CONECUH-SEPULGA-BLACKWATER RIVERS WATERSHED PROTECTION PLAN

GEOLOGICAL SURVEY
OF ALABAMA

CONECUH-SEPULGA
CLEAN WATER PARTNERSHIP

GEOLOGICAL SURVEY OF ALABAMA
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CONECUH-SEPULGA-BLACKWATER RIVERS WATERSHED PROTECTION PLAN

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INTRODUCTION

The purpose of this document is to provide a framework for the protection of water and biological resources in the Conecuh-Sepulga, and Blackwater River's watershed (CSBRW). Documents for other watersheds in Alabama have been designated as "Watershed Management Plans." However, many of our attempts to "manage" the environment have had less than satisfying results. Therefore, this document will be referred to as the "Conecuh-Sepulga, and Blackwater Rivers Watershed Protection Plan" (CSBRWPP). 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 CSBRW. 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 CSBRW is a relatively rural area. Therefore, an effective watershed plan is vital to perpetuate and protect these treasured resources. The Conecuh-Sepulga Clean Water Partnership and the CSBRWPP 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 CSBRWPP is designed for maximum utility in a variable-watershed scale format. Information is organized for development of broad-based stakeholder involvement for multi-county or regional watershed protection strategies (4 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 (8 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 CSBRW 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.

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WATERSHED PROTECTION PLAN GOALS AND OBJECTIVES

The mission objectives of the Conecuh-Sepulga Clean Water partnership are “To preserve, protect, and enhance water quality, biodiversity, and habitat of the Conecuh-Sepulga, and Blackwater Rivers watershed to meet the goals of the Clean Water Act through basin wide public/private partnerships.” Ten primary goals can be identified:

1. Increase citizen awareness of watershed protection.
2. Inventory and monitor the physical, chemical and biological parameters for surface and groundwater.

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, littering, and disposal of animal carcasses.
6. Reduce pollution from agricultural activities.
7. Reduce pollution from forestry activities.
8. Reduce nonpoint source pollution from urban sources.
9. Protect groundwater resources through conservation and pollution prevention.
10. Promote protection of wetlands, faunal habitats, and other critical areas.

The goals and objectives of the CSBRWPP are closely tied to the mission of the Clean Water Partnership (CWP). 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 Conecuh-Sepulga Clean Water Partnership (CSCWP), the Covington County Soil and Water Conservation District (CCSWCD), Geological Survey of Alabama (GSA), Alabama Department of Environmental Management (ADEM), and the U.S. Environmental Protection Agency (EPA). Early on, the Steering Committee of the CSCWP recognized the importance of the watershed plan being a “locally driven” project. The CSCWP has overseen the project development through the Technical Committee, the WPP oversight committee and the CSCWP facilitator. The CCSWCD has served as grant administrator for the project. The GSA was contracted to oversee scientific/technical data, maps, etc., and the CSCWP facilitator was contracted to handle

stakeholder contacts, public meetings, citizen input, etc. Public input has been gathered from various sources including: CSCWP steering committee meetings, CSCWP watershed committee meetings, presentations with civic and school groups, meetings with Soil and Water Conservation Districts, meetings with County commissions, and city councils, surveys, mail outs, 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 was chosen, so that the watershed plan, considered a living, dynamic publication can be economically updated as new data is available. The watershed plan will also be available in electronic version and funding for the watershed plan was provided through a 319 grant from ADEM and EPA.

This watershed plan is based on the full and balanced representation of all stakeholders in the Conecuh, Sepulga, and Blackwater Rivers Watersheds----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 Alabama Clean Water Partnership (ACWP) program.

The Alabama Clean Water Partnership (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 CSCWP 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 Upper Conecuh River Basin Committee area extends from the headwaters of the Conecuh River in Bullock County to the confluence of the Sepulga and Conecuh River near McGowin's Bridge on U.S. Highway 29 in Escambia County. The Lower Conecuh River Basin Committee area extends from McGowin's Bridge to the Florida line, including the Blackwater River Basin as well. The Sepulga River watershed comprises the area for the Sepulga River Basin Committee. 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 ground waters in the Conecuh River Basin. There is also a Technical sub-committee in place as well as a Watershed Protection Plan Oversight Committee, with both groups assisting with watershed plan input, development, and implementation.

This watershed protection 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, 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 Conecuh-Sepulga, and Blackwater Rivers watershed 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 Conecuh-Sepulga, and Blackwater Rivers Watershed---with no one interest group dominating watershed plan development or implementation.

Watershed plan comments and suggestions can be made at anytime to the Conecuh-Sepulga CWP facilitator. A thorough review of the protection plan will be conducted at least annually by the Conecuh-Sepulga CWP Steering Committee/Technical Committee 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 and technical committee reviews and consensus. Watershed plan corrections, if any, will be determined by the Steering Committee after public input and comments are received. The Conecuh-Sepulga CWP 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 CSCWP program was formed in the fall of 2001, a concerted effort has been made to contact anyone with a stake or interest in the water quality of the CSBRW and to keep them informed of CSBRW 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 protection plan and gauge current water-quality perceptions, a stakeholder survey was distributed at meetings,

presentations, and via mail. Approximately 400 surveys were distributed along with stamped, addressed return envelops. Fifty-four (54) or 13.5 percent (%) completed surveys were returned. Although this was a disappointing return, it did provide useful data. Survey results indicate that 41% of respondents were aware of the ongoing watershed protection plan development process. Respondents ranked water quality concerns/problems in the following order: 1) illegal dumping/littering, 2) agricultural runoff from crops, 3) agricultural runoff from livestock and poultry operations, 4) failing onsite septic systems, 5) urban runoff, 6) sedimentation (tie with no. 5), 7) water related recreation activities, and 8) silviculture, forestry, and timber harvesting.

Since October, 2001 at CSCWP steering committee meetings as well as meetings of the 3 sub-basin committees, 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:

Trash and illegal dumping in rivers and streams (tires, animal carcasses, etc.)
Enforcement of garbage pickup, watershed wide
Trash as a health concern, mosquito habitat in trash holding stagnant water
Boat ramp erosion at Bull Slough
Unpaved roads (sedimentation)
Cattle in the streams
Log jams in the river
Stream bank erosion
I-65 runoff
Septic system maintenance and failures
Endangered and threatened species
Mercury contamination in fish
Need to protect Sepulga's pristine streams
Need for more active volunteer groups
Need more outdoor classrooms at Hillcrest (Evergreen)
Additional Water Watch training
Sand and gravel pits
Additional Water Watch kits
Illegal access by four wheelers
Need for additional scientific data/information concerning existing water quality

Impairments identified and prioritized by the use of accurate scientific data and local stakeholder input will encourage community involvement. Remedies applied to impaired watersheds utilizing the latest technical methodology will validate the Clean

Water Partnership strategy and insure water-quality improvement. Due to the rural character of the CSBRW, little emphasis has been placed on scientific data collection related to the relationships of land use, hydrology, geology, biology, habitat, and water quality. Much of this lower Coastal Plain watershed is underlain by highly erodable soils. Monitoring programs must be properly designed and adequately funded in order to determine the causes and magnitude of water-quality impairments, the most efficient and effective remediation strategies, and measures of success of CWP objectives. These data are essential to measure progress and to determine the future direction of initiatives undertaken by watershed protection partners.

The first step in the monitoring process is to collect watershed-wide baseline data to determine current conditions and the geographic variation of water-quality characteristics. The CSCWP committee is proposing a comprehensive basin-wide monitoring program to determine the hydrogeologic character and current water-quality conditions in selected subwatersheds throughout the CSBRW. This Geographic Information System (GIS)-based program is designed to determine the hydrologic relationships between small and large watersheds, land use, and water quality relationships. Physical characteristics, in-stream sedimentation and nutrient loading, bacteria counts, toxic metals concentrations, and concentrations of a comprehensive group of organic compounds will be determined. These data when combined with existing data may be used to focus future monitoring efforts into smaller watersheds and into headwaters areas where many water-quality problems originate.

Monitoring data may also be used to design remediation programs to correct existing problems and prevent future impairments. Implementation of remedial actions is the most capitol intensive part of a comprehensive natural resource enhancement program. Data collected in the Lightwood Knot Creek watershed in Covington County indicated that a properly designed and implemented remediation strategy may reduce nutrients and sediment loads in streams by more than 70 per cent (Cook, 2003). Funding for remedial actions may be focused in priority problem areas to solve existing problems while watershed-wide implementation of proper land-use techniques will prevent future water-quality impairments.

A true partnership of the citizens of the CSBRW is dependent, in large part, on awareness of the issues that threaten the natural resources and quality of life for those that live in the watershed. Many of the water-quality problems which plague this watershed, such as illegal dumping and littering, are indicative of a population that is unaware of the environmental impact of their actions. Environmental education that leads to the development of a concerned, involved citizenry is a major part of the success of the Clean Water Partnership program.

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 CSBRW. Some of these programs and systems and their current status in the CSBRW 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. 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 five acres are regulated by the Clean Water Act through a permit process called the National Pollutant Discharge Elimination System (NPDES). The Alabama Department of Environmental Management (ADEM) administers the NPDES program in Alabama. Their records indicate 197 NPDES permits are currently active in the Conecuh River Watershed. 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 CSBRW

Hydrologic unit name and number	NPDES Permitted Sites	Number of violations
Upper Conecuh River (03140301)	45	0
Patsaliga Creek (03140302)	24	1
Sepulga River (03140303)	33	1
Lower Conecuh River (03140304)	61	0
Escambia Creek (03140305)	28	0
Blackwater River (03140104)	5	0

Storm water management regulations are also included in the NPDES permitting process. Phase I storm water 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 storm water 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 storm water 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 storm-water discharge.
    - Public participation and involvement – Community should be given the opportunity to actually participate in the development and implementation of storm water program.

- Elicit discharge detection and elimination – Municipalities must develop a plan to eliminate discharges into storm sewers from sources other than storm water.
- Pollution prevention and good housekeeping – The EPA requires municipalities to create a program to prevent or limit pollutants in storm water runoff.
- Construction-site runoff control – Governing bodies must employ measures to prevent or reduce pollutants associated with construction activities from entering the storm water 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 or II storm-water management guidelines.

Nonpoint source pollution (NPS) is composed of contaminants transported by runoff from diffuse sources. Assessment of NPS pollution is accomplished through Section 319 of the Clean Water Act which is administered by the ADEM the 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. Currently, one Section 319 project is ongoing in the Conecuh River Watershed. The Gantt-Point A project involves implementation of best management practices (BMPs) and monitoring to determine pre- and post BMP sediment loads entering Gantt and Point A reservoirs (Covington County) from tributaries with unpaved road crossings.

Impaired waters are listed under Section 303(d) of the Clean Water Act. 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 Total Maximum Daily Loads (TMDLs). A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water-quality standards.

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 (CERCLA)

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 are no National Priorities Listed sites in the CSBRW.

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:

1. Protect us from the hazards of waste disposal
2. Conserve energy and natural resources by recycling and recovery
3. Reduce or eliminate waste, and
4. 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

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 Conecuh River watershed. Seven species are candidates for federal protection. For a detailed discussion of listed species, go to page 58.

U. S. ARMY CORPS OF ENGINEERS REGULATIONS

The U.S. Army Corps of Engineers has regulatory authority related to the protection of the waters of the United States. Chapter 21-1 of The Corps of Engineers 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:

(1) Dams and dikes in navigable waters of the United States;

(2) Other structures or work including excavation, dredging, and/or disposal activities, in navigable waters of the United States;

(3) Activities that alter or modify the course, condition, location, or physical capacity

of a navigable water of the United States;

(4) Construction of fixed structures, artificial islands, and other devices on the outer continental shelf;

(5) 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. Currently, the Commission is researching the potential for surface and ground-water withdrawal regulations.

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 or County Health Departments. Currently, 26,255 domestic wastewater systems are permitted in the CSBRW. 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 CSBRW
(Alabama SWCC, Watershed Assessments, 1998-99; ADPH)

Hyd. Unit name and number	**Estimated no. of septic tanks**	**Estimated no. of failing septic tanks**	**Estimated % failure**	**Estimated no. of alternative systems***
Upper Conecuh 3140301	7,889	353	4.5%	812
Patsaliga 3140302	2,713	237	8.7%	352
Sepulga 3140303	6,161	791	12.8%	109
Lower Conecuh 3140304	6,573	467	7.1%	134
Escambia 3140305	2,454	108	4.4%	41
Blackwater 3140104	365	22	6.0%	5
Totals	26,155	1978	7.6% average	1,453

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

ANIMAL FEEDING OPERATION/CONCENTRATED ANIMAL FEEDING OPERATION (AFO/CAFO) PROGRAM

The AFO/CAFO program is administered by ADEM and sets requirements on the construction, operation, and closure of AFO/CAFOs. The program was enacted in 1999

and strictly prohibits the discharge of animal wastes to surface or ground waters. The program imposes buffer requirements as well as other management provisions to protect water quality. All animal-feeding operations must implement and maintain waste management system practices that meet or exceed the guidelines of the U.S. Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS). Currently, there are 45 AFO/CAFOs in the CSBRW. Table 3 lists CAFOs and animal types by HUC.

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

Hyd. Unit name and no.	No. of cattle	No. of dairy cows	No. of swine	No. of broilers	No. of layers	No. of catfish pond (acres)	No. of CAFO's
Upper Conecuh 3140301	21,369	0	622	2,468,590	84,857	39	1
Patsaliga 3140302	20,623	0	1,500	3,108,966	11,600	0	24
Sepulga 3140303	20,425	0	0	2,731,368	68,000	0	20
Lower Conecuh 3140304	13,462	300	385	0	0	120	0
Escambia 3140305	6,341	0	50	0	0	25	0
Blackwater 3140104	3,988	0	0	0	0	0	0
Totals	86,208	300	2,557	8,308,924	164,457	184	45

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 Natural Resources Conservation Service (NRCS) manages EQIP with input from the State Technical Committee and assistance from the Farm Service Agency (FSA), Soil and Water Conservation Districts (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 enhanceing 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 USDA Natural Resources Conservation Service (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 (USFWS) 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.

TURTLE POINT ENVIRONMENTAL SCIENCE CENTER

The purpose of the Turtle Point Project is to provide opportunities for students and citizens of Escambia County, Alabama to develop an understanding of the ecology of Big Escambia Creek, the CSBRW, and surrounding wetlands. Visitors are academically challenged to learn more about their land and water resources, and how to protect this legacy. Citizens and students from Escambia and surrounding counties have the opportunity to use this facility.

PREVIOUS INVESTIGATIONS

Natural resource investigations have been carried out in the watershed by various state and federal agencies. Geologic, stratigraphic, hydrologic, water availability, and

water-quality studies have been conducted by both the U.S. Geological Survey and the Geological Survey of Alabama and the EPA and ADEM have conducted water quality analysis. The ADCNR and USFWS have conducted biologic and habit studies related to fish and wildlife. The reader is encouraged to contact these agencies and those responsible for programs discussed above for specific reports.

STUDY AREA DESCRIPTION

LOCATION AND EXTENT

The CSBRW study area encompasses approximately 3,976 square miles (mi^2) in parts of 11 counties of south-central Alabama. Table 4 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 4.— Land area by county in the CSBRW study area

County	Sq. Miles	Acres
Bullock	102.79	65,784
Butler	623.67	399,149
Coffee	1.99	1,276
Conecuh	851.58	545,013
Covington	442.36	283,111
Crenshaw	555.27	355,371
Escambia	840.74	538,072
Lowndes	21.84	13,979
Monroe	99.11	63,431
Montgomery	98.13	62,802
Pike	338.43	216,597
TOTALS	**3,975.91**	**2,544,585**

The northern boundary of the study area follows an approximate line extending from Fort Deposit in southern Lowndes County to Union Springs in central Bullock County. Near Union Springs and the headwaters of the Conecuh River, the eastern boundary of the study area turns southwestward following the eastern boundary of the Conecuh River basin. In southwestern Covington and southeastern Escambia Counties the study area includes portions of the Blackwater River basin. The southern study area boundary is the Alabama-Florida state line from near Wing in Covington County westward to Atmore in Escambia County. From near Atmore the western boundary generally extends in a northerly direction to near Frisco City in Monroe County where it

trends northeastward along the Monroe-Conecuh County line and across northeastern Butler County back to Fort Deposit in southern Lowndes County.

COUNTY, MUNICIPAL, AND POPULATION DATA

An estimated 119,900 people resided in the watershed during 2000 (U.S. Bureau of Census, 2002) (table 5). Population growth occurred in all counties except Butler during the period 1990 to 2000. General housing and municipal information is provided in tables 6 and 7, respectively.

Table 5.— County population profile information for CSBRW counties
(U.S. Bureau of the Census: State and County QuickFacts, 2000)

County	**Total Population, 2000**	**Estimated population within watershed, 2000**	**Percent change since 1990**	**Median household income**
Bullock	11,714	7,000	6.1%	$20,605
Butler	21,399	15,000	-2.3%	$24,791
Coffee	43,615	100	8.39%	$33,664
Conecuh	14,089	14,000	0.25%	$22,111
Covington	37,631	18,000	3.2%	$26,336
Crenshaw	13,665	13,000	0.22%	$26,054
Escambia	38,440	35,000	8.22%	$28,319
Lowndes	13,473	1,300	6.4%	$23,050
Monroe	24,324	2000	1.49%	$29,093
Montgomery	223,510	500	6.9%	$35,962
Pike	29,605	14,000	7.3%	$25,551
TOTAL	**471,465**	**119,900**	---------	**$26,866.91**

Table 6.— Housing units/sewage disposal information for counties located within the CSBRW

County	Housing Units[1]	Public Sewage[2]	Septic tank[2]	Other[3]	Lacking complete plumbing facilities
Bullock	4,727	1,851	2,388	219	27
Butler	9,957	3,825	4,432	488	65
Coffee	19,837	9,886	6,874	191	139
Conecuh	7,265	1,554	4,330	323	60
Covington	18,578	7,811	8,105	262	110
Crenshaw	6,644	1,665	3,986	287	31
Escambia	16,544	6,701	7,434	221	106
Lowndes	5,801	1,154	3,223	415	118
Monroe	11,343	3,112	5,970	551	134
Montgomery	95,437	77,001	6,975	549	520
Pike	13,981	6,450	4,744	312	55

1 State and County Quick facts, US Census, 2000
2 State and County Quick facts, US Census, 1990; information not available with 2000 Census
3 Other systems would include mound systems, constructed wetlands, etc.

Table 7.— Municipalities within the CSBRW boundary

County	Municipalities
Bullock	Union Springs
Butler	Georgiana, Greenville, McKenzie
Coffee	No incorporated communities
Conecuh	Evergreen, Castleberry
Covington	Andalusia, Dozier, Gantt, Red Level, River Falls
Crenshaw	Brantley,Luverne
Escambia	Atmore, Brewton, East Brewton, Flomaton
Lowndes	Fort Deposit
Monroe	Frisco City
Montgomery	No incorporated communities
Pike	Troy

PHYSIOGRAPHIC DISTRICTS

Lying within the East Gulf Coastal Plain physiographic section of Alabama, the CSBRW study area is characterized by gently rolling hills, sharp ridges, prairies, and alluvial flood plains (fig. 1). Rocks 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 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

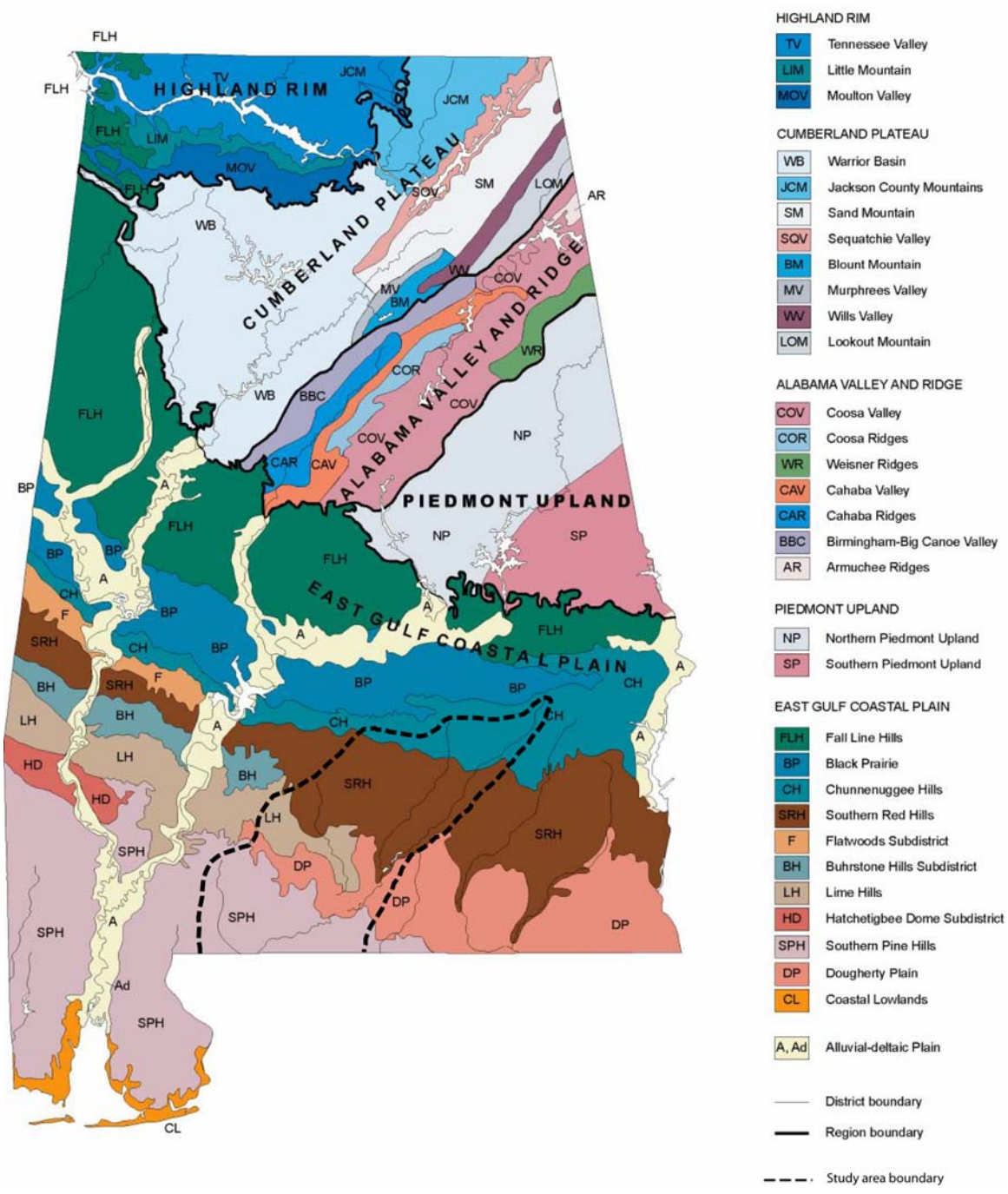

Figure 1.— Physiographic districts in Alabama and in the CSBRW study area.
(modified from Sapp and Emplaincourt, 1975)

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). Five of these districts including Chunnenuggee Hills, Southern Red

Hills, Lime 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 study area boundary closely follows the Lapine and High Ridge Cuestas. The headwaters of the Conecuh River and Patsaliga Creek originate in this district on the south side of the High Ridge Cuesta.

