006
Load Reduction Estimates: Reduced nutrients, pathogens, pesticides, toxics and other pollutants to groundwater
Estimated Cost: Unknown

ACTION ITEMS

1. Promote creation of wetlands for runoff treatment

2. Promote a comprehensive groundwater protection database
3. Educate stakeholders on current and future impacts of groundwater withdrawal
4. Promote pollution prevention efforts and remediation of contaminated sites

PROGRESS AND SUCCESS CRITERIA

1. Number of wetlands created in groundwater recharge areas
2. Development of a groundwater data base initiated
3. Stakeholders are provided information to help them protect their groundwater sources
4. Groundwater development practices consider both ground-water quality protection and economic sustainability

OBJECTIVE 12: ASSESS THE EFFECTIVENESS OF THE CPYRW PROTECTION PLAN

STRATEGY A

Review protection plan at least annually and update as necessary. Some states have been implementing management measures in small watersheds for many years before seeing any water quality improvement or significant successes. In some cases, even when all management measures have been implemented, they may not achieve water quality objectives within a specified timeframe. This management plan is a long-term commitment - unity and partnering is a must. Momentum must be maintained, duplication must be eliminated, and success must be built upon. Therefore, frequent management plan reviews are necessary in order to assure that human and financial resources are used effectively and efficiently.

Responsible Parties: CPYRCWP facilitator
Cooperators: All stakeholders
Potential Funding: No additional funding needed
Schedule: Annually beginning fourth quarter 2006
Load Reduction Estimates: Reduction in pollutants to all surface and groundwaters in the CPYRW, TBD
Estimated Cost: Unknown

ACTION ITEMS

1. Utilize long term surface and groundwater-monitoring results to evaluate the effectiveness of installed remedial and protection measures
2. Provide ample opportunities for citizen input, review, and decision-making processes

PROGRESS AND SUCCESS CRITERIA

1. Long-term surface and groundwater-monitoring results are used as a basis to evaluate the effectiveness of installed protection measures

2. Opportunities for citizen input, review, and decision-making processes provided

STRATEGY B

Coordinate development of subwatershed protection plans throughout the CPYRW. Additional resources and stakeholder coordination is needed to achieve the goal and objectives of this basin plan as expeditiously as possible.

Responsible Parties: CPYRCWP and CAC committees
Cooperators: ADEM, USDA, SWCD, RC&D, planners, city and county governmental units
Potential Funding: No additional funding needed.
Schedule: annual, sustain
Load Reduction Estimates: Reduction in pollutants to all surface and groundwaters in the CPYRW
Estimated Cost: Unknown

ACTION ITEMS

1. Utilize the CPYRCWP and CAC committees to implement components of this watershed protection plan in subwatersheds throughout the CPYRW
2. Coordinate human and financial capitol to achieve the goal and objectives presented in this protection plan with subwatershed protection plans
3. Investigate and solicit co-funding, in-kind services, reduced rates, grants and private sources of funding to implement components of this plan

PROGRESS AND SUCCESS CRITERIA:

1. Strategies implemented as expeditiously as possible to meet applicable protection plan goal and objectives
2. Resources coordinated to achieve protection plan goal and objectives
3. Sources of funding solicited to implement components of this plan

STRATEGY C

Develop TMDLs and implement effective and efficient protection measures. TMDLs mandate a daily loading limit on specific point and nonpoint sources of pollutants. Strategies presented in this watershed plan will target TMDL sources and causes as a priority.