The Southern Red Hills district extends in a belt across the study area broadening from about 30 miles wide in the west to approximately 60 miles wide in the east. 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 Conecuh River and Patsaliga Creek drain the Red Hills in the eastern part of the study area and the headwaters of the Sepulga River occur in the western potion of the study area.

The rugged Lime Hills district occurs over resistant limestones in an irregular wedge across Monroe County and in a small area of northwest Covington County. Much of the Sepulga River flows through this district.

The Dougherty Plain district or "wiregrass region" of the study area includes portions of Conecuh, Covington, and Escambia Counties. It is an extension of an upland in Georgia 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 Conecuh and Sepulga Rivers occurs in the Dougherty Plain in northeastern Escambia County.

The Southern Pine Hills (SPH) district of the study area includes most of Escambia County, the southwestern corner of Conecuh County, a small area in southwestern Covington County, and the headwater areas of Big Escambia Creek in Monroe County. Topography is low-relief with broad, rounded ridges and V-shaped

valleys with sand and clay sediments. This region is not subject to solution like the Dougherty Plain and the boundary between the two districts is sometimes a distinct escarpment. 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. Streams are well sustained by ground-water flows in summer and are commonly called "blackwater" creeks, particularly in reference to those streams originating in the Pine Hills proper, where the term refers to the natural color imparted by dissolved and suspended organic matter. Major streams draining the Southern Pine Hills in the study area include the Conecuh River and Big Escambia Creek.

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 (U.S. Geological Survey, 2001). Ecoregions in the CSBRW 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 (region 65d) corresponds to the Chunnenuggee Hills (CH) and Southern Red Hills (SRH) districts. The Southern Pine Plains and Hills ecoregion (65f) corresponds to the Dougherty Plain (DP), Southern Pine Hills (SPH), and Lime Hills (LH) districts. A small area of the lower Conecuh River flood plain has been designated as the Southern Floodplains and Low Terrace (65p) ecoregion and an area of the Lime Hills physiographic district is designated as the Buhrstone/Lime Hills (65q) ecoregion.

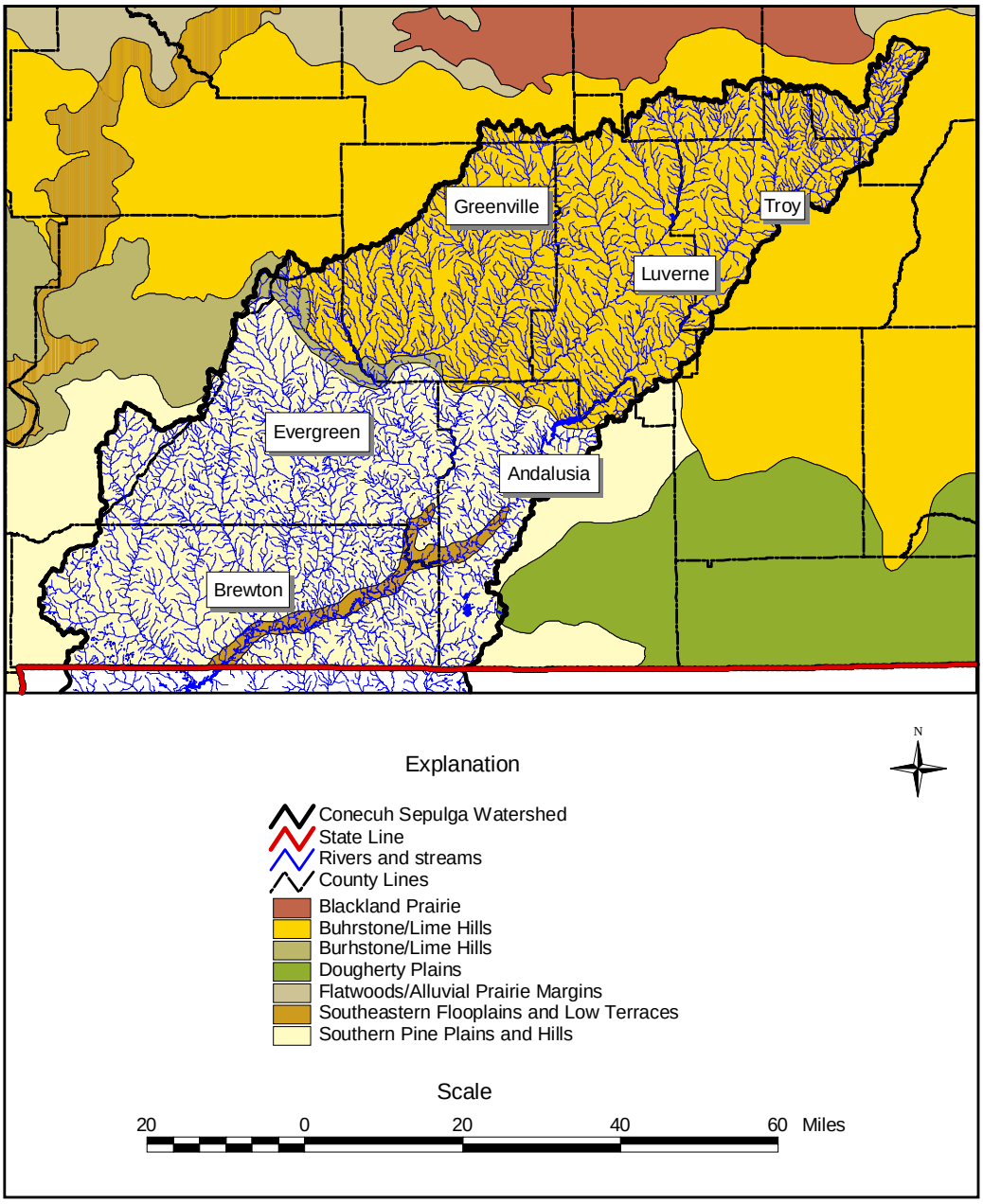

Figure 2— Ecoregions in the CSBRW study area.
(modified from U.S. Geological Survey, 2001)

CLIMATE

Alabama, including the CSBRW area, is classified climatically as humid sub-tropical with mild winters and hot summers. Average annual temperature in the basin is about 64 degrees Fahrenheit (°F) and annual precipitation ranges from about 53 inches in the northeastern part of the basin to near 64 inches in the southwestern basin area (Southeastern Regional Climatic Center, 2004). Figure 3 shows the location of selected rainfall stations within the basin along with 2003 and long-term average rainfall values.

Rainfall in the basin is generally well distributed throughout the year, 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. 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, 2004).

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

Station name/number	Precipitation (inches)			
	Mean	**Min./Year**	**Max./Year**	**Period of record**
Andalusia/010252	58.26	29.50/1954	92.90/1975	1948-2003
Brewton/011084	62.96	31.40/1954	98.58/1975	1928-2003
Evergreen/012758	64.05	44.91/2000	114.02/1975	1961-2003
Georgianna/013271	58.76	33.85/1968	83.61/1975	1956-2003
Greenville/013519	57.57	31.51/1954	81.03/1946	1928-2003
Highland Home/013816	53.54	24.62/1954	82.44/1975	1948-2003
Troy/018323	53.04	24.41/1954	73.40/1953	1930-2003
Union Springs/018438	54.54	36.58/1951	72.15/2003	1948-2003

GEOLOGY

Geologic units that crop out in the CSBRW include Quaternary alluvial and terrace deposits, Tertiary clays, sands, and gravels, and Cretaceous clays, sands, and gravels (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. Individual units are discussed below.

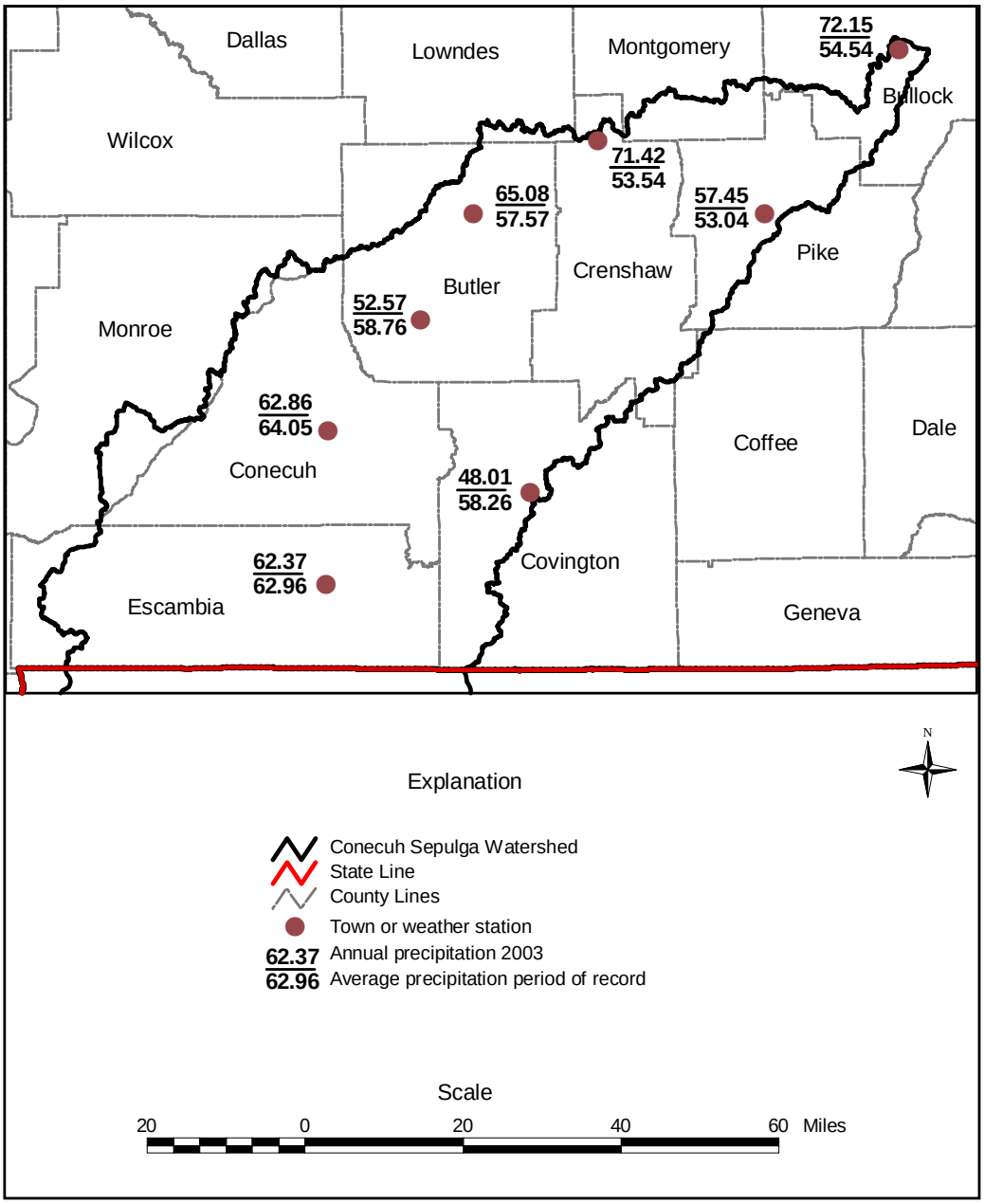

Figure 3.— Precipitation in the CSBRW.

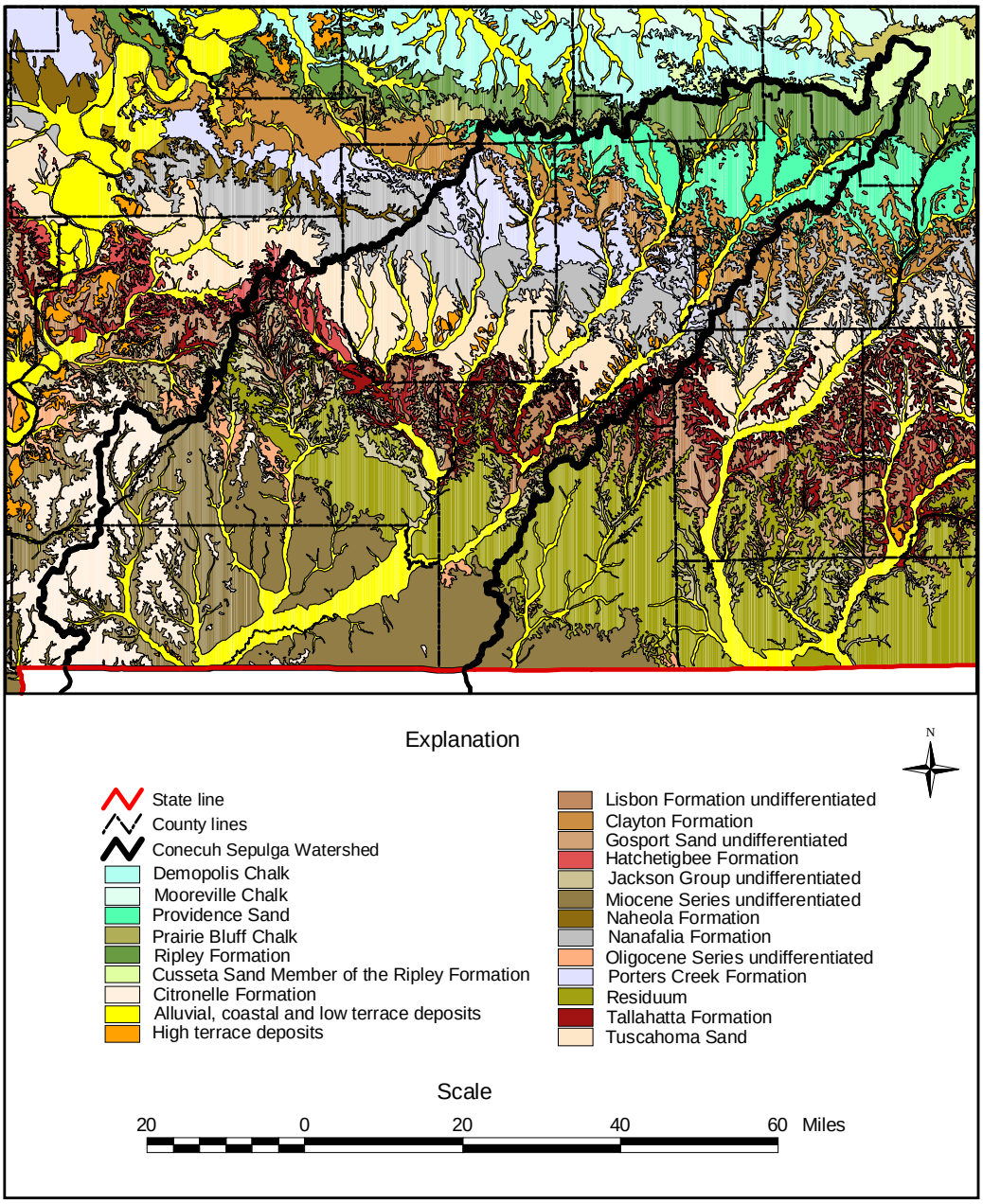

Figure 4.— Generalized geology in the CSBRW.
(Osborne and others, 1988)

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

SYSTEM	SERIES	GROUP	GEOLOGIC UNIT	THICKNESS (feet)
Quaternary	Holocene/Pleistocene		Alluvial and Terrace deposits	0-50
	Pleistocene/Pliocene		Citronelle Fm.	
Tertiary	Miocene		Miocene undiff.	30-100
	Oligocene		Oligocene Series undiff	50-200
	Eocene/Oligocene		Residuum	0-?
	Eocene	Jackson	Jackson Group undiff.	40-150
		Claiborne	Lisbon Fm.	100-300
			Tallahatta Fm.	100-200
		Wilcox	Hatchetigbee Fm.	30-100
	Paleocene		Tuscahoma Sand	100-250
			Nanafalia Fm.	150-300
			Salt Mountain Limestone	100-300
		Midway	Porters Creek Fm.	0-30
			Clayton Fm.	100-250
		Selma	Providence Sand	100-250
			Ripley Fm.	150-200
			Cusseta Sand	50-150

CRETACEOUS SYSTEM

UPPER CRETACEOUS SERIES

CUSSETA SAND MEMBER OF THE RIPLEY FORMATION

The Cusseta crops out near Union Springs in Bullock County (fig. 4) in the study 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

Within the study area, the Ripley Formation crops out in southern Bullock, northern Pike, and southern Montgomery Counties. The Ripley is composed of light-gray to pale-olive massive, glauconitic, fine sand and fossils are common. Thin indurated beds of fossiliferous sandstone may also be present (Osborne and others, 1988).

PROVIDENCE SAND

Conformably overlying the Ripley is the Providence Sand which crops out in southeastern Lowndes County, in small areas of southwestern and southeastern Montgomery County, in northeastern Butler and northern Crenshaw Counties, in northern Pike County, and in a small area of southern Bullock County. Baker and Smith (1997) report the Providence in the vicinity of Luverne in Crenshaw County is composed of

about 200 feet of “hard shale” or marl. This subsurface lithology is thought to be consistent across Crenshaw County and eastward into neighboring counties. McWilliams, Newton, and Scott (1968) describe the Providence Sand as consisting of fine-grained clayey sand and sandy, silty clay.

TERTIARY SYSTEM
PALEOCENE SERIES

CLAYTON FORMATION

Unconformably overlying the Providence Sand, the Clayton crops out in an irregular band from southeastern Pike County, across north-central Crenshaw County, and into northeastern Butler County (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

Overlying the Clayton Formation is the Porters Creek Formation. It crops out in north-central Crenshaw County and in northeastern Butler County and subsurface lithology has also been described as fossilliferous sandy limestone (Baker and Smith, 1997). Beds to the east of Crenshaw County correlative to the Porters Creek are assigned to the Clayton Formation.

NANAFALIA FORMATION

Cropping out in a band from central Butler County through Crenshaw County and into extreme southwestern Pike County, the Nanafalia conformably overlies the Porters Creek Formation. The formation consists primarily of fine to coarse sand, gravel, and clay (Baker and Smith, 1997).

TUSCAHOMA SAND

In the outcrop of the study area, the Tuscahoma Sand generally consists of thin basal glauconitic sand overlain by dark-gray to black, thinly laminated, micaceous and carbonaceous, nonfossiliferous clay and silty clay. The outcrop area is an irregular band extending across southern Crenshaw and Butler Counties and includes a small area of northeastern Conecuh County. This general lithologic character remains consistent southward into the subsurface throughout the project study area. The name “Tuscahoma

Sand" is somewhat misleading because at its type locality, throughout its outcrop belt, as well as in the shallow subsurface of the Alabama Coastal Plain area, the Tuscahoma Sand consists predominantly of thin-bedded carbonaceous and finely lignitic 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). Within the study area, the formation crops out in thin bands in southern Crenshaw and Butler Counties. A larger outcrop area occurs in northeastern Conecuh County.

TALLAHATTA FORMATION

The Tallahatta through northern Covington and northeastern Conecuh Counties, the Tallahatta generally consists of clayey sand, sandy clay, and thin beds of limestone. Most published reports dealing with the surface geology of the area do not separate the Tallahatta from the underlying Hatchetigbee Formation due to their lithologic similarity, indistinct contact, uniformly thin nature, and weathered profiles. Throughout the study area, both units are invariably deeply weathered and oxidized and consist almost entirely of reddish-orange to reddish-brown, ferruginous-stained, fine to coarse quartzose sand. Beds of typical siliceous claystone are only rarely present in surface outcrops, and then only near the top and base of the Tallahatta (Smith, 2001).

LISBON FORMATION

The Lisbon Formation overlies the Tallahatta and is overlain by the Moodys Branch Formation, the lowermost unit assigned to the upper Eocene Jackson Group. The Lisbon Formation was named for exposures at Lisbon Bluff and nearby Lisbon Landing along the east bank of the Alabama River in northwestern Monroe County, Alabama. In its type area of Clarke and Monroe Counties, the Lisbon consists of glauconitic and highly fossiliferous coarse sand, clayey sand, and sandy clay (Smith, 2001). In the study area the Lisbon has a limited outcrop in northern Covington and Conecuh Counties.

JACKSON GROUP undifferentiated

In southwestern and south-central Alabama, the Jackson group consists of the Moodys Branch Formation and overlying Yazoo Clay. In outcrop exposures, the Moodys Branch Formation extends across southern Alabama to the Chattahoochee River, although throughout most of southeastern Alabama, the formation is deeply weathered and mapped as a part of the thick undifferentiated Tertiary residuum. From southwestern Alabama eastward, the overlying Yazoo Clay rapidly becomes more-and-more calcareous and grades into limestone in central Alabama. This limestone, mapped as the Crystal River Formation by the Geological Survey of Alabama and the Ocala Limestone by the U.S. Geological Survey, extends eastward throughout southeastern Alabama (Smith, 2001). In the study area the Jackson Group has limited exposures, mainly in secondary stream valleys, in Covington and Conecuh Counties.

EOCENE AND OLIGOCENE SERIES

RESIDUUM

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 Conecuh Counties (Osborne and others, 1989). It is primarily composed of clay, sandy clay, and layers of gravelly sand and fossiliferous chert.

OLIGOCENE SERIES

OLIGOCENE SERIES undifferentiated

Small outcrops of this unit have been mapped in western Covington and west-central Conecuh Counties. Composed of soft limestone, marl, fossiliferous limestone, and beds of fossiliferous clay the unit is largely confined to stream valleys (Osborne and others, 1989).

MIOCENE SERIES

MIOCENE SERIES undifferentiated

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

PLEISTOCENE AND PLIOCENE SERIES

CITRONELLE FORMATION

The Citronelle Formation, within the study area, is exposed in western Escambia and Conecuh Counties. It is primarily composed of deeply weathered quartz sand with scattered limonite pellets (Osborne and others, 1988).

QUARTERNARY SYSTEM

PLEISTOCENE AND HOLOCENE SERIES

TERRACE AND ALLUVIAL DEPOSITS

Terrace and Alluvial deposits occur throughout the CSBRW 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 SUB-REGIONS

A hydrologic region and sub-region geographical classification system was adopted in 1974 by the U.S. Water Resources Council as a framework for detailed planning. Sub-regions are further divided into accounting units which are used by the U.S. Geological Survey in managing the National Water Data Network. Accounting units are divided into several cataloging units. Region, sub-region, accounting unit, and cataloging unit makes 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 2 regions, 7 sub-regions, 11 accounting units, and 53 cataloging units. The state is further divided into 629 smaller sub-watersheds (SCS, 1984).

The CSBRW lies in the South Atlantic-Gulf hydrologic region (03), the Choctawhatchee-Escambia subregion (0314), and the Escambia accounting unit (031403) (plt. 1). Cataloging units include the Upper Conecuh (03140301), Patsaliga (03140302), Sepulga (03140303), Lower Conecuh (03140304), and Escambia (031401305). In addition, a small area outside of the CSBRW that lies in Covington and Escambia Counties, the Blackwater River (03140104), is included in the study area. Table 10 lists each hydrologic unit by name, number, and county along with land area values.

Individual river and creek discharge values are provided in table 11. Surface water discharge as a part of the overall water budget for the watershed is estimated to be 35 percent of total precipitation or about 21 inches. Each cataloging unit is discussed below.

UPPER CONECUH RIVER (03141301)

The Upper Conecuh River hydrologic unit comprises approximately 822 square miles (mi^2) of the CSBRW (fig. 5). This unit lies in the eastern part of the watershed study area and is comprised of the Conecuh River drainage basin from its headwaters near Union Springs in Bullock County southwestward to the mouth of the Sepulga River in northeastern Escambia County. Sub-watersheds within the unit are noted in table 10.

Discharge or flow values for the Upper Conecuh River hydrologic unit are available from the U.S. Geological Survey for a station at Brantley (no. 02371500). At Brantley the drainage area is approximately 500 mi^2 and average daily discharge for the period of record is about 659 cubic feet per second (cfs). A maximum daily discharge of

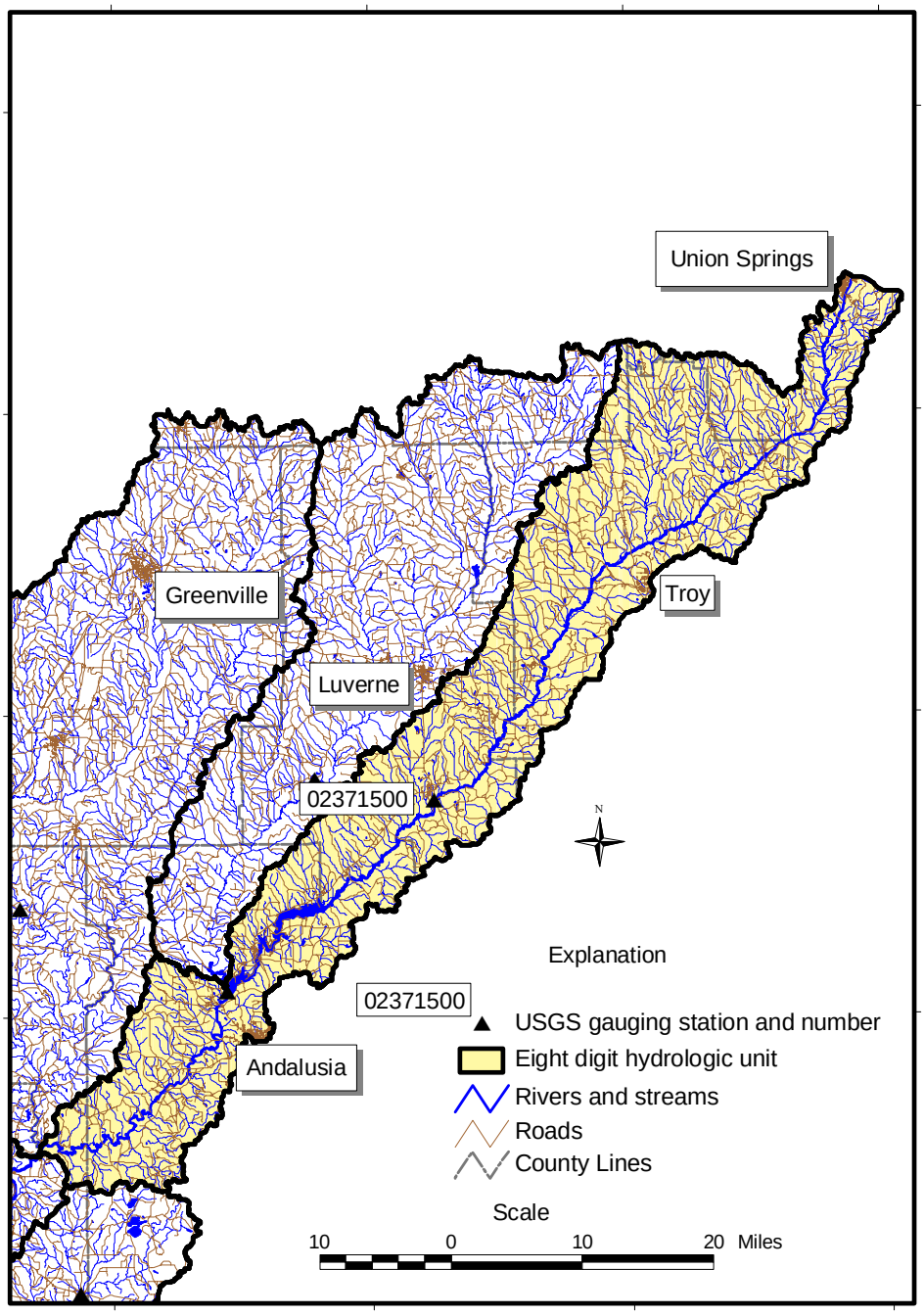

Figure 5.— Upper Conecuh River (03141301) hydrologic unit.

Table 10.— Hydrologic units in the CSBRW

Hydrologic Unit code and name 03140301 Upper Conecuh River

Sub-watershed	County	Sq. Miles	Acres
010 Conecuh River	Bullock	97.17	62188
	Pike	82.15	52573
		179.31	**114761**
020 Mannings Ck	Bullock	5.62	3596
	Montgomery	11.74	7511
	Pike	143.33	91731
		160.68	**102838**
030 Conecuh River	Coffee	1.99	1276
	Crenshaw	81.08	51891
	Pike	65.69	42044
		148.77	**95211**
040 Conecuh River	Covington	88.69	56761
	Crenshaw	80.96	51814
		169.65	**108574**
050 Conecuh River	Conecuh	9.35	5983
	Covington	147.87	94639
	Escambia	6.13	3926
		163.36	**104548**
	Hydrologic Unit Totals	**821.77**	**525932**
Hydrologic unit code and name 03140302 Patsaliga Creek			
010 Olustee Ck	Crenshaw	16.46	10534
	Montgomery	77.24	49435
	Pike	42.09	26940
		135.79	**86909**
020 Blue Ck	Crenshaw	53.52	34254
	Montgomery	9.15	5855
		62.67	**40110**
030 Up Patsaliga Ck	Crenshaw	78.20	50048
	Pike	5.17	3310

Table 10.— Hydrologic units in the CSBRW— Continued

		83.37	**53358**
040 Little Patsaliga Ck	Crenshaw	117.10	74944
		117.10	**74944**
050 Lower Patsaliga Ck	Butler	37.96	24293
	Covington	47.31	30281

	Crenshaw	94.04	60188
		179.31	**114762**
060 Buck Ck	Covington	21.38	13684
		21.38	**13684**
	Hydrologic Unit Totals	**599.63**	**383766**

Hydrologic unit code and name 03140303 Sepulga River

Sub-watershed	County	Sq. Miles	Acres
010 Sepulga River	Butler	58.84	37659
	Conecuh	104.59	66937
	Monroe	9.18	5877
		172.61	**110472**
020 Upper Persimmon Ck	Butler	87.60	56061
		87.60	**56061**
030 Lower Persimmon Ck	Butler	192.43	123152
	Conecuh	0.58	371
		193.00	**123523**
040 Sepulga River	Butler	11.67	7470
	Conecuh	76.71	49097
		88.39	**56567**
050 Upper Pigeon Ck	Butler	177.43	113555
	Crenshaw	33.90	21697
	Lowndes	21.84	13979
		233.17	**149230**
060 Lower Pigeon Ck	Butler	57.75	36960
	Conecuh	21.80	13953
	Covington	53.16	34020
		132.71	**84932**
070 Sepulga River	Conecuh	107.57	68846
	Covington	13.75	8802
	Escambia	19.63	12562
		140.95	**90210**
	Hydrologic Unit Totals	**1048.43**	**670995**

Table 10.— Hydrologic units in the CSBRW— Continued

Hydrologic unit code and name 03140304 Lower Conecuh River

Sub-watershed	County	Sq. Miles	Acres
010 Conecuh River	Escambia	197.96	126693
		197.96	**126693**

020 Upper Murder Ck	Conecuh	209.56	134118
	Monroe	11.71	7493
		221.27	**141611**
030 Lower Murder Ck	Conecuh	87.74	56152
	Escambia	41.15	26339
		128.89	**82491**
040 Cedar Ck	Conecuh	34.73	22228
	Escambia	49.66	31784
		84.39	**54013**
050 Burnt Corn Ck	Conecuh	118.50	75838
	Escambia	62.12	39757
	Monroe	6.30	4035
		186.92	**119630**
060 Franklin Mill Ck	Escambia	14.02	8973
		14.02	**8973**
070 Jernigan Mill Ck	Escambia	25.18	16113
		25.18	**16113**
090 Little Escambia Ck	Conecuh	15.28	9781
	Escambia	124.97	79980
	Hydrologic Unit Totals	**998.89**	**639285**

Hydrologic unit code and name 03140305 Escambia Creek

Sub-watershed	County	Sq. Miles	Acres
010 Big Escambia Ck	Monroe	58.58	37494
		58.58	**37494**
020 Big Escambia Ck	Conecuh	65.17	41709
	Escambia	62.04	39707
	Monroe	13.33	8533
		140.54	**89948**
030 Sizemore Ck	Escambia	80.76	51685
		80.76	**51685**

Table 10.— Hydrologic units in the CSBRW— Continued

040 Big Escambia Ck	Escambia	52.61	33668
		52.61	**33668**
070 Pritchetts Mill Ck	Escambia	0.45	291
		0.45	**291**

090 Canoe Ck	Escambia	19.20	12289
		19.20	**12289**
130 Pine Barren Ck	Escambia	9.69	6199
		9.69	**6199**
	Hydrologic Unit Totals	**361.83**	**231574**
Total Hydrologic Unit 031403		**3830.56**	**2451552**

Hydrologic unit code and name 03140104 Blackwater River

Sub-watershed	County	Sq. Miles	Acres
010 Blackwater River	Covington	70.15	44896
	Escambia	48.93	31318
		119.08	**76213**
040 Panther Ck	Covington	0.04	29
		0.04	**29**
080 Big Juniper Ck	Escambia	2.69	1723
		2.69	**1723**
100 Sweetwater Ck	Escambia	8.92	5711
		8.92	**5711**
140 E Fork Big Coldwater Ck	Escambia	13.87	8875
		13.87	**8875**
170 W Fork Big Coldwater Ck	Escambia	0.75	481
		0.75	**481**
	Hydrologic Unit Totals	**145.35**	**93032.31**
TOTAL STUDY AREA DRAINAGE		**3,975.91**	**2,544,584**

Table 11.— Discharge data for selected U.S. Geological Survey gauging stations in the CSBRW

Station name and number	Drainage area (mi^2)	Discharge (cfs)				Record (Years)
		Avg.	Min.	Max.	Mi^2	
Conecuh River at Brandley/02371500	500	659	14	23,100	1.32	64
Patsaliga Creek at Brantley/02372250	442	610	11	34,000	1.38	27

Sepulga River near McKenzie/02373000	470	665	2.60	29,700	1.41	31
Conecuh River at Brewton/02374250	2,661	2,543	217	56,600	0.96	2.5
Upper Murder Creek near Evergreen/02374500	176	282	33	12,200	1.60	64
Burnt Corn Creek at Brewton/02374745	182	196	10	6,740	1.08	2.5
Big Escambia Creek near Sardine/02374950	193	229	45	6,730	1.18	1.25
Blackwater River near Bradley/02369800	88	146	17	16,000	1.66	34

23,100 cfs occurred on March 3, 1990 and the minimum daily discharge of 14 cfs occurred on August 31, 2000. Based on a unit discharge value of 1.32 cfs per mi² the average daily discharge from this hydrologic unit is estimated at 1,085 cfs.

PATSALIGA CREEK (03140302)

The Patsaliga Creek hydrologic unit covers about 600 mi² of the study area. Patsaliga Creek, formed by the joining of Little Patsaliga, Blue, and Olustee Creeks, joins the Conecuh River near Andalusia in Covington County. Figure 6 shows the units location and table 10 lists individual sub-basin land areas.

Patsaliga Creek discharge is available from a U.S. Geological Survey station west of Brantley (no. 02372250). The drainage area at this site is 442 mi². Based on 27 years of record the average daily discharge is approximately 610 cfs, a maximum of 34,000 cfs was recorded on March 18, 1990, and a minimum of 11 cfs was recorded on July 7, 2000. Based on a unit discharge value of 1.38 cfs per mi², the average hydrologic unit discharge is estimated at 828 cfs.

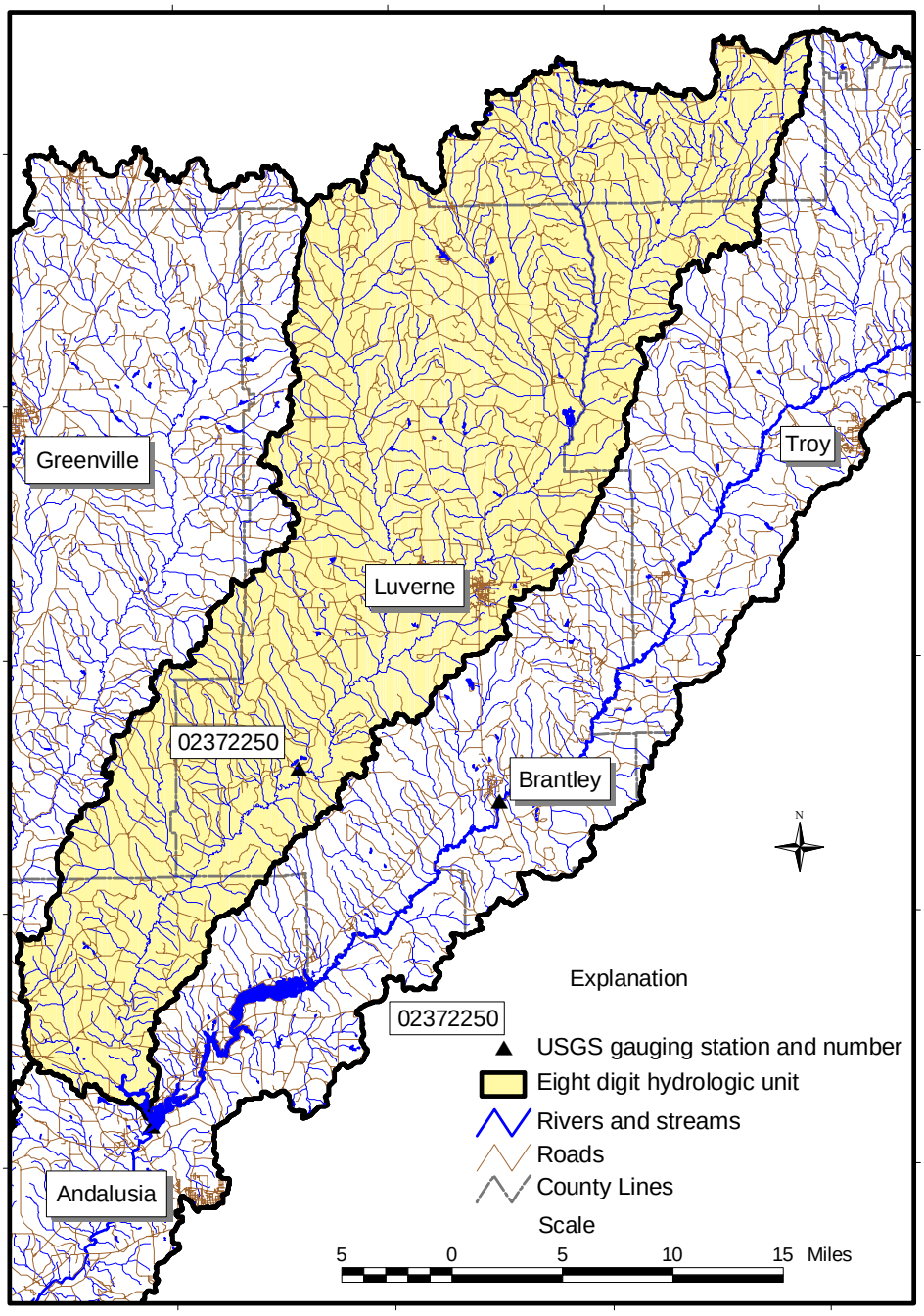

Figure 6.— Patsaliga Creek (03140302) hydrologic unit.

SEPULGA RIVER (03140303)

From its confluence with the Conecuh River in northeastern Escambia County to the headwaters of Upper Pigeon Creek near Fort Deposit in southern Lowndes County (fig. 7), the Sepulga River drainage area covers nearly 1,050 mi², the largest hydrologic unit in the study area. Significant sub-watersheds in the hydrologic unit include Upper and Lower Persimmon and Upper and Lower Pigeon Creeks. Table 10 lists sub-basins and their land areas.

Discharge for the Sepulga River is available from a U.S. Geological Survey station (no. 02373000) near McKenzie. This site drains an area of approximately 470 mi². Average daily discharge for 31 years of record is about 665 cfs. A minimum discharge of 2.60 cfs occurred on August 31, 2000 and a maximum of 29,700 cfs occurred on October 1, 1998. Average discharge per square mile is about 1.41 cfs. The average daily discharge for the entire hydrologic unit is estimated at 1,490 cfs.

LOWER CONECUH RIVER (03140304)

The Lower Conecuh River hydrologic unit covers about 1,000 mi² of the watershed study area. This unit includes the main stem of the Conecuh River from the Florida-Alabama state line northeastward to the mouth of the Sepulga River. Tributary streams, or sub-watersheds, in the unit include Upper and Lower Murder Creeks, Cedar Creek, Burnt Corn Creek, Franklin Mill Creek, Jernigan Mill Creek, and Little Escambia Creek (fig. 8 and tbl. 10).