Responsible Parties: CWP and CAC Committees, ADEM
Cooperators: CWP facilitator
Potential Funding: Unknown
Schedule: Ongoing beginning first quarter 2003

Load Reduction Estimates: Reduction in pollutants to all surface and groundwaters in the CPYRW
Estimated Cost: Unknown

ACTION ITEMS

1. Establish TMDLs for all 2002 Section 303(d) listed waterbodies in the CPYRW
2. Include additional impaired streams for 303(d) listing and TMDL development
3. Provide ADEM with data or other information that will be beneficial in the development of CPYRW TMDLs
4. Encourage public participation throughout the TMDL development process, as well as written comments during the public comment period
5. Coordinate TMDL implementation plans with this watershed management plan
6. Give higher priority to polluted waters that are a source of drinking waters or support threatened or endangered species
7. Target protection practices to reduce pollutant loads that ultimately lead to de-listing of Section 303(d) waterbodies

PROGRESS AND SUCCESS CRITERIA

1. The CWP Facilitator and other partners provide ADEM with data or other information to develop CPYRW TMDLs
2. Additional streams added to 303(d) list and TMDLs developed
3. Public provides input and comments into the TMDL development and approval process
4. TMDLs for all 2002 Section 303(d) listed waterbodies in the CPYRW
5. TMDL implementation plans coordinated with or become addendum's to this protection plan
6. Protection practices installed on polluted waters that are a source of drinking waters or support threatened or endangered species
7. Protection practices reduce pollutant loads and ultimately lead to de-listing of Section 303(d) waterbodies

AGENCY CONTACTS

A CWP facilitator/ watershed plan coordinator for the CPYW is in place to coordinate the development, updating and implementation of this watershed plan. Comments and suggestions concerning the CPYWPP can be made at any time (in writing) to the CPYRCWP facilitator. A review of the plan will be conducted annually by the CPYCWP Steering Committee to assess new basin concerns or to fill in information and best management practice gaps. Modifications or revisions to this Plan will be through CWP steering committee reviews and consensus. The CPYCWP facilitator will be responsible for tracking and coordinating stakeholder input, making changes to the document as directed by the Steering Committee and notifying stakeholders of watershed revisions or course changes.

The CPYRCWP Chair and facilitator may be contacted as follows:

Chair Choctawhatchee, Pea and Yellow Rivers CWP:
Don Hallford
P.O. Box 1125
Ozark, AL 36361
(334) 774-2336

Facilitator Choctawhatchee, Pea and Yellow Rivers CWP:
Lisa N, Harris
7708 Brantley Highway
Brantley, AL 36009
(334) 527-3584
lharris@troycable.net

The following is a reference list of agencies, associations, organizations, etc., which play a role in the protection and preservation of our water quality. Each one serves a vital role in the protection of our environment through the dissemination of education, information, technical advice, etc.

Alabama Clean Water Partnership (ACWP)
www.cleanwaterpartnership.org
(205) 266-6285

Alabama Cooperative Extension System (ACES)
www.aces.edu
Director's office (334) 844-4444

ACES county offices located within the watershed:

Barbour County
(334) 775-3284

Bullock County
(334) 738-2580

Coffee County
(334) 894-5596

Covington County
(334) 222-1125

Crenshaw County
(334) 335-6312

Dale County
(334) 774-2329

Geneva County
(334) 684-2484

Henry County
(334) 585-6146

Houston County
(334) 794-4108

Pike County
(334) 566-0985

Alabama Department of Conservation and Natural Resources (DCNR)
www.dcnr.state.al.us
Commissioner's Office (334) 242-3486

Alabama Office of Water Resources (a division of ADECA)
www.adeca.state.al.us
Office of Water Resources
(334) 242-5499

Alabama Department of Environmental Management (ADEM)
www.adem.state.al.us
(334) 271-7700

Alabama Department of Public Health (ADPH)
www.adph.org
State Health Officer (334) 206-5200

ADPH County offices within the watershed area:

Barbour County
(334) 687-4808

Bullock County
(334) 738-3030

Coffee County
(334) 347-9574

Covington County
(334) 222-1175

Crenshaw County
(334) 335-2471

Dale County
(334) 774-5146

Geneva County
(334) 684-2257

Henry County
(251) 575-3109

Houston County
(334) 678-2800

Pike County
(334) 566-2860

Alabama Forestry Commission (AFC)
www.forestry.state.al.us
(334) 240-9300

AFC Field Offices located within this watershed area:

Barbour County
(334) 775-3496
1-800-922-7688 (Burn permit or report wildfire)

Bullock County
(334) 738-3040
1-800-392-5679 (Burn permit or report wildfire)

Coffee County
(334) 894-6734
1-800-922-7688 (Burn permit or report wildfire)

Covington County
(334) 222-0379
1-800-922-7688 (Burn permit or report wildfire)

Crenshaw County
(334) 335-5712
1-800-392-5679 (Burn permit or report wildfire)

Dale County
(334) 774-8112
1-800-922-7688 (Burn permit or report wildfire)

Geneva County
(334) 684-2876
1-800-922-7688 (Burn permit or report wildfire)

Henry County
(334) 585-2403
1-800-922-7688 (Burn permit or report wildfire)

Houston County
(334) 677-5454
1-800-922-7688 (Burn permit or report wildfire)

Pike County
(334) 566-3436
1-800-922-7688 (Burn permit or report wildfire)

Alabama Hiking Trail Society
(334) 427-4445

Alabama Soil and Water Conservation Committee
www.swcc.state.al.us
(334) 242-2622

Soil and Water Conservation District (SWCD) Offices by County

Barbour SWCD
(334) 382-8538

Bullock SWCD serviced by Tuskegee F.O. (NRCS)
(334) 727-3763

Coffee SWCD
(334) 382-8538

Covington SWCD
(334) 222-3519

Crenshaw SWCD
(334) 335-3613

Dale SWCD

(334) 774-4749

Geneva SWCD
(334) 684-2235

Henry SWCD
(334) 585-2284

Houston SWCD
(334) 793-2310

Pike SWCD
(334) 566-2301

Alabama Water Watch Association
www.alabamawaterwatch.org
1-888-844-4785

Choctawhatchee, Pea and Yellow Rivers Clean Water Partnership
(334) 527-3584
lharris@troycable.net

Choctawhatchee, Pea and Yellow Rivers Watershed Management Authority
choctaw@troy.ed
(334) 670-3780

Geological Survey of Alabama
www.gsa.state.al.us
(205) 349-2852

Legacy, Inc., Partners in Environmental Education
www.legacyenved.org
1-800-240-5115 (toll free in Alabama)
(334) 270-5921

US Army Corps of Engineers
www.sam.usace.army.mil
Mobile District office
(251) 690-2505

US Environmental Protection Agency (EPA)
www.epa.gov
Region 4 (AL, FL, GA, KY, MS, NC, SC, TN)
EPA
1-800-241-1754
Office of Water Resource Center (OWRC)

Center.water-resource@epa.gov
(202) 566-1729

US Fish and Wildlife Service (FWS)
www.fws.gov
Daphne Field Office
(251) 441-5181

US Forest Service
www.fs.fed.us
Conecuh National Forest Ranger Office
(334) 222-2555

US Geological Survey (USGS)
www.usgs.gov
1-800-ASK-USGS (275-8747
AL office
(334) 213-2332
dc_al@usgs.gov

USDA Natural Resource Conservation Service (NRCS)
www.al.nrcs.usda.gov
1-800-342-9893 (state office)
Field offices are collocated with SWCDs (exception- see Bullock County)

SUMMARY

This management plan provides a detailed portrait of the CPYRW. The watershed's physical characteristics, geology, hydrology, land use, water-quality impairments and threatened species are thoroughly described. Programs for natural resource protection and enhancement are discussed as are current water-quality conditions.

Watershed goals and 13 primary objectives were developed by the CPYRCWP. The strategies to achieve the objectives are based on water quality data, land use/land cover information, and best professional judgment of professional staff from numerous governmental agencies. Action items are proposed for the accomplishment of each strategy and measures of progress and success are proposed for each strategy and action. Management measures attempt to address, at a minimum, the pollutants for which TMDLs will be developed for water bodies on the 2002 Section 303(d) List of Impaired Waters and other identified, impaired waterbodies. Management strategies promote a voluntary rather than a regulatory approach. A combination of education and outreach efforts and installation of on-the ground BMPs will be used to expedite pollutant load reductions, improve, protect and maintain water quality, and ultimately lead to delisting of Section 303(d) water bodies in the CPYRW.