Based on 2.5 years of record, the Conecuh River at Brewton, U.S. Geological Survey station no. 02374250, had an average daily discharge of 2,543 cfs, a maximum discharge of 56,600 cfs (March 9, 2002), and a minimum discharge of 217 cfs (July 20, 2000). The total drainage area for the Conecuh River at this station is 2,661 mi², resulting in average discharge of 0.96 cfs per mi².

Upper Murder Creek near Evergreen, U.S. Geological Survey station no. 02374500, has an average discharge of 282 cfs, a maximum of 12,200 cfs (March 16, 1938), and a minimum of 33 cfs (July 20, 2000). With a drainage area of 176 mi², the average daily discharge is about 1.60 cfs per mi². This station has a 64-year period of record.

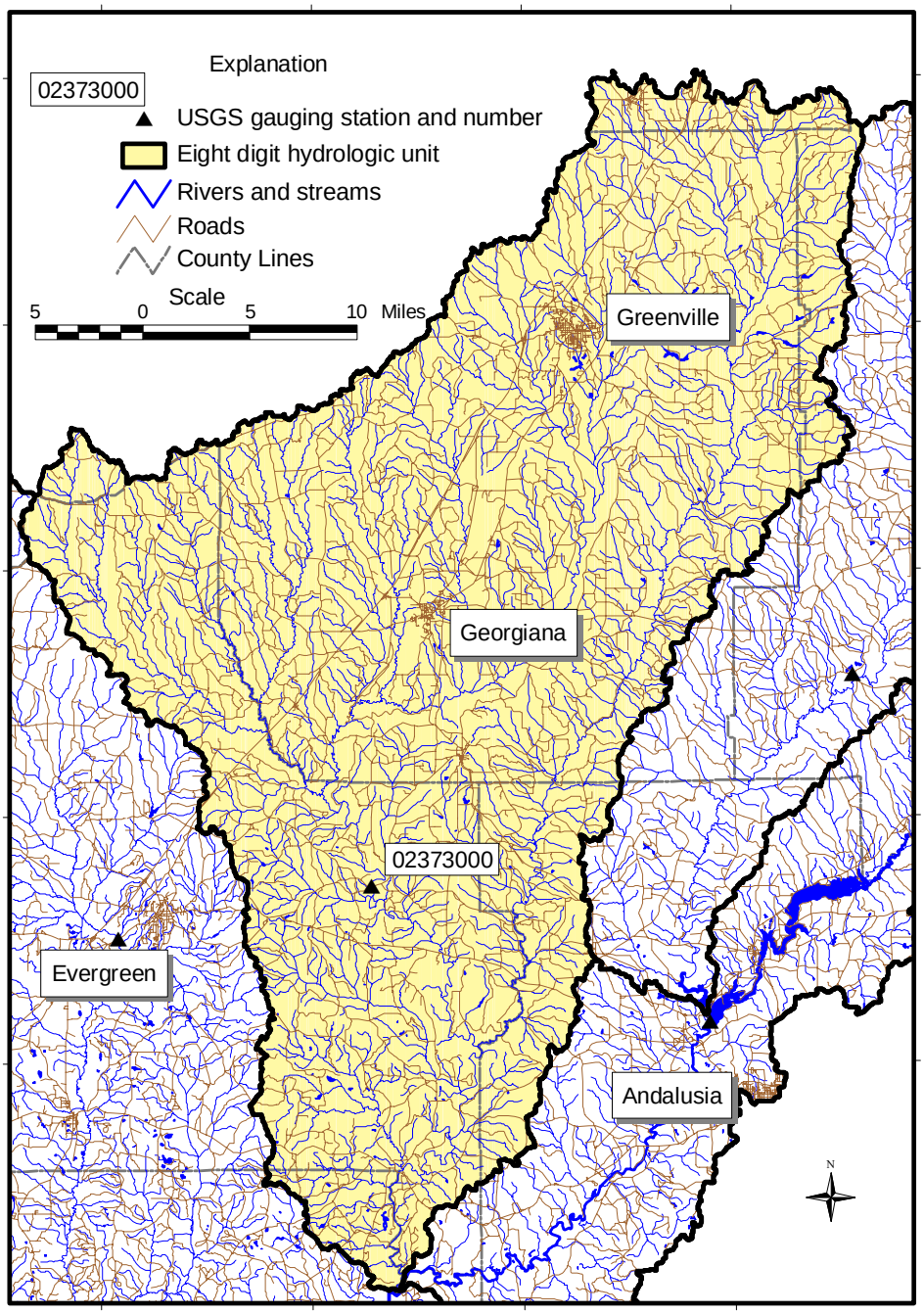

Figure 7.— Sepulga River (03140303) hydrologic unit.

Burnt Corn Creek at Brewton, U.S. Geological Survey station no. 02374745, has a drainage area of 182 mi². Daily discharge, based on 2.5 years of record, averages 196

cfs, with a maximum of 6,740 cfs (March 4, 2001), and a minimum of 10 cfs (June 12, 2000). Discharge per mi² is about 1.08 cfs.

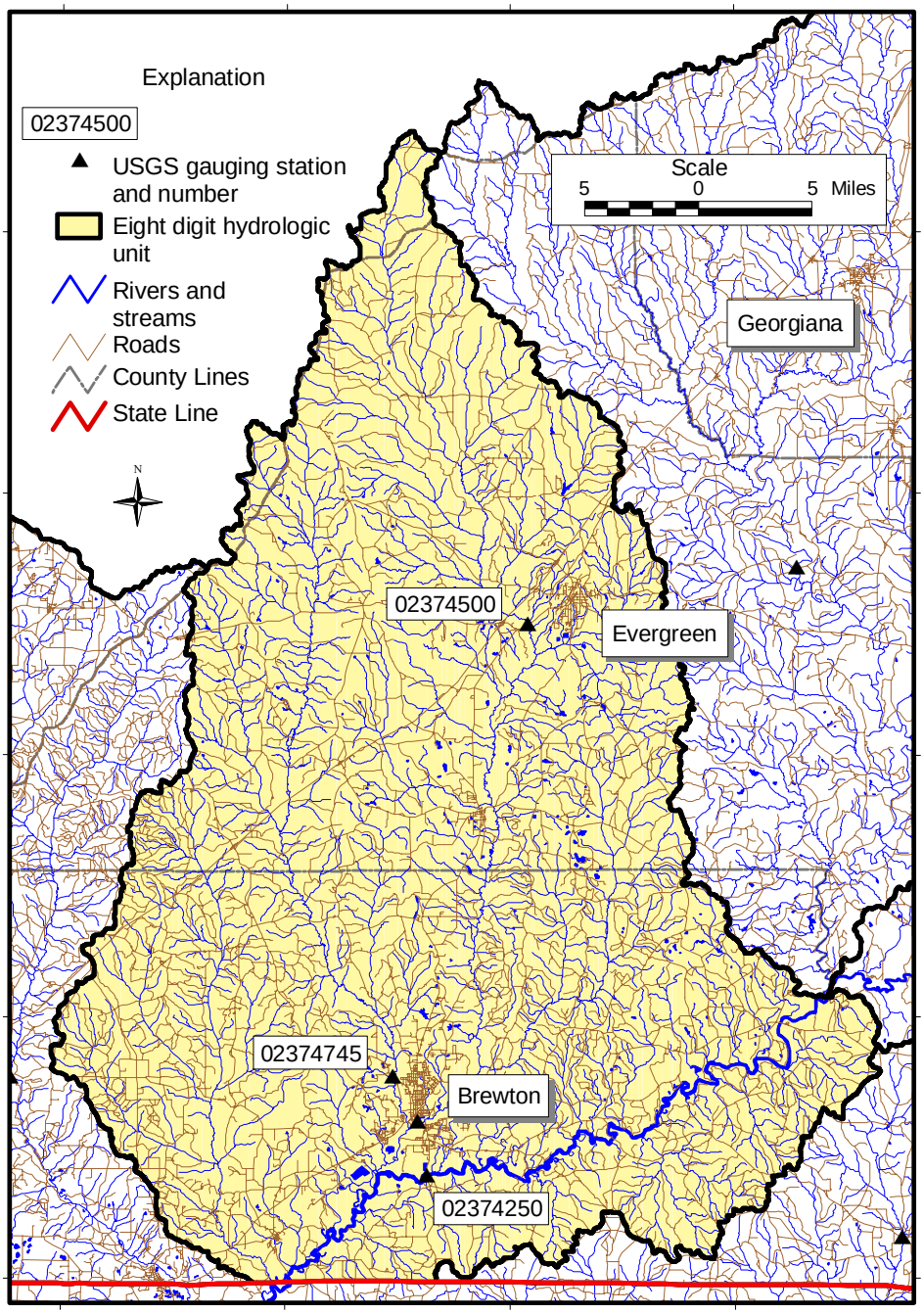

Figure 8.— Lower Conecuh (03140304) hydrologic unit.

ESCAMBIA CREEK (03140305)

Big Escambia Creek hydrologic unit contains about 362 mi² in western Escambia County, southwestern Conecuh County, and southeastern Monroe County. Sub-watersheds in the unit include Big Escambia Creek, Sizemore Creek, Pritchetts Mill Creek, Canoe Creek, and Pine Barren Creek (fig. 9 and tbl. 10).

Near Sardine in Escambia County, at U. S. Geological Survey station no. 02374950, the average daily discharge for the period of May 2000 through September 2001 was 229 cfs. The maximum discharge recorded was 6,730 cfs (March 4, 2001) and the minimum was 45 cfs (August 8, 2000). With a drainage area of 193 mi², the unit discharge is about 1.18 cfs per mi².

BLACKWATER RIVER (03140104)

The Blackwater River hydrologic unit is not technically part of the Conecuh River watershed; however, for purposes of this study it has been include. The unit covers about 145 mi² in southwestern Covington and southeastern Escambia Counties. Sub-watersheds include Panther Creek, Big Juniper Creek, Sweetwater Creek, and the East and West Fork Big Coldwater Creek (fig. 10 and tbl. 10).

Average discharge of the Blackwater River at U.S. Geological Survey station no. 02369800 near Bradley in eastern Escambia County is 146 cfs. Based on 34 years of record, a maximum flow of 16,000 cfs was reported for March 17, 1990 and a minimum flow of 17 cfs was reported for June 11, 12, and 13, 2000. The basin's drainage area at this point is about 88 mi², or about 1.66 cfs per mi².

GROUND-WATER RESOURCES

Ground water in the CSBRW occurs in porous sands, gravels, clays, and limestones 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 table 9 is a generalized stratigraphic column of geologic units that crop out in the study area.

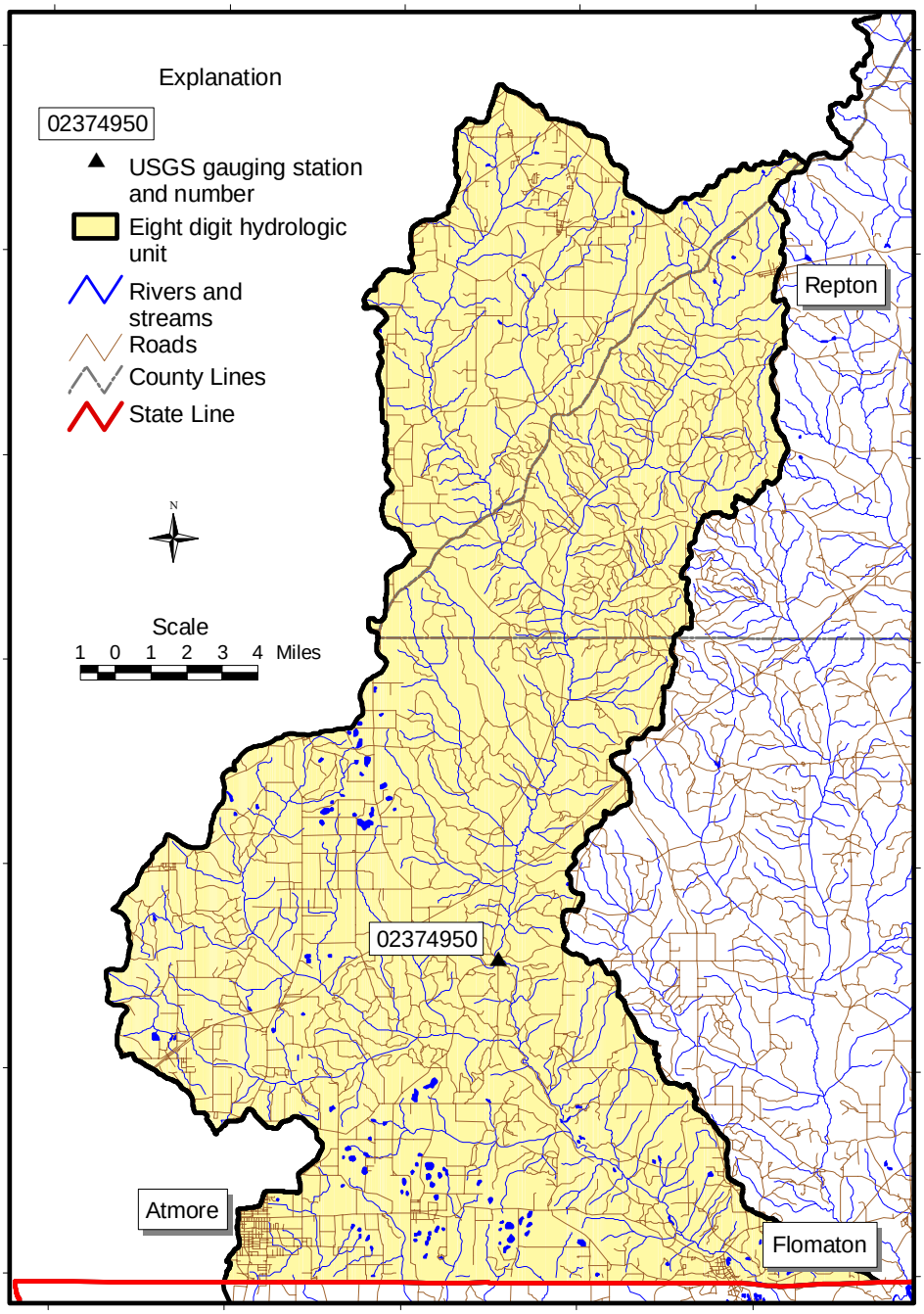

Figure 9.— Escambia Creek (03140305) hydrologic unit.

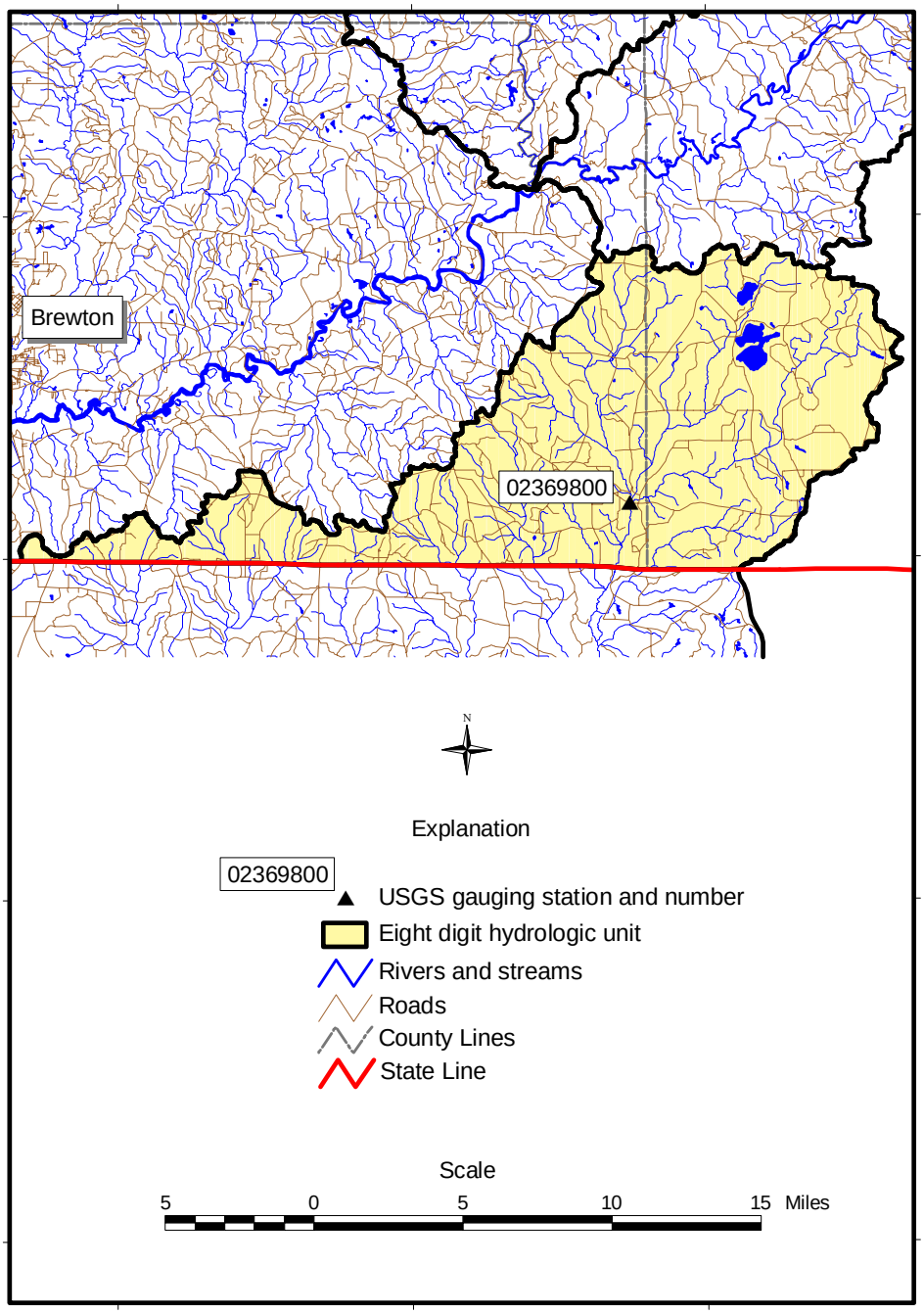

Figure 10.— Blackwater River (03140104) hydrologic unit.

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 U. S. Geological Survey identified five aquifers and five confining units in the Alabama Coastal Plain (U.S. Geological Survey, 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, and the Providence-Ripley aquifers (fig. 11). The deeply buried Cretaceous age Eutaw Formation and Tuscaloosa Group aquifers occur in the study area, however, they are little used outside the extreme northern portion of the area. They may prove to be significant aquifers, however, additional investigation is required to define their suitability as aquifers in most of the study area.

EOCENE-PLEISTOCENE undifferentiated AQUIFER

This aquifer group is composed of alluvial and terrace deposits, the Citronelle Formation, Oligocene-Miocene Series undifferentiated, and Crystal River Formation sediments. These sediments are primarily sands, clays, gravels, unconsolidated silts, and some soft limestones 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 (fig 11).

LISBON AQUIFER

This aquifer, as defined by the U.S. Geological Survey (1993) includes the lower Moodys Branch Formation, the Gosport Sand, 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 and Conecuh Counties and southern Butler and Crenshaw Counties (fig. 11). Individual wells generally yield 200 to 500 gpm.

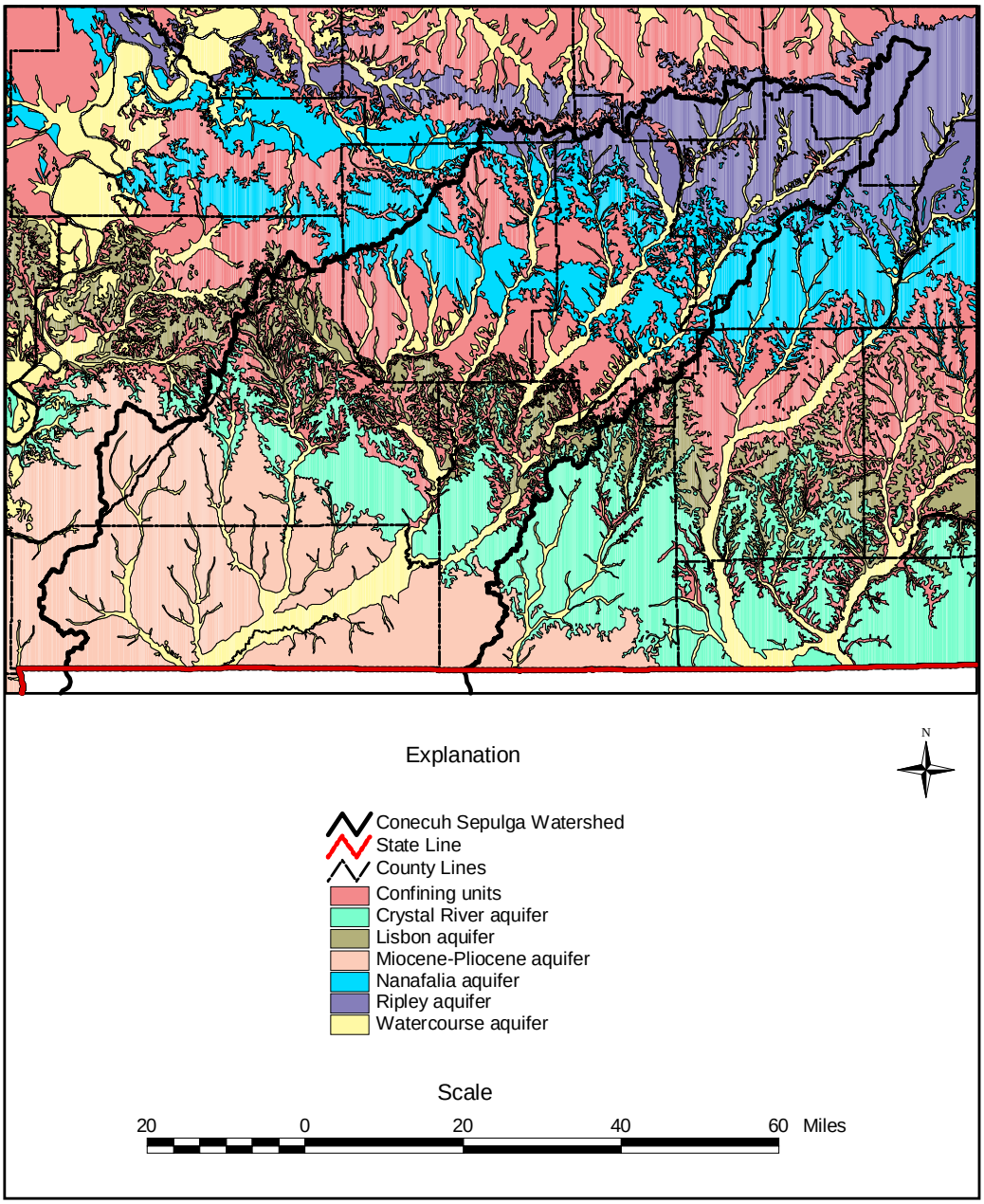

Figure 11.— Generalized aquifer map of the CSBRW.

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 (U.S. Geological Survey, 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 County, most of Crenshaw County, and northern Butler County (fig. 11). 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 and Crenshaw Counties, this aquifer includes the Providence Sand and the Ripley Formation (fig. 11). These formations are composed of sand, sandstone, and clay beds. Potential yields to large wells range from about 200 to 1,400 gpm (U.S. Geological Survey, 1993).

RECHARGE

Based on stream hydrograph separation techniques (Fetter, 1988) applied to gauging stations on the Sepulga and Conecuh Rivers and Patsaliga Creek as well as consideration of the various elements of the overall water budget for the watershed, ground-water recharge is estimated at 10 percent of average annual precipitation or about 5 to 6 inches. Additional modeling and stream discharge data for specific geologic units is needed to refine this value.

WATER USE

Use of water in the watershed includes both surface and ground water. Significant use categories include public supply, self-supplied domestic, self-supplied industrial/commercial, agriculture (irrigation and livestock), and hydroelectric power generation. The Office of Water Resources, Alabama Department of Economic and

Community Affairs, is charged with the collection of water use and related data for Alabama. However, only fragmented data is available for 2000. As a result of this deficiency, 1995 data available from the U.S. Geological Survey (USGS, 1998) is reported here and used in water budget estimates. Where available more recent data are given for comparison and figure 12 shows water-use trends (excluding instream hydroelectric generation) from 1980 through 1995. Each water use category is discussed below and table 12 provides use values by category and hydrologic cataloging unit.

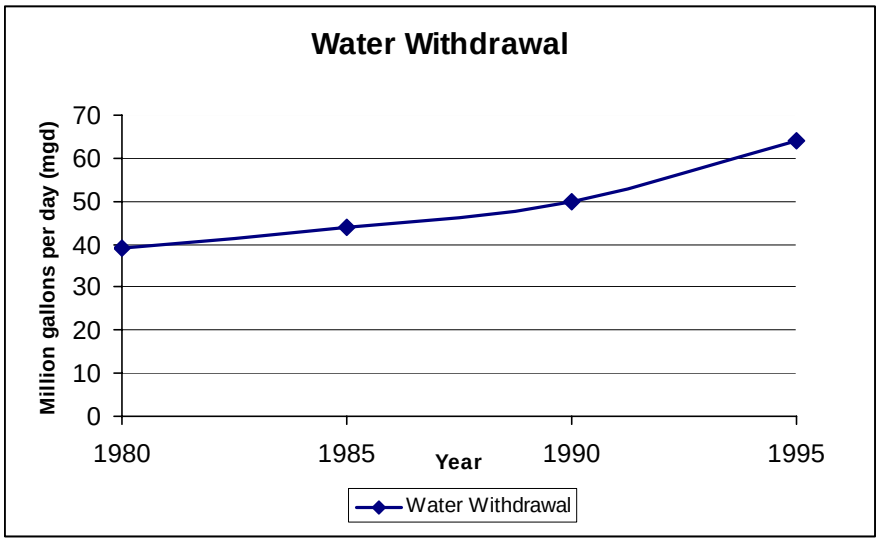

Figure 12.— Historic water use in the CSBRW area of the Choctawhatchee River basin.

PUBLIC SUPPLY

Public-supply water use includes all water delivered to customers via municipal or county water systems and water authorities. Ground water is the sole source of supply for all public water in the watershed. During 1995 it was estimated that 13.36 mgd, serving approximately 88,000 people, was withdrawn from aquifers in the watershed for public-supply use (tbl. 12). Water requirements for this category continually increase due to population and industrial/commercial growth and the addition of former self-supplied users.

SELF-SUPPLIED DOMESTIC

Self-supplied domestic use includes water drawn from private wells or springs for the sole use of individual households. Estimated water use for this category during 1995

was 2.03 mgd. Water use in the category can be expected to decline as public-water systems expand.

Table 12.— Water use (1995) in the CSBRW (All values are in million gallons per day) (USGS, 1998)

Hydro. Unit	Water use categories										
	Public		SS Dom.		SS Ind./Com.		Agr.[1]		Hydro.[2]	Totals	
	GW	SW	GW	SW	GW	SW	GW	SW	SW	GW	SW
03140104	0	0	0.05	0	0	0	0	0.01	0	**0.05**	**0.01**
03140301	4.50	0	0.03	0	0	0	2.35	2.73	954.73	**6.88**	**957.46**
03140302	1.02	0	0.22	0	0	0	0.33	0.42	0	**1.57**	**0.42**
03140303	2.36	0	0.49	0	0.21	0	0.21	0.31	0	**3.27**	**0.31**
03140304	3.37	0	0.69	0	0.79	35.52	0.13	1.18	0	**4.98**	**36.70**
03140305	2.11	0	0.55	0	0.51	0	2.65	1.20	0	**5.82**	**1.20**
Totals	**13.36**	**0**	**2.03**	**0**	**1.51**	**35.52**	**5.67**	**5.85**	**954.73**	**22.57**	**996.10**

[1] Irrigation and livestock combined, [2] Instream use only

SELF-SUPPLIED INDUSTRIAL/COMMERCIAL

Self-supplied industrial/commercial water use in the watershed includes both ground and surface water. An estimated total of 37.03 mgd were required for this category during 1995. The vast majority (98%) was surface water use by one industry (tbl. 12). Water requirements for this category are expected to increase, at least in some areas of the watershed.

AGRICULTURE

Agricultural water use includes both water for irrigation and livestock. During 1995 an estimated 2.11 mgd (60 % surface water and 40 % ground water) was withdrawn for use by livestock in the watershed. Irrigation water use totaled 9.22 mgd, 52 % from groundwater and 48 % from surface water sources. Water use for irrigation has been on an upward trend in the recent past and will probably continue.

HYDROELECTRIC POWER GENERATION

Within the watershed the Conecuh River provides water for hydroelectric power generation at Gantt and Point A dams in Covington County. During 1995, 954.73 mgd was used to generate 24.85 million kilowatt hours of electricity. There is no consumption of water associated with this category and water is available for other uses downstream.

LAND USE

Land use in the CSBRW is heavily weighted toward agricultural and silvicultural uses (pl. 2). Urban and residential uses are mostly confined to the small towns and county seats. Land use in each hydrologic subregion is discussed below. As can be seen on plate 2 and figure 13 three areas of intense agricultural land use stand out; Area A stretching from the Conecuh River in Pike County westward to Greenville in Butler County, Area B from near Andalusia in Covington County to McKenzie in Butler County, and Area C in southwestern Conecuh County and western Escambia 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. The 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, B, and C, distinguishes them from the rest of the CSBRW. The boundaries of areas A, B, and C on the NLCD land use map were derived by assessing the geology, soils, physiography, topography, and land use patterns.

The land use in area A is predominately deciduous, evergreen, and mixed forest (55%), followed by agricultural row crops, pastureland, and hay (28%), emergent and woody wetland (12%), urban and commercial (1%), lakes and water bodies (>1%), and other uses (4%). Area B is predominately deciduous, evergreen, and mixed forest land use (68%), followed by agricultural row crops, pastureland, and hay (22%), emergent and

woody wetland (4%), urban and commercial (>1%), lakes and water bodies (2%), and other uses (3%). Area C is predominately agricultural row crops, pastureland, and hay (57%), followed by deciduous, evergreen, and mixed forest land use (35%), emergent and woody wetland (2%), urban and commercial (2%), lakes and water bodies (>0.3%), and other uses (4%). The area outside of A, B, and C have land use values that are considerably different due to the change in proportion of agricultural processes. Percentage values for this area is dominated by deciduous, evergreen, and mixed forest land use (80%), followed by the agricultural row crops, pastureland, and hay which is only (10%), emergent and woody wetland (5%), urban and commercial (>1%), lakes and water bodies (>1%), and other uses (4%).

Clayton, Porters Creek, and Nanafalia Formations, 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. The geology of Area C is composed mostly of the Citronelle Formation, which contains sand, clay, and chert. 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.

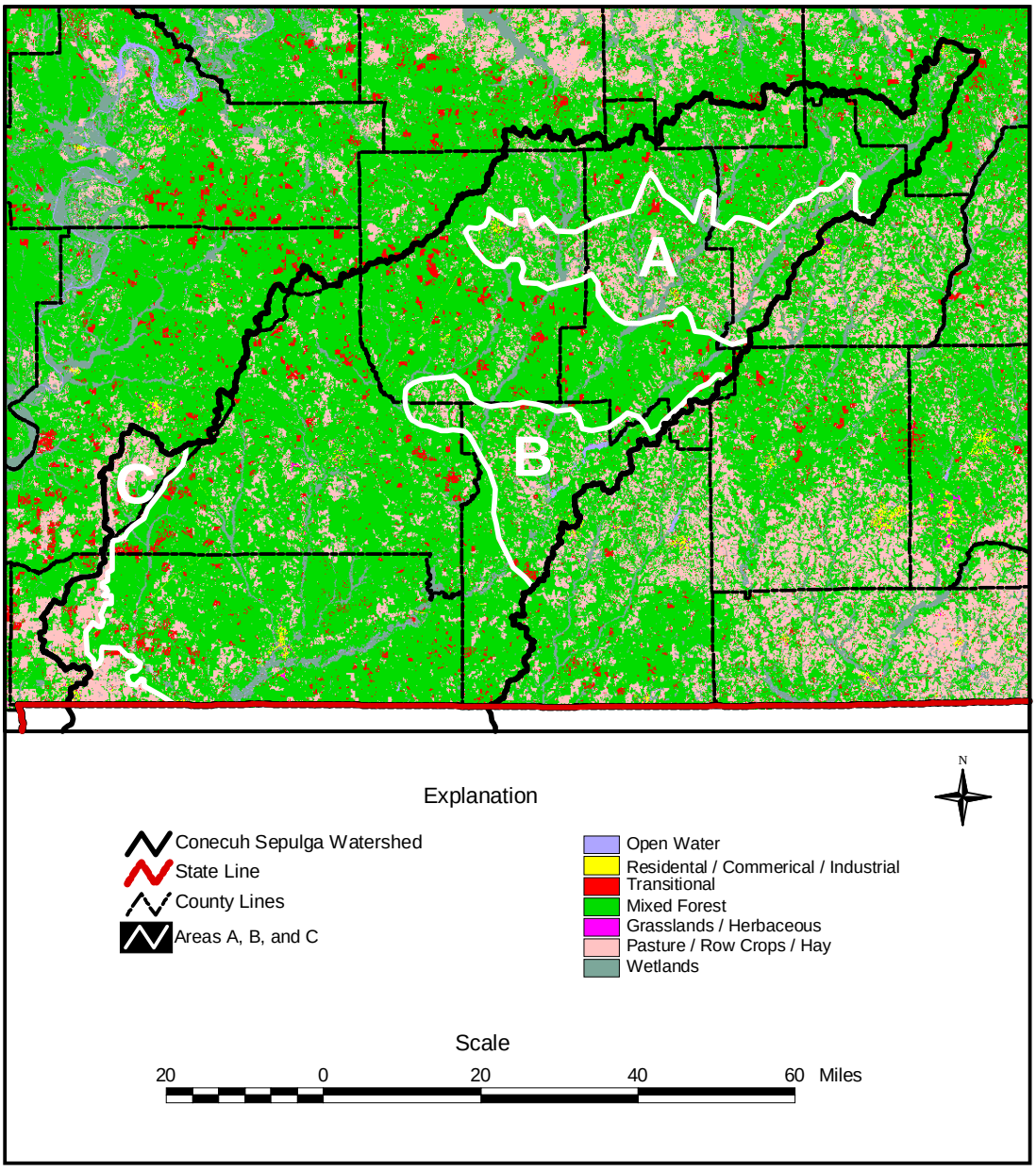

Figure 13.— Land use in the CSBRW.

The physiography of the region is closely tied to the geology and soils. Area A is in the Southern Red Hills district of the East Gulf Coastal Plain section and is southward-sloping upland of moderate relief, dissected irregular plains, and low hills and broad tops.

The streams have wide floodplains with sandy bottoms. Area B is in two physiographic districts: the Dougherty Plain and Southern Red Hills. The northern portion of area B is in the previously described Southern Red Hills district. The southern portion of area B is in the Dougherty Plain district. The Dougherty Plain is characterized by irregular plains, some flat plains, lightly dissected; mostly low to moderate gradient with sand and clay-bottomed streams. Area C is underlain by sediments of the Citronelle Formation and is in the Southern Pine Hills physiographic district. The Southern Pine Hills is characterized by moderate relief, dissected irregular plains, and low hills with broad tops. The physiography and topography of all three 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, B, and C 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 CSBRW are characterized by excessive sedimentation and organic enrichment, low dissolved oxygen concentrations, and in some locations, excessive pathogens. Two of three 2000 303(d) listed stream segments in the watershed are found in areas A, B, and C demonstrating a relationship between land use and diminished water quality.

BLACKWATER RIVER 03140104

The Blackwater River hydrologic subregion (pl. 2) encompasses about 93,032 acres (tbl. 10) in the southeastern watershed area. Deciduous, evergreen, and mixed forest is the dominant land use (80 %), followed by agricultural row crops (10 %), pastureland (7 %), and the remaining 3 % is urban, lakes and water bodies, or other uses (SWCC, 1998-99).

UPPER CONECUH RIVER 03010301

The Upper Conecuh River hydrologic subregion (pl. 2) encompasses about 525,932 acres (tbl. 10) in the eastern watershed area. Deciduous, evergreen, and mixed

forest is the dominant land use (76 %), followed by agricultural row crops (11 %), pastureland (8 %), urban 2 %, lakes and water bodies (1 %), and other uses (2 %) (SWCC, 1998-99).

PATSALIGA CREEK 03010302

The Patsaliga Creek hydrologic subregion (pl. 2) encompasses about 383,776 acres (tbl. 10) west of the Conecuh River subregion from near Andalusia northeastward to the northern limit of the watershed area. The central portion of this subregion is included in the previously described concentrated agricultural area A and the southern watershed area is included in concentrated agricultural area B. Deciduous, evergreen, and mixed forest is the dominant land use (77 %), followed by agricultural row crops (7 %), pastureland (1 %), urban 1 %, lakes and water bodies (1 %), and other uses (4 %) (SWCC, 1998-99).

SEPULGA RIVER 03010303

The Sepulga River hydrologic subregion (pl. 2) encompasses about 670,995 acres (tbl. 10) in a wedge shape from the mouth of the Sepulga River northward to the watershed boundary. Portions of this subregion are included in the previously described concentrated agricultural area B. Deciduous, evergreen, and mixed forest is the dominant land use (80 %), followed by pastureland (9 %), agricultural row crops (7 %), urban (2 %), and other (2 %) (SWCC, 1998-99).

LOWER CONECUH RIVER 03010304

The Lower Conecuh River hydrologic subregion (pl. 2) encompasses about 639,285 acres (tbl. 10) in a band from the southeastern watersheds boundary with Florida, northwestward to the watersheds western border. Deciduous, evergreen, and mixed forest is the dominant land use (86 %), followed by agricultural row crops (5 %), urban (5 %), pastureland (3 %), and other (1 %) (SWCC, 1998-99).

ESCAMBIA CREEK 03010305

The Escambia Creek hydrologic subregion (pl. 2) encompasses about 231,574 acres (tbl. 10) in a band from the southeastern watersheds boundary with Florida, northwestward to the watersheds western border. Deciduous, evergreen, and mixed forest

is the dominant land use (59 %), followed by agricultural row crops (26 %), urban (6 %), pastureland (4 %), mined land (1 %), and land and water and other uses (4 %) (SWCC, 1998-99).

NATURAL RESOURCES

Natural resources in the CSBRW study area include abundant timber and wood product lands, quarry sand and gravel, fertile soils for agriculture, and water supplies for all major uses, including hydroelectric power generation. Ample outdoor recreational opportunities are available from the rivers and lakes and wild game is abundant throughout the watershed.

Gantt Dam is located on the Conecuh River in Covington County, approximately six miles north of the City of Andalusia. The Gantt Dam impounds a reservoir with a surface area of about 2,700 acres. Gantt Hydroelectric Facility has a powerhouse which contains two turbines with a combined capacity of 3,050 kilowatts. The watershed area of the Conecuh River above Gantt Dam is estimated to be 657 square miles in size. Point A Dam is located downstream of the Gantt Dam, just below the confluence of the Conecuh and Patsaliga Rivers, and approximately four miles northwest of the City of Andalusia. Point A dam powerhouse contains three turbines with a combined capacity of 5,200 kilowatts. Point A Dam impounds a reservoir with a surface area of about 700 acres. The watershed of the Conecuh River at Point A Dam is estimated to be 1,259 square miles in size. Both dams and hydroelectric facilities are owned and operated by Alabama Electric Cooperative (AEC). However, the majority of all shoreline property is privately owned. A public park is located on Point A reservoir which provides boat ramps, camping and picnic facilities. AEC is currently in the process of relicensing with the Federal Energy Regulatory Commission for both sites. Both lakes provide an abundance of water-related activities to both local citizens and tourists. Homes along the shorelines include both permanent residences and vacation homes (Scoping Document, AEC relicensing, December, 2001).

The Conecuh National Forest is located in southwest Covington and western Escambia County. Encompasses over 80,000 acres the forest provides areas for camping, picnic, horseback riding, hiking, bicycling, hunting, fishing, and swimming

IMPERILED SPECIES

Following is a summary of species of concern in the CSBRW. Information contained in this section was derived from accounts from a recently published workshop detailing the current status and conservation needs of vertebrate and selected invertebrate species in Alabama. Conservation status indicated for each species was determined by panels of experts on each group based on most recent available scientific evidence. These accounts include Priority 1 and Priority 2 species from that workshop. 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. The information from these accounts is summarized in table 13.

FRESHWATER MUSSELS

ALABAMA PEARLSHELL *Margaritifera marrianae*

This species is endemic to a four county area in southcentral Alabama. Most of the area lies in the headwaters of the Escambia River drainage in Butler, Conecuh, and Crenshaw Counties, but a disjunct population is in Limestone Creek, a nearby tributary of the lower Alabama River in Monroe County. It inhabits shallow riffles and pool margins in substrata consisting of silty sand, sand, gravel or a mixture of sand and gravel in headwater creeks. Little is known of the life history and ecology of this species, although it is observed occupying streams in pairs, with males upstream of females. Its restricted distribution, rarity, and declining population trend make it highly susceptible to extinction. It is classified by some workers as endangered or imperiled, and currently is considered a candidate for federal protection. It is considered a species of highest conservation concern in Alabama (McGregor, 2004a).

NARROW PIGTOE *Fusconaia escambia*

This species is endemic to Gulf of Mexico drainages, where it is known from the Escambia and Yellow River systems in Alabama and Florida and is apparently extirpated from the Yellow River system. It inhabits small to medium rivers with sand, gravel, or sandy gravel substrata and slow to moderate flow. It is vulnerable to extinction because of limited historical distribution, rarity, and susceptibility to habitat degradation. It is considered threatened throughout its distribution and is of special concern or imperiled in Alabama. It is currently considered a candidate for federal protection. It is considered to be of highest conservation concern in Alabama (McGregor, 2004b).