SELECTED REFERENCES

Alabama Department of Environmental Management, 1992, Water-quality criteria, Chapter 335-6-10-.09-5.

______ 1999a, Alabama Clean Water Strategy Water Quality Assessment Report (1996): Alabama Department of Environmental Management.

______1999b, Monitoring of Watersheds Associated with Alabama State Parks Utilizing Chemical, Physical and Biological Assessments: Environmental Indicators Section, Field Operations Division, Alabama Department of Environmental Management.

______2000a, Alabama Monitoring and Assessment Program (ALAMAP) data collected by ADEM 1997-2000 (unpublished): Field Operations Division, Alabama Department of Environmental Management.

______2000b, Ecoregional reference site data collected by ADEM from 1992-2000 (unpublished): Field Operations Division, Alabama Department of Environmental Management.

______2000c, Water quality monitoring data collected by ADEM in support of CWA 303(d) listing and de-listing decisions 1999-2000 (unpublished): Field Operations Division, Alabama Department of Environmental Management.

______2000d, Water quality monitoring data from tributaries of the Coosa River basin reservoirs collected by ADEM (2000, unpublished): Field Operations Division, Alabama Department of Environmental Management.

Aresco, M. J., 2004, River Frog *Rana heckscheri*: p. 17-18, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Aresco, M. J., and Guyer, Craig, 2004, Gopher Tortoise *Gopherus polyphemus*: p. 82-83, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Bailey, M. A. and Means, D. B., 2004a, Gopher Frog *Rana capito* and Mississippi Gopher Frog *Rana sevosa*: p. 15-17, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Bailey, M. A. and Means, D. B., 2004b, Red Hills Salamander *Phaeognathus hubrichti*, p. 34-36, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Baker, R. M. and Smith, C. C., 1997, Delineation of wellhead protection area boundaries for the public-water supply wells of the Town of Luverne Water Department, Crenshaw County, Alabama: Geological Survey of Alabama open file report, 14 p.

Best, T. L., 2004a, Gray Myotis *Myotis grisescens*: p. 179-180, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Best, T. L., 2004b, Little Brown Myotis *Myotis lucifugus*: p. 193-194, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Best, T. L., 2004c, Rafinesque's Big-eared Bat *Corynorhinus rafinesquii*: p. 182-183, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Blalock-Herod, H. N., 2004, Southern Sandshell *Lampsilis australis*: p. 60, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

Boschung, H. T., and Mayden, R. M.., 2004, Ironcolor Shiner *Notropis chalybaeus* p. 179-180, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

Carlson, R. E., and J. Simpson, 1996, A Coordinator's Guide to Volunteer Lake Monitoring Methods, North American Lake Management Society. 96 pp.

Fetter, C. W., 1988, Applied hydrogeology: New York, Macmillian, Inc., 592 p.

Godwin, J. C., 2004, Eastern Indigo Snake *Drymarchon couperi*: p. 40-41 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Haag, W. R., 2004, Alabama Moccasinshell *Medionidus acutissimus*: p. 98, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

Hart, B. D., 2004, Marsh Rabbit *Sylvilagus palustris*: p. 200-201, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Hastings, R. W., and Parauka, F. M., 2004, Gulf Sturgeon *Acipenser oxyrinchus desotoi*: p. 204-205, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

Henry, T. H., 2004, Northern Yellow Bat *Lasiurus intermedius*: p. 197-198, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife:

Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Hepp, G. R., 2004, American Black Duck *Anas rubripes*: p. 126-127, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Hill, G. E., 2004: Kentucky Warbler *Oporonis formosus*: p. 148-149 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Hughes, M. H., 2004, Southeastern Five-Lined Skink *Eumeces inexpectatus*: p. 60-61 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Hughes, M. H., and Bailey, Mark, 2004, North Florida Swamp Snake *Seminatrix pygaea pygaea*: p. 71 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Hughes, M. H., and Nelson, D. H., 2004, Rainbow Snake *Farancia erytrogramma erytrogramma*: p. 62-63 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Jensen, J. B., 2004a, Mimic Glass Lizard *Ophisaurus mimicus*: p. 57-58 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Jensen, J. B., 2004b, Southern Hognose Snake *Heterodon simus*: p. 42-43 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Johnston, C. E., 2004, Bluenose shiner P*teronotropis welaka*: p. 217, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

Jordan, J. R., Jr., 2004, Southeastern Pocket Gopher *Geomys pinetis*: p. 204-205, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Kiser, W. M., 2004, Brazilian Free-tailed Bat *Tadarida brasiliensis*: p. 198-199, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Kittle, P. D., 2004a, Northern Harrier *Circus cyaneus*: p. 130-131, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Kittle, P. D., 2004b, Short-eared Owl *Asio flammeus*: p. 140-142, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Kittle, P. D., 2004c, Wood Thrush *Hylocichla mustelina*: p. 142-143, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Kittle, P. D., 2004d, Worm-eating Warbler *Helmitheros vermivorus*: p. 142-143, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Lewis, J. A., 2004, Southeastern Myotis *Myotis austroriparius*: p. 194-195, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Maidment, D. R., ed., 1993, Handbook of hydrology: New York, Mcgraw-Hill Inc., p. 11.37-11.54.

Major, C. S., 2004, Wood Stork *Mycteria americana*: p. 124-125 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

McGregor, S. W., 2004a, Alabama Pearlshell *Margaritifera marrianae*: p. 40, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

McGregor, S. W., 2004b, Narrow Pigtoe *Fusconaia escambia*: p. 55, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

McGregor, S. W., 2004c, Round ebonyshell *Fusconaia rotulata*: p. 56, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

McGregor, S. W., 2004d, Southern Kidneyshell *Ptychobranchus jonesi*: p. 84, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

McGregor, S. W., 2004e, Fuzzy Pigtoe *Pleurobema strodeanum*: p. 101, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

McGregor, S. W., 2004f, Choctaw Bean *Villosa choctawensis*: p. 103, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

McWilliams, R. G., Newton, J. G., and Scott, J. C., Geologic map of Crenshaw County, Alabama: Geological Survey of Alabama special map 68.

Means, D. B., 2004a, Flatwoods Salamander *Ambystoma cingulatum*: p. 19-20 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Means, D. B., 2004b, One-toed amphiuma *Amphiuma pholeter*: p. 28-29 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Means, D. B., 2004c, Flatwoods Salamander *Ambystoma cingulatum*: p. 19-20 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Means, D. B., 2004d, Coal Skink *Eumeces anthracinus*: p. 58-59 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Means, D. B., 2004e, Eastern Kingsnake *Lampropeltis getula getula*: p. 65-66 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Means, D. B., 2004f, Florida Pinesnake *Pituophis melanoleucus mugitus*: p. 69-70 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Means, D. B., 2004g, Eastern Diamondback Rattlesnake *Crotalus adamanteus*: p. 73-74 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Mettee, M. F., 2004, Alabama Shad *Alosa alabamae*: p. 206-207, in Mirarchi, R. E., Garner, J. T., Mettee, M. F., and O'Neil, P. E., eds., Alabama Wildlife: Volume 2: Imperiled aquatic mollusks and fishes, Tuscaloosa, University of Alabama Press, 255 p.