Table 13.— Conservation status of species of concern in the CSBRW

Species	Status	Distribution	Major Habitat	Threats
Mollusks				
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
Round Ebonyshell	P1; C	Escambia River, AL and FL	Main channel Conecuh/Escambia River	Restricted distribution, rarity, habitat degradation
Southern Sandshell	P1; C	Choctawhatchee, Escambia and Yellow Rivers, AL and FL	Clear creeks and rivers with sandy substrates	Restricted distribution, rarity, habitat degradation
Alabama Moccasinshell	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	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	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	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
Fishes				
Ironcolor Shiner	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	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

Table 13.— Conservation status of species of concern in the CSBRW

Species	Status	Distribution	Major Habitat	Threats
Alabama Shad	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	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
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	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	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	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	P1	Coastal Plain from NC to TX	Mucky areas of swamps, bogs, and moist floodplains	Unknown
Red Hills Salamander	P1; T	South-central AL	Steep slopes in hardwood forests	Loss or degradation of specific habitat, limited distribution, low fecundity
Reptiles				
Mimic Glass Lizard	P2	Coastal Plain from NC to MS	Flatwoods with pine/wire-grass, savannas and seepage bogs with groundcover	Habitat loss/degradation
Coal Skink	P2	Eastern U.S.	Hilly pine-hardwood forests near water	Decreasing population densities, spotty distribution
Southeastern Five-lined Skink	P2	Coastal Plain and nearby from MD to LA	Open, dry forest	Unknown; possibly declining numbers
Eastern Indigo Snake	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	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	P1	Coastal Plain and Ridge and Valley from NC to MS	Upland sandy woods, fields	Unknown; possible declining populations

Eastern Kingsnake	P2	Coastal Plain and Piedmont from NJ to AL	Terrestrial habitats with open canopies	Loss/degradation of habitat
Florida Pine Snake	P2	Coastal Plain and Piedmont from SC to AL	Longleaf pine and scrub oak forests, clearings, and other woods with open canopies	Rarity, loss/degradation and isolation of habitat, gassed by poachers in gopher tortoise burrows; fire suppression
North Florida Swamp Snake	P2	Southern Coastal Plain in AL, FL, and GA	Swamps, canals, ditches, ponds, lakes	Peripheral occurrence and rarity; loss/degradation of habitat
Eastern Coral Snake	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	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	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	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
Birds				
Red-cockaded Woodpecker	P1; E	Southeastern U.S.	Mature, open pine forests with frequent burning	Fragmented populations, low numbers, fire suppression
Henslow's Sparrow	P1	Eastern U.S.	Tall grasslands with standing dead vegetation, salt marshes, meadows	Loss of breeding and wintering habitat, fire suppression
American Kestrel	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
American Woodcock	P2	Eastern North America	Boreal forests	Habitat loss/degradation
Northern Harrier	P2	Central, North and South America, Eurasia	Open wetlands, fields, marshes	Habitat loss/degradation, pesticides, low numbers
American Black Duck	P2	Eastern North America	Marshes, meadows, river floodplains	Overharvest, hybridization
Swallow-tailed Kite	P2	Coastal Plain from SC to TX	Floodplain forests of large rivers	Disjunct populations, low numbers, shooting, low fecundity
Wood Stork	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	P2	North America	Prairies, meadows, tundra, steppes, marshes, savannas, fields	Low numbers, expected loss of non-breeding habitat, loss of prey base
Wood Thrush	P2	Central and North America	Deciduous or mixed forests with dense canopy and understory	Habitat degradation and fragmentation

Worm-eating Warbler	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	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	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	P2	Southeastern U.S.	Open pine forests with dense groundcover	Habitat fragmentation, fire suppression
Mammals				
Black Bear	P1	North America	Rugged isolated areas with low human density	Habitat loss to human encroachment
Gray Myotis	P1; E	Southeastern U.S.	Near water in caves, barns, roofs, storm drains	Vandalism, habitat loss, pesticide pollution
Little Brown Myotis	P2	North America except lower Great Plains	Tree cavities, rocks, woodpiles, crevices, caves and manmade structures	Rarity despite broad distribution
Southeastern Myotis	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
Northern Yellow Bat	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	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	P1	Southeastern U.S.	Caves, trees, buildings, mines, wells near forests	Poorly known life history and ecology and low numbers
Marsh Rabbit	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	P2	Southeastern U.S.	Dry, sandy ridges and hammocks	Low fecundity, loss of habitat, fragmentation of populations
Long-tailed Weasel	P2	Southern Canada to Bolivia	Dense understories, edges and riparian zones	Habitat loss/degradation, recent steep declines in numbers
Eastern Spotted Skunk	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).

ROUND EBONYSHELL *Fusconaia rotulata*

This species is endemic to the Escambia River drainage in Alabama and Florida and in Alabama it appears to be confined to the main channel Conecuh River, where it

occurs as far upstream as the Conecuh/Covington County line. It is known only from main stream channels in areas with moderate current and with sand or a mixture of sand and gravel substrate. Its limited historical distribution and rarity make *F. rotulata* susceptible to extinction from habitat degradation within the Escambia River watershed. It is classified as endangered throughout its distribution and imperiled in Alabama. It is currently a candidate for federal protection. It is considered to be of highest conservation concern in Alabama (McGregor, 2004c).

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, 2004).

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 is now 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, 2004).

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 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).

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 within the Choctawhatchee River system and currently it is considered a candidate for federal protection. This species is of high conservation concern in Alabama (McGregor, 2004e).

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, 2004f).

FISHES

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).

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 river systems 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 blocked by dams. 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 incidental or 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).

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, whereas dredging activities have eliminated 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).

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 black 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

GOPHER FROG *Rana capito*

The Gopher Frog is principally a frog of Coastal Plain longleaf pine forests from Louisiana to North Carolina, with possible disjunct populations in the Ridge and Valley province above the Fall Line in Shelby County, Alabama, and in the Interior Low Plateau of Coffee County, Tennessee. Subspecific allocation of Alabama populations is problematic, and were formerly considered *R. c. sevosa*, the Dusky Gopher Frog. This

highly terrestrial species breeds from late January to March in open temporary ponds. Alabama's five extant breeding sites are in Escambia and Covington counties. The only Ridge and Valley breeding pond (Shelby County) was drained for a subdivision in 1997, and a Barbour County breeding pond was destroyed by road construction. It is considered to be of highest conservation concern in Alabama and is a federally listed endangered species (Bailey and Means, 2004a).

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).

RED HILLS SALAMANDER *Phaeognathus hubrichti*

The Red Hills Salamander is the only terrestrial vertebrate endemic to Alabama, and is recognized as the official state amphibian of Alabama. It is restricted to the Red Hills of south Alabama and can be found on steep slopes (usually north-facing) of ravines and bluffs in old growth hardwood forests with siltstone or claystone near the surface where the salamander burrows. Its limited distribution in a small geographic area together with detrimental forestry practices, specialized habitat requirements, low fecundity, and low vagility make the species existence very tenuous. It is a federally listed threatened species and is of high conservation concern in Alabama (Bailey and 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

MIMIC GLASS LIZARD *Ophisaurus mimicus*

The Mimic Glass Lizard occurs on the Coastal Plain from southeastern North Carolina to the Pearl River in Mississippi, exclusive of peninsular Florida. It is

uncommon to rare, secretive, and possibly threatened range-wide. It is a relatively recently described (1987) legless lizard of southeastern coastal flatwoods, strongly associated with longleaf pine-wiregrass as well as pine flatwoods, savannas, and hillside seepage bogs, generally with grassy groundcover. There are three documented occurrences from the southern portion of Alabama's Dougherty Plain and Southern Pine Plains and Hills. Its preferred habitat of pine flatwoods is now much reduced in extent. It is considered to be of high conservation concern in Alabama (Jensen, 2004a).

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. It is a federally listed endangered species and is of highest conservation concern in Alabama (Godwin, 2004).

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, 2004b).

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).

FLORIDA PINE SNAKE *Pituophis melanoleucus mugitus*

The Florida Pine Snake ranges from extreme southern South Carolina to the south and west across southern Georgia and southeastern Alabama and into Florida. In Alabama it is known from Russell, Covington, and Crenshaw Counties. The Florida Pine Snake interbreeds with the Black Pine Snake in Mobile and Baldwin Counties, and a Fall Line Hills population in Elmore County appears to be intergrade with the Northern Pine Snake. It is a large snake of open, periodically burned pine forest with abundant groundcover and is frequently associated with burrows of the Gopher Tortoise and the Southeastern Pocket Gopher. It is considered to be of high conservation concern in Alabama (Means, 2004f).

NORTH FLORIDA SWAMP SNAKE *Seminatrix pygaea pygaea*

The North Florida Swamp Snake is peripheral and rare in the extreme southern Coastal Plain of Alabama, and occurs in extreme south Georgia and northern Florida. It is known only from three Covington County localities and one locality west of the Conecuh River in Escambia County, the northwestern limit of the known range. It is a small, secretive snake of swamps, canals, ditches, cypress ponds, lakes, swamps, and weedy ponds. It is considered to be of high conservation concern in Alabama (Hughes and Bailey, 2004).

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 Southern Hilly 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).

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 20th 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).

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, and 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).

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 14 provides a listing of streams and rivers classified in the CSBRW. Uses in the watershed include swimming and fish and wildlife.

Table 14. —Water use stream classifications in the CSBRW

Hydrologic Unit name and no.	Stream Name	From	To	Classification*
Blackwater River 03140104	Blackwater River	Alabama-Florida state line	Its source	F&W
	Big Juniper Creek	Alabama-Florida state line	Its source	F&W
	Sweetwater Creek	Alabama-Florida state line	Its source	F&W
	Rock Creek	Alabama-Florida state line	Its source	F&W
	Boggy Hollow Creek	Alabama-Florida state line	Its source	F&W
	Dixon Creek	Alabama-Florida state line	Its source	F&W

Table 14. —Water use stream classifications in the CSBRW

Hydrologic Unit name and no.	Stream Name	From	To	Classification*
Upper Conecuh River 03140301	Conecuh River	Upper Conecuh River HUC boundary	Point A Dam	F&W
	Conecuh River	Point A Dam	Head of Gantt Lake	S/F&W
	Conecuh River	Head of Gantt Lake	Its source	F&W
	Prestwood Creek	Conecuh River	Its source	F&W
	Unnamed Tributary west of Andalusia	Conecuh River	Its source	F&W
	Double Branch	Conecuh River	Its source	F&W
Lower Conecuh River 03140304	Conecuh River	Alabama-Florida state line	Upper Conecuh River HUC boundary	F&W
	Little Escambia Creek	Alabama-Florida state line	Its source	F&W
	Murder Creek	Conecuh River	Its source	F&W
	Sandy Creek	Murder Creek	Its source	F&W
	Burnt Corn Creek	Murder Creek	Its source	S/F&W
Sepulga River 03140303	Sepulga River	Conecuh River	Its source	F&W
	Pigeon Creek	Sepulga River	Its source	F&W
	Unnamed Tributary	Pigeon Creek	Its source	F&W
	Persimmon Creek	Sepulga River	Its source	F&W
	Rocky Creek	Persimmon Creek	Its source	F&W
Patsaliga Creek 03140302	Patsaliga Creek	Conecuh River	Its source	F&W
	Little Patsaliga Creek	Patsaliga Creek	Its source	S/F&W
Escambia Creek 03140305	Big Escambia Creek	Alabama-Florida state line	Its source	F&W
	Pine Barren Creek	Alabama-Florida state line	Its source	F&W
	Canoe Creek	Alabama-Florida state line	Its source	F&W
	Reedy Creek	Alabama-Florida state line	Its source	F&W
	Beaver Dam Creek	Alabama-Florida state line	Its source	F&W
	Sizemore Creek	Big Escambia Creek	Its source	S/F&W
	Wet Weather Creek	Sizemore Creek	Its source	F&W

* S- Swimming, 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 15 lists the 303(d) impaired streams in the Conecuh River watershed and their TMDL status.

Table 15.— Streams in the CSBRW included on the Section 303(d) list of impaired waters

Hyd. Unit name and no.	**Impaired Stream**	**Impairments**	**Proposed source**	**TMDL status**
Upper Conecuh River (03140301)	Conecuh River	Siltation OE/DO	Nonirrigated crop prod. Pasture grazing	Draft TMDL 2003
Upper Conecuh River (03140301)	Conecuh River	Siltation	Flow regulation/ modification	Draft TMDL 2003
Patsaliga Creek (03140302)	(None)			
Sepulga River (03140303)	Rocky Creek	Unknown Toxicity	Unknown	Draft TMDL 2005
Lower Conecuh River (03140304)	(None)			
Escambia Creek (03140305)	(None)			
Blackwater River (03140104)	(None)			

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 Conecuh River 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. Concentrations of these pollutants in water bodies must be known before regulatory and remedial actions may be applied to improve water quality and to protect these vital resources for the future.

Relatively little technical data have been collected in the CSBRW 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 Geological Survey of Alabama (GSA), Alabama Department of Environmental Management (ADEM), U.S. Geological Survey (USGS), County Soil and Water Conservation Districts, and Troy State University, and Smurfit-Stone Container Corporation. Table 14 lists the 303(d) impaired streams in the watershed and their TMDL status.

Major threats to water quality in the watershed are primarily controlled by land use practices and are composed of excessive nutrients (ammonia, nitrate, and phosphorus), high bacteria counts, excessive sedimentation, and excessive concentrations of toxic metals and organic compounds

EXCESSIVE 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 CSBRW 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 ground-water 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

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 CSBRW. There are four primary sources of water quality data. All of the data are synoptic but give some measure of water quality conditions at the time the data were collected. An assessment of the data indicates that impaired water quality is caused by elevated concentrations of nitrate and phosphorus, excessive bacteria counts and sedimentation, and low dissolved oxygen. Detectable concentrations of toxic metals including arsenic, chromium, zinc, lead, and mercury were also found.

VIOLATION OF ADEM GROUNDWATER QUALITY

Ground-water quality data is available from ADEM for each public-water supply system in the CSBRW. 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 16 coliform bacteria was the only water quality parameter violated by any water system.

Table 16.— Public-water supply systems in the CSBRW and their water quality violations since 2000

System	County	Source	Population served	Water quality violations (since 2000)
South Bullock County Water Authority	Bullock	Groundwater	8,430	None
Union Springs Utility Board	Bullock	Groundwater	4,338	None
Butler County Water Authority	Butler	Groundwater	12,837	None
Georgiana Water Works and Sewer Board	Butler	Groundwater	2,601	None
Greenville Water Works	Butler	Groundwater	9,150	Coliform Bacteria August 2003
McKenzie Water Board	Butler	Groundwater	1,260	None
Castleberry Water System	Conecuh	Groundwater	1,068	None
Evergreen Water Works	Conecuh	Groundwater	5,004	Coliform Bacteria June 2002
Fairview Water System	Conecuh	Groundwater	846	None

Table 16.— Public-water supply systems in the CSBRW and their water quality violations since 2000

System	County	Source	Population served	Water quality violations (since 2000)
Hamden Ridge Water Authority	Conecuh	Groundwater	10,68	Coliform Bacteria June 2001
Lyeffion Water and Fire Protection Authority	Conecuh	Groundwater	1,437	None
Owassa-Brownsville Water Authority	Conecuh	Groundwater	3,033	None
Repton Water Works	Conecuh	Groundwater	9,00	Coliform Bacteria August 2002
Andalusia Water Works	Covington	Groundwater	14,256	Coliform Bacteria December 2002
Covington County Water Authority	Covington	Groundwater	8,860	None
CRS Water Inc.	Covington	Groundwater	2,802	None
Gantt Water System	Covington	Groundwater	711	None
Heath Water System	Covington	Groundwater	450	None
Red Level Water Works	Covington	Groundwater	879	None
River Falls Water System	Covington	Groundwater	903	None
Brantley Water Works	Crenshaw	Groundwater	1,503	Coliform Bacteria November 2001
Dozier Water Works	Crenshaw	Groundwater	600	None
Glenwood Water Works	Crenshaw	Groundwater	426	None
Luverne Water and Sewer Department	Crenshaw	Groundwater	3,540	Coliform Bacteria August 2001
Quint-Mar Water Authority	Crenshaw	Groundwater	7,629	None
Rutledge Water Works	Crenshaw	Groundwater	867	None
South Crenshaw County Water Authority	Crenshaw	Groundwater	5,001	None
Atmore Utility Board	Escambia	Groundwater	11,874	None
Brewton Water Works	Escambia	Groundwater	9,741	None
Canoe Water Works	Escambia	Groundwater	1,011	None
East Brewton Water and Sewer Board	Escambia	Groundwater	3,090	None
Flomaton Water Works	Escambia	Groundwater	2,568	None
Freemanville Water System	Escambia	Groundwater	3,354	Coliform Bacteria May 2000
Huxford Water and Fire Protection Authority	Escambia	Groundwater	444	None

McCall Water System Inc.	Escambia	Groundwater	6,700	Coliform Bacteria August 2003
Pollard Water System	Escambia	Groundwater	201	None
Ridge Road Water Authority	Escambia	Groundwater	1,575	Coliform Bacteria April 2002
Riverview Water Works	Escambia	Groundwater	456	None
JSC Brewton, Inc.	Escambia	Groundwater	600	None
Fort Deposit Water and Sewer Board	Lowndes	Groundwater	2,250	None
Pilgrim-Providence Water and Fire Protection Authority	Montgomery	Groundwater	576	None
Ramer Water Company, Inc.	Montgomery	Groundwater	1,560	None
Sellers Station Water System	Montgomery	Groundwater		None
Banks Water System	Pike	Groundwater	1,212	None
Pike County Water Authority	Pike	Groundwater	17,670	Coliform Bacteria April 2000
Troy Utilities Department	Pike	Groundwater	17,829	None

WATERS IN VIOLATION OF ADEM SURFACE WATER QUALITY CRITERIA OR WATERS WITH ELEVATED CONSTIUENTS

Dr. Paul M. Stewart with the Department of Biological and Environmental Sciences at Troy University performed an evaluation of aquatic ecosystem health in the Conecuh River below Point A dam and in major tributaries upstream from Gantt and Point A reservoirs (Stewart, 1993). This study was required as part of the Alabama Electric Cooperative Gantt and Point A Hydroelectric Project relicensing agreement with the Federal Energy Regulatory Commission.

Water and habitat quality were measured at 11 sites on the Conecuh River (C), downstream from Point A dam and at 2 sites each on the Conecuh Rivers (UC) upstream from Gantt reservoir, Patsaliga Creek (P) upstream from Point A reservoir, and the Sepulga River (S). Physical and chemical parameters were measured in May, June, and July 2002 for four samples from each of the 11 “C” and 3 samples from each of the “UC”, “P”, and “S” sites (tbl. 17).

Evaluation of these samples indicates that nitrate was elevated in 13 percent of samples. Elevated phosphorus concentrations were detected in 90 percent of samples.

Dissolved oxygen concentrations were below the standard in 39 percent of samples collected.

Table 17.— Parameters below established water quality standards measured during the Troy University study of streams in the vicinity of Gantt and Point A reservoirs

Data collection site	Hyd. Unit name and no.	Total number of samples	Parameter	ADEM Criteria or published standard	Samples violating ADEM criteria or published standard
C-1 Conecuh River Downstream from Point A Dam	Upper Conecuh River (03140301)	4	Total Phosphorus	0.05 mg/L	4
		4	Total Nitrogen	0.5 mg/L	0
C-2	Upper Conecuh River (03140301)	4	Total Phosphorus	0.05 mg/L	4
		4	Total Nitrogen	0.5 mg/L	0
C-3	Upper Conecuh River (03140301)	4	Dissolved Oxygen	5 mg/L	2
		4	Total Nitrogen	0.5 mg/L	0
		4	Total Phosphorus	0.05 mg/L	4
C-4	Upper Conecuh River (03140301)	4	Dissolved Oxygen	5 mg/L	1
		4	Total Nitrogen	0.5 mg/L	1
		4	Total Phosphorus	0.05 mg/L	4
C-5	Upper Conecuh River (03140301)	3	Dissolved Oxygen	5 mg/L	1
		3	Total Nitrogen	0.5 mg/L	0
		3	Total Phosphorus	0.05 mg/L	3
C-6	Upper Conecuh River (03140301)	3	Total Phosphorus	0.05 mg/L	3
		3	Total Nitrogen	0.5 mg/L	0
C-7	Upper Conecuh River	4	Dissolved	5 mg/L	1

Table 17.— Parameters below established water quality standards measured during the Troy University study of streams in the vicinity of Gantt and Point A reservoirs

Data collection site	Hyd. Unit name and no.	Total number of samples	Parameter	ADEM Criteria or published standard	Samples violating ADEM criteria or published standard
	(03140301)		Oxygen		
		4	Total Nitrogen	0.5 mg/L	0
		4	Total Phosphorus	0.05 mg/L	4
C-8	Upper Conecuh River (03140301)	4	Total Phosphorus	0.05 mg/L	4
		4	Total Nitrogen	0.5 mg/L	0
C-9	Upper Conecuh River (03140301)	4	Total Phosphorus	0.05 mg/L	4
		4	Total Nitrogen	0.5 mg/L	0
C-10	Upper Conecuh River (03140301)	4	Total Phosphorus	0.05 mg/L	4
		4	Total Nitrogen	0.5 mg/L	0
C-11	Upper Conecuh River (03140301)	4	Total Phosphorus	0.05 mg/L	4
		4	Total Nitrogen	0.5 mg/L	0
UC-1 Conecuh River Upstream form Gantt Reservoir	Upper Conecuh River (03140301)	3	Total Nitrogen	0.5 mg/L	1
		3	Total Phosphorus	0.05 mg/L	2
UC-2	Upper Conecuh River (03140301)	3	Total Phosphorus	0.05 mg/L	2
		3	Total Nitrogen	0.5 mg/L	0
P-1 Patsaliga Creek	Patsaliga Creek (03140302)	3	Total Nitrogen	0.5 mg/L	1
		3	Total Phosphorus	0.05 mg/L	3

Table 17.— Parameters below established water quality standards measured during the Troy University study of streams in the vicinity of Gantt and Point A reservoirs

Data collection site	Hyd. Unit name and no.	Total number of samples	Parameter	ADEM Criteria or published standard	Samples violating ADEM criteria or published standard
P-2	Patsaliga Creek (03140302)	3	Total Nitrogen	0.5 mg/L	2
		3	Total Phosphorus	0.05 mg/L	3
S-1 Sepulga River	Sepulga River (03140303)	3	Total Nitrogen	0.5 mg/L	2
		3	Total Phosphorus	0.05 mg/L	3
S-2	Sepulga River (03140303)	3	Dissolved Oxygen	5 mg/L	2
		3	Total Nitrogen	0.5 mg/L	1
		3	Total Phosphorus	0.05 mg/L	3

The US Geological Survey operates 9 monitoring sites in the CSBRW. Data collected at these sites include water quality and discharge. Table 18 contains information about the water samples collected from these sites and results of chemical analyses.