Mirarchi, R. E., and Shelton, E. S., 2004a, American Kestrel *Falco sparverius*: p. 132-133, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Mirarchi, R. E., and Shelton, E. S., 2004b, American Woodcock Scolopax minor: p. 138-140, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Mitchell, M. S., 2004, Black Bear *Ursus americanus*: p. 187-189, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Mitchell, M. S., and Sievering, Michael, 2004a, Long-tailed Weasel *Mustela frenata*: p. 208-209, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Mitchell, M. S., and Sievering, Michael, 2004b, Eastern Spotted *Skunk Spilogale putorius*: p. 210-211, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Nelson, D. H., 2004, Eastern Coral Snake *Micrurus fulvius*: p. 72-73 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Natural Resource Conservation Service, 2004, Overview and History of Hydrologic Units and the Watershed Boundary Dataset (WBD), URL accessed November 1, 2005

http://www.ncgc.nrcs.usda.gov/products/datasets/watershed/hislory.html

Means, D. B., 2004f, Florida Pinesnake *Pituophis melanoleucus mugitus*: p. 69-70 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Osborne, W. E., Szabo, M. W., Neathery, T. L., and Copeland, C. W., Jr., 1988, Geologic map of Alabama, southwest sheet (1:250,000): Alabama Geological Survey Special Map 220.

Sapp, C. D., and Emplaincourt, Jacques, 1975, Physiographic regions of Alabama: Alabama Geological Survey Special Map 168.

Smith, C. C., 2001, implementation assessment for the Choctawhatchee, Pea, and Yellow Rivers watershed, Geological Survey of Alabama Open File Report.

Soehren, E. C., 2004a, Swallow-tailed Kite *Elanoides forficatus*: p. 128-129 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife:

Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Soehren, E. C., 2004b, Swainson's Warbler *Limnothlypis swainsonii*: p. 146-148, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Soehren, E. C., and Godwin, J. C., Alligator Snapping Turtle *Macrochelys temminckii*: p. 75-77 in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Southeastern regional climate center web page, accessed October, 2005.

Stewart, P. M., 2003, Biological Collections of the Conecuh River near and below the Point A and Gantt Reservoirs, and two sites each on the upper Conecuh, Patsaliga Creek, and Sepulga River in Southern Alabama, Troy State University, 86 p.

SWCC, 1998-99,Watershed Assessments.

Tucker, J. W., Jr., 2004a, Henslow's Sparrow *Ammodramus henslowii*: p. 118-119, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

Tucker, J. W., Jr., 2004b, Bachman's Sparrow *Aimophila aestivalis*: p. 150-151, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p

Tucker, J. W., Jr., and Robinson, W. D., 2004, Red-cockaded Woodpecker *Picoides borealis*: p. 112-113, in Mirarchi, R. E., Bailey, M. A., Haggerty, T. M., and Best, T. L., eds., Alabama Wildlife: Volume 3: Imperiled amphibians, reptiles, birds, and mammals, Tuscaloosa, University of Alabama Press, 225 p.

U.S. Department of Agriculture, 1984, Hydrologic units and sub-watersheds of Alabama: Soil Conservation Service Map.

____, 2004, Federal Standards for Delineation of Hydrologic Unit Boundaries: Version 2.0, URL accessed November 1, 2005

ftp://ftp-fc.sc.egov.usda.gov/NCGC/products/watershed/hu-standards.pdf

U.S. Geological Survey, 1998, Water use in Alabama, 1995: Water-Resources Investigations Report 98-4154, 92 p.

____, 1992, Hydrologic units, hydrologic unit codes, and hydrologic unit names, URL accessed November 1, 2005

http://water.usgs.gov/nawqa/sparrow/wrr97/geograp/hucs.txt

____, 1993, Geohydrology of the southeastern Coastal Plain aquifer system in Alabama: U.S. Geological Survey professional paper 1410-H, 75 p.

____, 2001, Ecoregions of Alabama and Georgia: U.S. Geological Survey, color poster with map, descriptive text, summary tables, and photographs.

U.S. Bureau of the Census, 2000, State and County QuickFacts