The US Geological Survey has collected water-quality data sporadically for more than 30 years. The database contains physical characteristics, nutrients, trace metals, bacteria, and other types of water-quality data. Assessment of the data indicates elevated concentrations of nitrate in five percent of samples collected from 1972 to 1983 with a range of 0.59 to 2.7 milligrams per liter (mg/L). Elevated phosphorus concentrations were detected in 11 percent of samples collected form 1971 to 1994 with a range of 0.06 to 0.15 mg/L. Fecal coliform bacteria exceeded the standard for streams classified as fish and wildlife (2,000 colonies per 100 milliliters) in five percent of the samples collected. Arsenic was detected in 66 percent of samples collected form 1972 to 1983 with a range of 1.0 to 10 micrograms per liter (µg/L). Chromium was detected in 10 percent of samples collected form 1972 to 1991 with a range of 1.0 to 30 µg/L. Zinc was detected in 53 percent of samples collected form 1970 to 1983 with a range of 1.0 to 1,600 µg/L.

Lead was detected in four percent of samples collected form 1970 to 1991 with a range of one µg/L. Mercury was detected in 25 percent of samples collected form 1972 to 1983 with a range of 0.1 to 2.0 µg/L.

Table 18.— Parameters below established water quality standards measured by the USGS at sites in the CSBRW

Data Collection Site	Hyd. Unit name and no.	Total number of samples and (collection dates)	Parameter	Detection and concentration
Conecuh River near Brantley	Upper Conecuh River (03140301)	54 (1972-1983)	Nitrate	4 samples > 0.5 mg/L range=0.59-2.7 mg/L
		53 (1972-1983)	Arsenic	34 samples range=1-4 µg/L
		56 (1972-1983)	Chromium	1 sample 30 µg/L
		52 (1972-1983)	Zinc	29 samples range=10-1600 µg/L
		50 (1972-1983)	Mercury	12 samples range=0.1-1.9 µg/L
Patsaliga Creek near Brantley	Patsaliga Creek (03140302)	13 (1981-1983)	Arsenic	6 samples range=1-7 µg/L
		13 (1981-1983)	Zinc	11 samples range=20-130 µg/L
		13 (1981-1983)	Mercury	7 samples range=0.1-0.8 µg/L
Sepulga River near McKenzie	Sepulga River (03140303)	19 (1976-1983)	Nitrate	1 sample > 0.5 mg/L 1.7 mg/L
		20 (1976-1983)	Arsenic	11 samples range=1-5 µg/L
		20 (1976-1983)	Zinc	16 samples range=10-180 µg/L
		20 (1976-1983)	Mercury	5 samples range=.1-.3 µg/L
Murder Creek near Evergreen	Lower Conecuh River (03140304)	53 (1971-1983)	Nitrate	2 samples > 0.5 mg/L range=0.60-0.66 mg/L
		51 (1981-1983)	Zinc	33 samples range=1-9 µg/L
		51 (1972-1983)	Mercury	16 samples range=0.1-2.0µg/L
Escambia River at Century Florida near Alabama State Line	Escambia River (03140305)	146 (1971-1994)	Phosphorus	16 samples > 0.05 mg/L range=0.06-0.15 mg/L
		39 (1972-1982)	Arsenic	32 samples range=1-10 µg/L
		61 (1974-1991)	Chromium	12 samples range=1-10µg/L
		69 (1970-1991)	Lead	3 samples 1µg/L
		68 (1970-1983)	Zinc	20 samples range=4-250 µg/L
		21 (1974-1976)	Fecal	1 sample

Table 18.— Parameters below established water quality standards measured by the USGS at sites in the CSBRW

Data Collection Site	Hyd. Unit name and no.	Total number of samples and (collection dates)	Parameter	Detection and concentration
			Coliform	6000 col/100 ml
		57 (1972-1983)	Mercury	7 samples range=0.1-1.0µg/L

ADEM collects water quality and biological data as a part of their regular watershed monitoring schedule and as special projects targeting specific water bodies or watersheds. Table 19 contains information about the water samples collected from these sites and results of chemical analyses.

ADEM has collected synoptic water-quality data in the CSBRW for several water-quality programs. Assessment of the data indicates elevated concentrations of nitrate in 31 percent of samples collected. Elevated phosphorus concentrations were detected in 36 percent of samples. Dissolved oxygen concentrations were below the standard established for streams classified as fish and wildlife (5.0 mg/L) in 16 percent of samples. Fecal coliform bacteria counts exceeded the standard in 29 percent of samples collected by ADEM.

Table 19.— Parameters below established water quality standards measured by ADEM at sites in the CSBRW

Hyd. Unit name and no.	Data collection site	Total number of samples	Parameter	ADEM criteria or published standard	Samples violating ADEM criteria or published standard
Upper Conecuh River (03140301	010	3	Total Phosphorus	0.05 mg/L	3
		3	Dissolved Oxygen	5 mg/L	1
	020	3	Total Phosphorus	0.05 mg/L	2
		3	Total Nitrogen	0.5 mg/L	3
	030	19	Total Phosphorus	0.05 mg/L	4
		19	Total Nitrogen	0.5 mg/L	1
		19	Dissolved Oxygen	5 mg/L	1
	040	21	Total Phosphorus	0.05 mg/L	5

Table 19.— Parameters below established water quality standards measured by ADEM at sites in the CSBRW

Hyd. Unit name and no.	Data collection site	Total number of samples	Parameter	ADEM criteria or published standard	Samples violating ADEM criteria or published standard
	050	3	Total Phosphorus	0.05 mg/L	1
Patsaliga Creek (03140302)	030	4	Total Phosphorus	0.05 mg/L	3
	050	8	Total Phosphorus	0.05 mg/L	1
Sepulga River (03140303)	010	1	Dissolved Oxygen	5 mg/L	1
	030	9	Total Phosphorus	0.05 mg/L	6
		9	Dissolved Oxygen	5 mg/L	1
		7	Fecal Coliform Bacteria	200colonies/ 100 ml	2
Lower Conecuh River (03140304)	010	4	Total Phosphorus	0.05 mg/L	1
		4	Dissolved Oxygen	5 mg/L	1
	030	1	Total Phosphorus	0.05 mg/L	1
		1	Total Nitrogen	0.5 mg/L	1
Escambia River (0314-0305	030	7	Total Nitrogen	0.5 mg/L	5
	090	1	Dissolved Oxygen	5 mg/L	1
Blackwater River (0314-0302)	010	5	Total Nitrogen	0.5 mg/L	1

Trophic conditions in Gantt and Point A Reservoirs (fig. 14) have been monitored by ADEM since 1985 (fig. 15). Results of this monitoring were reported as part of the 2004

Gantt and 48 for Point A, which puts them in the mesotrophic classification. Latest conditions measured in August 2003 indicate a TSI of 52 for Gantt Reservoir and 46 for Point A. TSI trends are shown in figure 15 and 16. TSI values indicate an increasing trend of TSI over the monitoring period with only a slight decrease in 2001. This may indicate increasing nutrient loads and eutrophication.

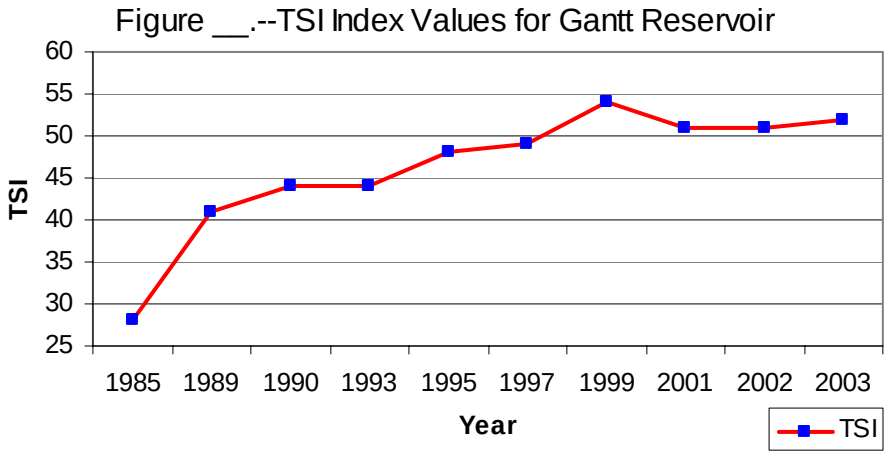

Figure 15.— Tropic conditions in Gant and Point A Reservoirs.

Latest conditions measured in August 2003 indicate a TSI of 46 for Point A Reservoir. TSI trends are shown in figure 15. Although the values are relatively similar the graph indicates slightly decreasing eutrophication since 1999.

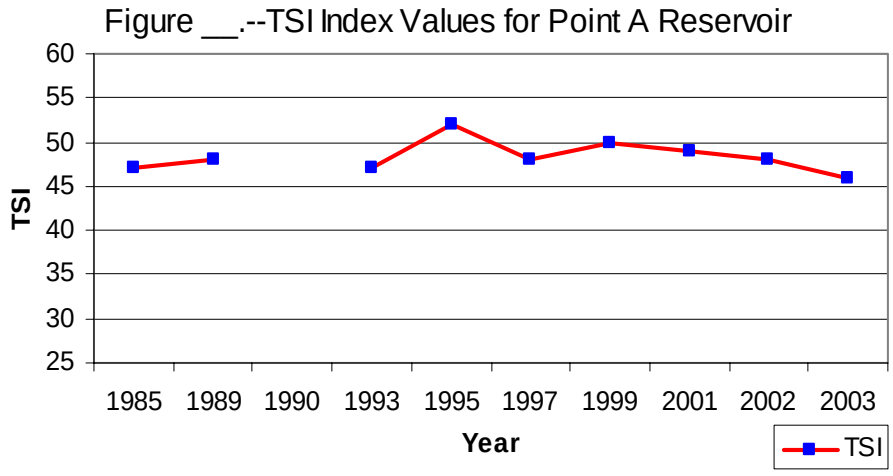

Figure 16.— Tropic conditions in Point A Reservoir.

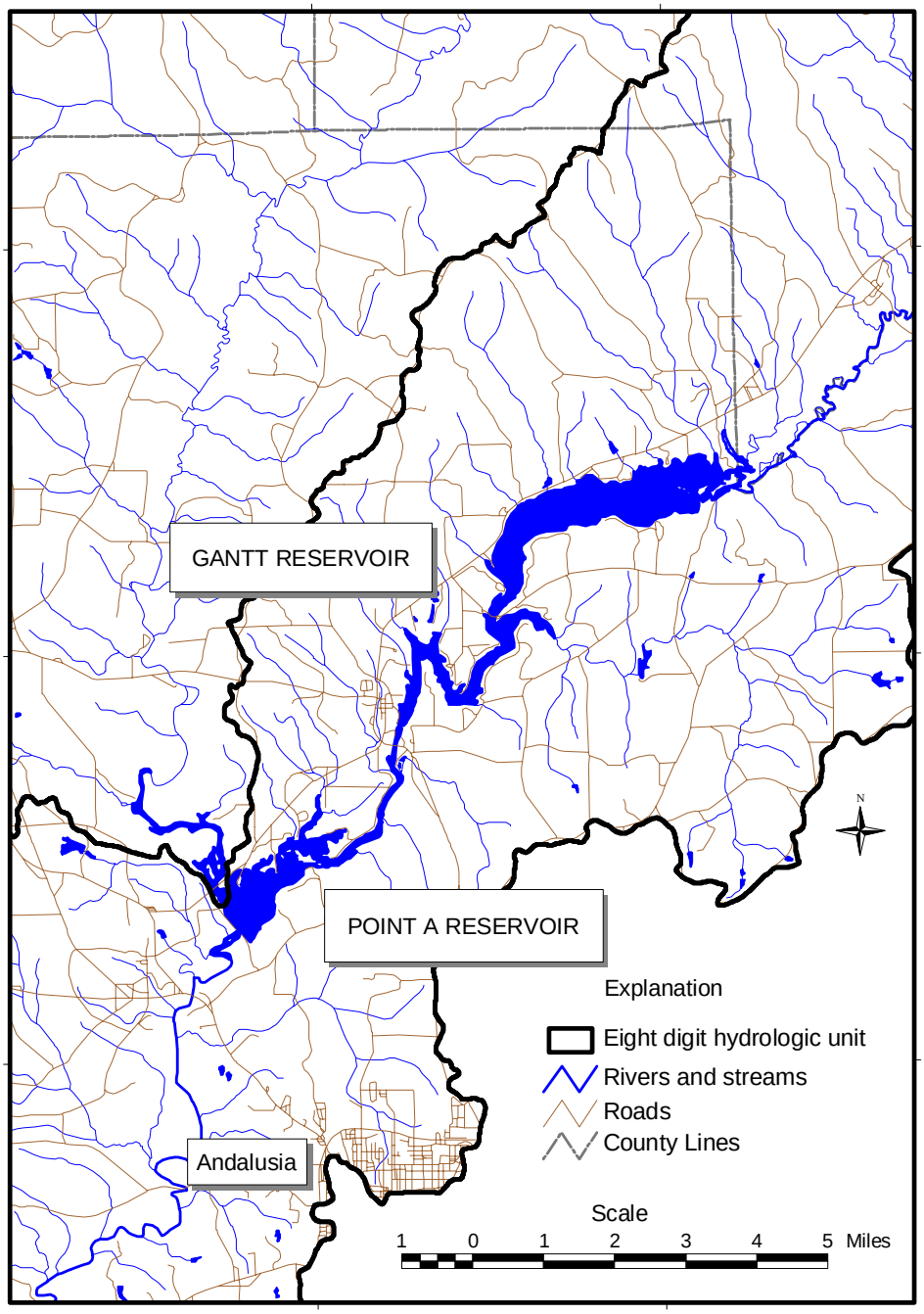

Figure 14.— Gant and point A reservoirs.

An evaluation of sediment transported into Gantt and Point A reservoirs from selected tributaries was performed by the Geological Survey of Alabama in 2001 and 2002. Bedload was measured for one year in four tributaries traversed by unimproved roadways. The measured mean bedload for the tributaries was 3.3 tons per day. The measured mean sediment load contributed by suspended sediment was 2.2 tons per day. The total mean sediment load measured transported by the project streams to Gantt and Point A reservoirs was 5.5 tons per day.

The largest pollutant by volume in the Conecuh River watershed is sediment. Sediment from roads, farms, construction sites, logging, and a host of other sources combine to form the largest single contributor of pollution of the waters of the area included in the Conecuh-Sepulga Clean Water Partnership. With the growing environmental awareness of the seventies and eighties, most point source pollution (pollution that has a particular entry site such as a factory's smokestack or pipe) sites have been under strict regulation. With the decline of point source pollution problems, nonpoint source pollution (pollution generated over a broad area instead of originating from an identified source), especially in rural watersheds like the Conecuh, has become a growing concern.

Roads in the Conecuh River watershed are a great example of non-point source pollution. There are more than 2,100 miles of unpaved roads in the watershed. The watershed also has a large network of rivers and streams. Therefore, this network of streams becomes an all to convenient disposal area for road runoff. Traditional thinking in road maintenance has been to get water off of the roads and into streams by the quickest means possible. This practice results in thousands of tons of sediment being deposited into the watershed’s streams.

The presence of sediment is a natural and necessary part of a healthy stream. The addition of excess sediment, however, can cause great harm to the aquatic ecosystem. Here are some of the effects of excess sediment:

- Disruption of natural stream order and flow
- Damage to fish species through direct abrasion to body and gills
- Loss of fish spawning areas due to the filling in of gaps in stream beds

- A breakdown in the aquatic food chain as sediment suffocates small organisms living in the streambed
- Accelerated filling in of dams and reservoirs
- A change in the water composition

Table 20.— Estimated miles of unpaved public roads (by county) in the CSBRW

County	Miles
Bullock	15
Butler	225
Coffee	25
Conecuh	484
Covington	300
Crenshaw	480
Escambia	283
Lowndes	15
Monroe	75
Montgomery	8
Pike	210
Total	2,120

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 CONECUH 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 21 contains the water bodies with current fish consumption advisories in the CSBRW.

Table 21.— Fish consumption advisories for water bodies in the CSBRW

Water Body	Hyd. Unit name and no.	County	Location	Species	Pollutant	Level of Advisory
Big Escambia Creek	Upper Conecuh River (03140301)	Escambia	L&N Railroad Bridge	Largemouth Bass	Mercury	No Consumption
Blackwater Creek		Escambia	CR 4 Bridge to AL-FL State Line	Largemouth Bass	Mercury	No Consumption
Conecuh River		Escambia	At Pollard Landing	Largemouth Bass	Mercury	No Consumption
Little Escambia Creek		Escambia	US Hwy 31/29 Bridge	Spotted Bass	Mercury	No Consumption

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 Conecuh River watershed display varying degrees of these habitat characteristics and range 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 Conecuh system and are important components of habitat quality supporting a diversity of fishes. Limestone outcrops along some stream channels and provides hard substrate for invertebrates to colonize. Gravel shoals occur in the larger river and stream channels and are important habitats for fishes. 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. These activities generally lead to high amounts of bedload sediments and higher stream turbidity during storm events.

PROTECTION PLAN IMPLEMENTATION

GOAL

The goal of the Conecuh-Sepulga and Blackwater Rivers Watershed Protection Plan is to preserve, protect, and enhance water quality, biodiversity, and habitat of the

Conecuh-Sepulga and Blackwater Rivers watershed to meet the goals of the Clean Water Act through basin wide public/private partnerships.

OBJECTIVES

The following objectives will be implemented to meet the above goal. The order of the objectives has been determined through public input, stakeholder surveys and stakeholder meeting discussions.

1. Increase citizen awareness of watershed protection.
2. Inventory and monitor the physical, chemical and biological parameters for surface and ground water.
3. Reduce pollution from construction and other land disturbance activities.
4. Reduce pollutions from domestic onsite sewage disposal systems.
5. Reduce pollutions from illegal waste dumping sites, littering, and disposal of animal carcasses.
6. Reduce pollution from agriculture activities.
7. Reduce pollution from forestry activities.
8. Reduce nonpoint source pollution from urban sources.
9. Protect groundwater resources through conservation and pollution prevention.
10. Promote protection of wetlands, faunal habitats, and other critical areas.
11. Assess the effectiveness of the CSBRW protection plan.

The Goal and 11 Objectives were developed by the Conecuh-Sepulga and Blackwater Rivers Watershed Protection Plan oversight committee and technical committee. The strategies to achieve the objectives are based on water quality data, land use/land cover information, and best professional judgment of GSA, 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 1998 CWP Section 303(d) List of Impaired Waters. 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 Conecuh-Sepulga and Blackwater Rivers watershed.

OBJECTIVE 1: INCREASE CITIZEN AWARENESS OF WATERSHED PROTECTION

The purpose of this objective is to increase citizen awareness 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 object 1 will be facilitated by coordinating implementation of this basin protection plan with the CWP, the CSCWP, the general public, and other stakeholders. Although it is recognized that water quality on a basin-wide scale may respond slowly to protection measures, implementation of this plan can be improved if everyone "works off the same page." Coordination is needed to assure that stakeholders cooperatively achieve the objectives of this protection plan using specific action items listed below.

Responsible Parties: CSCWP
Cooperators: All stakeholders
Potential Funding: Unknown
Schedule: Ongoing, beginning first quarter, 2005
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Facilitate inclusive river basin partnerships. Ensure that public participation efforts meet the needs of various affected segments of the population, taking into account low-income and minority populations
2. Maintain responsive and reliable lines of communication
3. Incorporate citizen-based input into resource agency decision-making processes
4. Provide stakeholders with ample opportunities to engage in basin-wide protection plan implementation efforts
5. Provide stakeholders with education and outreach and training to illustrate the need to take personal responsibility for solutions to river basin problems
6. Coordinate funding, technical assistance, and technology transfer to resolve watershed environmental issues
7. Develop subwatershed protection plans that incorporate watershed plan objectives
8. Incorporate subwatershed protection plans as addendum's to this watershed protetion plan

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 between many and varied entities
3. Citizen input used in decision-making processes
4. Stakeholders volunteer to implement components of the basin 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. Subwatershed protection plans developed that incorporate basin plan objectives
8. Subwatershed protection 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 protection plan. It is very important to have buy-in from CSBRW stakeholders such as 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: CSCWP
Cooperators: Any stackholder
Potential Funding: Section 319, CWP
Schedule: Ongoing, beginning first quarter, 2005
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 protection plans to interested citizens for comment.
3. Conduct an annual progress review of protection plan implementation successes and needs
4. Update the protection plan as needed after ample stakeholder input
5. Make the protection plan available to the general public
6. Individuals and groups providing or contributing human and financial resources to watershed protection 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 protection plans provided
3. Reviews of protection plan implementation successes and needs instituted
4. Watershed protection plan updated based on stakeholder input
5. Protection plan available to stakeholders
6. Individuals and groups providing or contributing human and financial resources to watershed protection objectives publicly recognized

STRATEGY C

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

Responsible Parties: CSCWP facilitator and education committee
Cooperators: Legacy, ADEM, Turtle Point Environmental Science Center, public and private school districts
Potential Funding: Legacy, Section 319
Schedule: Ongoing, beginning first quarter, 2005
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. The CSCWP facilitator will research availability, acquire and distribute education resources to public and private school teachers and students
2. The CSCWP 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 and classrooms

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 and classrooms constructed and used throughout the river basin

STRATEGY D

Promote watershed protection activities through the news media to increase citizen awareness. Presenting accurate, meaningful, and timely information to a large sector of the population in a cost-effective and short time period, 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 and 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: CSCWP facilitator
Cooperators: News media
Potential Funding: Section 319, Legacy
Schedule: Ongoing, beginning first quarter, 2005
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Publish articles in newspapers and newsletters to update citizens on protection plan activities and successes within the CSBRW
2. Use radio and television media public service announcements (PSA's) for CSBRW activities
3. Promote Clean Water Partnership PSAs

PROGRESS AND SUCCESS CRITERIA

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

STRATEGY E

Develop and maintain a website for the CSBRW. A website is needed to provide instant and widespread exchange of watershed information.

Responsible Parties: CSCWP facilitator
Cooperators: AEC, AL. CWP
Potential Funding:, Water boards and utilities
Schedule: Third quarter, 2005, update as needed
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Develop and maintain a CSBRW website. The CSBRW CWP will choose a domain name and host for the site
2. Add or link to CSBRW subwatershed protection plans and activities as appropriate
3. Provide a link to the statewide CWP website

PROGRESS AND SUCCESS CRITERIA

1. A CSBRW website developed and maintained
2. Links to other CSBRW subwatershed protection plans and the CWP website provided

STRATEGY F

Design and print brochures and other materials describing the scope, extent, goals, and objectives of the CSBRWPP. Education and outreach materials are needed to promote watershed protection plan goals and objectives and protection measurers. The materials should provide sufficient knowledge and be clear enough so that stakeholders can identify with it, and specific enough so that citizens recognize their roles and responsibilities in the implementation process.

Responsible Parties: CSCWP facilitator
Cooperators: All stakeholders
Potential Funding: Section 319
Schedule: Third quarter, 2005; update as needed
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Develop an appropriate watershed protection or CWP logo to be used on education and outreach materials
2. Develop and include a map of the CSBRW and add other graphics as appropriate

PROGRESS AND SUCCESS CRITERIA:

1. CSBRW or CWP logos identify watershed wide education and outreach materials
2. Maps and other graphic are incorporated into watershed wide education and outreach materials

STRATEGY G

Place "Conecuh-Sepulga-Blackwater Rivers Watershed" signs on major roads entering and leaving the Basin. Citizens need to be aware or routinely reminded of the unique resources that are available in the watershed 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: CSCWP
Cooperators: SWCD's, County Commissions, ADOT
Potential Funding: Section 319 funding, city and county governmental units, water boards and utilities
Schedule: First quarter, 2006
Load Reduction Estimates: Intrinsic
Estimated Cost: $200 per sign

ACTION ITEM

1. Install CSBRW 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

STRATEGY H

Develop presentations to present to educators, civic organizations, businesses, homebuilders associations, county and city personnel, etc., to promote the project. Although many people do not want to cause or contribute to pollution problems, many do so because of a lack of information or environmental awareness. Education materials should stress that the CSBRW's valuable assets have potential benefits that may not yet be realized. Individual and collective actions can impair water

quality and watershed residents of environmental and economic benefits. However, residents can be instructed to do specific things to protect and restore water quality so that they can reap the benefits and improve their quality of life. User friendly, electronic media presentations are needed to target specific audiences throughout the watershed.

Responsible Parties: CSCWP facilitator
Cooperators: ADEM, Legacy, SWCD's,
Potential Funding: Legacy, Section 319
Schedule: Ongoing, beginning first quarter, 2005
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. The CWP facilitator and other group leaders will use or modify existing presentations (e.g., PowerPoint), as appropriate, to target particular issues, concerns, and audiences and maintain cooperative stakeholder communication and partnerships
2. The CWP facilitator and other volunteers will deliver presentations and talks to inform stakeholders and change attitudes and behaviors that contribute to watershed degradation

PROGRESS AND SUCCESS CRITERIA

1. Presentations developed or modified
2. Presentations delivered to targeted audiences

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

STRATEGY A

Identify and prioritize environmental data and information needed to improve watershed plan implementation effectiveness. As the protection plan is developed and implemented, new information will most likely emerge. Additional CSBRW data and information is needed to help stakeholders protect public health and welfare, water quality, aquatic and upland species, and enhance of recreational benefits. A coordinated monitoring approach is needed to collect environmental data and information for planning; decision making; protection 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: CSCWP
Cooperators: ADEM, GSA, USGS, academia, city and county governmental units, water boards, industry, municipalities
Potential Funding: ADEM, GSA, USGS
Schedule: Fourth quarter, 2005, then update as needed
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 develop monitoring strategies to acquire data
3. The CWP facilitator will develop funding proposals
4. Coordinate monitoring and assessment activities to prevent duplication of efforts
5. Use scientifically based data and information to establish priorities
6. Compare improvements and ecological status and trends using least impaired reference station data

PROGRESS AND SUCCESS CRITERIA:

1. The need for additional data and information is routinely identified and funding sources sought and acquired
2. Monitoring and assessment activities coordinated among resource agencies and other stakeholders
3. Scientifically based data and information is used to establish protection practice priorities
4. Improvements and ecological status and trends compared to least impaired reference station data

STRATEGY B

Develop support and interest in the Alabama Water Watch citizens volunteerwater 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 globally aware and locally active in environmental monitoring and decision making processes. The water quality data that citizens collect provides valuable information, but 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: CSCWP and CAC committees, schools, environmental protection groups, AWWA, watchdog groups, AARP, League of Woman Voter's, Scouts, church groups
Potential Funding: AWWA, ADEM
Schedule: Ongoing, beginning first quarter, 2005
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 assess improvements, on water quality in the watershed
5. Encourage teachers and students to get involved in volunteer water quality monitoring
6. Involve and coordinate protection 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
8. Concentrate on other impaired and unimpaired waterbodies, especially where on-the-ground protection practices have been installed

PROGRESS AND SUCCESS CRITERIA

1. Citizens volunteering to monitor water quality throughout the watershed
2. Certification workshops presented
3. AWW data used to assess improvements in water quality
4. Teachers and students trained to collect monitoring data
5. Coordination with volunteer groups
6. Volunteer monitoring data collected on Section 303(d) listed waterbodies
7. Volunteer monitoring data collected on other impaired and unimpaired waterbodies

STRATEGY C

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

Responsible Parties: CSCWP
Cooperator: Colleges and universities, instructors, students, science clubs
Potential Funding: Colleges and universities
Schedule: Ongoing, beginning first quarter, 2005
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS:

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

PROGRESS AND SUCCESS CRITERIA:

1. The CSBRWPP promoted in colleges and universities
2. Colleges and universities include CSBRW environmental data collection as part of coursework/labs

STRATEGY D

Input broad-based watershed and subwatershed-specific data into water quality databases. Easily accessible and user-friendly data and information depository and retrieval systems are needed to better identify and assess CSBRW problems and to develop solutions. Geographic Information System (GIS) database development woul allow for responsive data storage and retrieval options.

Responsible Parties: CSCWP
Cooperators: ADEM, GSA, ADECA
Potential Funding: CWP, ADEM, GSA, ADECA
Schedule: Ongoing, beginning first quarter, 2005
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Coordinate CSBRW data with the statewide Clean Water Partnership database and reporting efforts (www.cleanwaterpartnership.org)
2. Present watershed wide monitoring data and information in an easily accessible and user-friendly database
3. Maintain a library of CSBRW data, including water quality studies and research reports
4. Use compiled data to assess Section 303(d) listed waters (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. CSBRW data collections coordinated with the statewide Clean Water Partnership database and reporting efforts
2. Watershed wide monitoring and other data is presented in an easily accessible and user-friendly database
3. A library of CSBRW studies and reports is maintained
4. Data used to assess Section 303(d) listed waters is compiled

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

Reduction of pollution and contamination from construction sites, road building, logging 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, CSCWP
Potential Funding: EPA, county commissions, city governments, HBAA
Schedule: Ongoing, beginning first quarter, 2005
Load Reduction Estimates: Intrinsic
Estimated Cost: $50,000 annually

ACTION ITEMS

1. Encourage implementation of pollution control measures using the Homebuilders Association of Alabama'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 Homebuilders Association of Alabama'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

Identify and rank dirt roads that contribute most to stream sediment loads.

Erosion and sedimentation from unpaved roads are a major contributor to water quality problems. Unpaved roads located near 303(d) listed streams will be given highest priority during the ranking process.

Responsible Parties: County commissions, CSCWP
Cooperators: NRCS, SWCDs, USFWS, county engineers, Soil and Water Conservation Society
Potential Funding: County commissions, USFWS
Schedule: Fourth quarter, 2004 ,then updated as needed
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Utilize SWCD and other county watershed assessments 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. Promote the use of standardized criteria by county commissions and county engineers to rank sites for priority management practice implementation
4. Facilitate unpaved road management practices to roads located near Section 303(d) listed waterbodies
5. 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. Use of SWCD and other county watershed assessments 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. Use of standardized criteria by county commissions and county engineers to rank sites for priority protection practice implementation
4. 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

STRATEGY C

Provide sediment and erosion control training for public works employees and others involved in building and maintaining roads. Protection measures are needed to control polluted runoff from roads, highways, and bridges. Pollutant sources are generally site-specific and are affected by traffic volume, road design, land use, and accidental spills. 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
Cooperators: County and municipal governments, ACES, ADEM, SWCD, ADOT, SWCS, CSCWP committees
Potential Funding: 319 funding, ADOT, county commissions
Schedule: Second quarter 2005
Load Reduction Estimates: Intrinsic
Estimated Cost: $50,000 annually

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 Choctawhatchee, Pea and Yellow Rivers Watershed Management Authority
3. Encourage public works departments and developers to hire trained contractors
4. Enlist the SWCS to present erosion control protection presentations 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 Choctawhatchee, Pea and Yellow Rivers Watershed Management Authority is made available to targeted groups
3. Trained contractors 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)

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 should be conducted to determine the suitability of an absorption field in conjunction with percolation tests. Adequate treatment of domestic wastewater is needed to protect public health and the environment. A database for all permitted onsite systems is currently being used by county health departments. However, county environmentalists do not have time for program development, maintenance and trouble-shooting of GIS/GPS systems.

Responsible Parties: County health departments, CSCWP facilitator
Cooperators: Alabama Onsite Wastewater Association, SWCD, water authorities, county commissions, ADEM,
Potential Funding: EPA Rural Hardship Assistance Program, Section 319, county commissions
Schedule: Ongoing, beginning second quarter, 2005
Load Reduction Estimates: Reduced nutrients and pathogens to surface and groundwater
Estimated Cost: $100,000/county assessment

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 river basin

4. Assist health departments with database program development, maintenance and trouble-shooting of the newly established county OSDS permits, GIS database, and georeference system
5. Seek funding for global positioning system (GPS) units—as well as training how to use them—for all county health departments within the watershed
6. Promote antibiotic resistance, DNA analyses, and other detection methods to distinguish between human and animal coliform pollutant sources
7. Promote periodic water quality monitoring to identify impaired waters and to assess the effectiveness of protection practices
8. Facilitate assessments to expedite sewage pollutant load reductions and ultimately lead to de-listing of Section 303(d) waterbodies

PROGRESS AND SUCCESS CRITERIA:

1. The SWCD Watershed Assessment database compiles sewage information a minimum of every 5 years
2. Water quality monitoring data collected 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. GIS technicians are acquired at the State and local levels, and county health departments have a better understanding of the OSDS database and georeference system
5. Adequate numbers of GPS units are acquired for county health departments within the watershed
6. Programs in-place to distinguish between human and animal coliform pollutant sources
7. Water quality monitoring programs in-place to identify impaired waters and to assess the effectiveness of protection practices
8. Miles or areas of waterbodies restored or delisted from the Section 303(d) List as a result of implementation of sewage treatment management practices

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, 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, and family size, housing density, and seasonal use.

Responsible Parties: CSCWP facilitator, ADPH, county health departments
Cooperators: Homebuilder associations, county engineers, planners, Alabama Onsite Wastewater Training Center, RC&D, alternative septic system designers, manufactures and installers
Potential Funding: County funds, SWCD, Section 319
Schedule: Beginning first quarter, 2006
Load Reduction Estimates: Reduced nutrients and pathogens to surface and groundwater
Estimated Cost: Unknown

ACTION ITEMS

1. Encourage the use of decentralized OSDSs. Certified operators should perform installation, operation and maintenance
2. Encourage the use of alternative OSDS treatment technologies. Certified operators should perform installation and maintenance
3. 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
4. Promote alternative treatment systems to protect surface waters, groundwaters, wetlands, and floodplains
5. Promote pollution prevention, recycling, and composting as alternative sewage pollutant management measures
6. Expedite alternative and decentralized treatment systems to reduce pollutant load and ultimately lead to de-listing of Section 303(d) waterbodies
7. Assist with OSDS education and outreach
8. Promote county/local resolutions to promote decentralized wastewater treatment
9. 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 OSDSs in areas not suitable for conventional septic tank systems
2. Installation of alternative OSDS treatment technologies in areas not suitable for conventional septic tank systems

3. Miles or areas of 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, LITTERING, AND DISPOSAL OF ANIMAL CARCASSES

Strategies are needed to reduce the motivation of 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: CSCWP, PALS, AFC
Potential Funding: County funds, SWCD, Section 319
Schedule: Ongoing, beginning third quarter, 2005
Load Reduction Estimates: Intrinsic
Estimated Cost: Unknown

ACTION ITEMS

1. Promote pollution prevention, recycling, and composting as alternatives for household, lawn, and building material disposal
2. Develop a list of priority illegal dump sites by county
3. Coordinate with local health departments and law enforcement in illegal site assessment
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 and provide alternatives
2. List of priority sites
3. Report of site assessments
4. Funding in place for site cleanup and law enforcement

STRATEGY B

Promote lake clean-up days to include the tributaries and mainstem of the entire Conecuh River. Routine and coordinated clean-up efforts are needed throughout the entire CSBRW to protect water quality from pollutants and to improve aesthetics and water resource recreational use and value.

Responsible Parties: CSCWP and CAC
Cooperators: AEC, ADEM
Potential Funding: AEC, Section 319, governmental units
Schedule: Annually, beginning second quarter, 2005
Load Reduction Estimates: Reduced solid waste pollutants on waterways and along shorelines
Estimated Cost: Unknown

ACTION ITEMS

1. Expand annual cleanups to include tributaries and other waterways located within the CSBRW
2. Increase number of participants in cleanup event

PROGRESS AND SUCCESS CRITERIA

1. Existing annual lake cleanups expand to include tributaries and other CSBRW waterways
2. Increase in number of volunteers participating in cleanup events
3. Reduction in the amount of litter and debris collected during annual cleanups

OBJECTIVE 6: REDUCE POLLUTION FROM AGRICULTURAL ACTIVITIES

STRATEGY A

Identify and prioritize impaired watersheds. Identification and targeting of priority watersheds 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 the latest SWCD Watershed Assessments. Subwatersheds that include Section 303(d) listed waters, or have approved TMDLs, will also be ranked highest.

Responsible Entities: SWCC, SWCD, NRCS, ACES, ADEM
Cooperators: CSCWP facilitator, CAC
Potential Funding: 319 grant funds; state agricultural cost-share
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 convening and sustaining locally led citizen advisory committees
2. Assist with county-wide watershed assessments
3. Assist with compiling and analyzing watershed data and information
4. Assist with revising priority impaired subwatershed list
5. Assist with disseminating lists and data to public (CWP; lead agency websites)
6. CSBRW promotes targeting of resources to address priority impaired watersheds

PROGRESS AND SUCCESS CRITERIA:

1. Number of locally led citizen advisory groups in each county
2. Use of data in CSBRW for environmental enhancement
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 CSBRW. Agricultural pollutants are a significant contributor to water quality problems in the CSBRW. Watershed protection plan activities must be coordinated with the agricultural sector to assure landowner buy-in and to promote a "bottom-up" approach in 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, CSCWP facilitator
Cooperators: CSCWP and Facilitator, farmers, producer/commodity groups
Potential Funding: No additional funds necessary
Schedule: Beginning first quarter, 2005
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 affect improved 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

STRATEGY C

Identify needs and install agricultural production practices. Implementing agricultural protection practices will significantly reduce erosion, sedimentation, and nutrient loading to the Conecuh River mainstem and its tributaries. Protection practices 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. Protection measures 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 beginning first quarter 2005
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 management practices 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

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. Miles or areas of 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.

Responsible Entities: CSCWP and facilitator, 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: $50,000 per county annually

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 river basin wide or watershed-specific. The signs will feature the Clean Water Partnership logo and explain why the farmer is being recognized
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 pollution prevention, reduction, and reuse programs
5. Promote erosion control, nutrient management, and other training and certifications
6. Promote conservation buffer, backyard conservation, wetland and groundwater protection, nutrient transfer, Farm*A*Syst, and other initiatives
7. Promote BMP demonstration projects on local farms to promote the understanding and adoption of agricultural BMPs

8. Maintain effective and timely lines of communication between urban/rural interface using a watershed wide protection approach

PROGRESS AND SUCCESS CRITERIA

1. Number of farmers recognized for good stewardship
2. Number and types of programs/activities offered, and number of youth participating
3. Number and types of agricultural educational outreach materials produced and distributed
4. Number of farms with nutrient management plans, using litter hotline, alternative uses, or other pollution prevention measures
5. Number of farmers attending training opportunities or receiving certifications
6. Number of farmers participating
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
Cooperators: CSCWP; 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: $350,000 annually

ACTION ITEMS

1. Assist in pesticide collection events to collect and properly dispose of pesticides
2. Promote integrated pest management 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. Number of collection events scheduled; lbs. of chemicals properly eliminated

2. Acres incorporating IPM and precision farming (GIS/remote sensing technologies)
3. Number of applicators certified/re-certified
4. Number and types of education opportunities offered and number of stakeholders reached

OBJECTIVE 7: REDUCE POLLUTION FROM FORESTRY ACTIVITIES

STRATEGY A

Provide education and outreach to assist forest landowners in making informed forestry management decisions. 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.

Responsible Entities: AFC, AFA
Cooperators: CSCWP and facilitator, AU-School of Forestry, Alabama Loggers Council, consulting foresters, USDA, Pulp and Paper Industry, American Tree Farm System, and the Alabama SFI Implementation Committee.
Potential Funding: AFC, AFA, Section 319, USDA, SWCD, Pulp and Paper Industry
Schedule: Ongoing beginning first quarter 2005
Load Reduction Estimates: Erosion from forestry activities <25% of "T" annually; TBDs
Estimated Cost: $50,000 per county annually

ACTION ITEMS

1. Distribute education and outreach to private forest landowners to promote the interconnectedness between water quality protection and installation and maintenance of management practices. Seek new delivery methods, but continue to use practices that have worked in the past such as field days, demonstrations, tours, industry and association meetings, and on-site training
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, TREASURE Forest Program, Sustainable Forest Initiative, 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.

The signs will feature the Clean Water Partnership logo and explain why the farmer is being recognized

6. Promote forestry as a solution to water quality degradation. 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
8. Maintain effective and timely lines of communication between agencies, forestland owners, environmental groups, and industrial sectors using a basin wide management approach
9. Reinstate aerial BMP monitoring

PROGRESS AND SUCCESS CRITERIA

1. Number of workshops and seminars scheduled; and number of forestry sector stakeholders participating
2. Number of chemical applicators certified/re-certified
3. Number and types of education opportunities offered and number of stakeholders reached
4. Land area (acre, miles) with ongoing pollution prevention and natural resource protection initiatives, CRP acres, and Treasure or Tree Farm acres
5. Miles or areas of waterbodies incorporating forestry management measures that were restored or delisted from the Section 303(d) list

STRATEGY B

Promote education and outreach to teachers and students. Education of youth is essential for forestry and long-term health of the basin. 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; reexamine 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 good forestry practices often enough, it will eventually become a natural part of their mindset and habits.

Responsible Entities: CSCWP, AFC, ACES, NRCS
Cooperators: FFA, landowners, 4H Club, local school districts, Alabama Forest Foundation

Potential Funding: Legacy, AFC, AFA, USDA Forest Service, Southern Group of State Foresters
Schedule: Ongoing beginning first quarter 2005
Load Reduction Estimates: Intrinsic
Estimated Cost: $100,000 annually

ACTION ITEMS

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

PROGRESS AND SUCCESS CRITERIA

1. Number and types of presentations given and outreach materials provided
2. Number of programs presented and teachers/students participating
3. Parallel river basin forestry initiatives with statewide/national forest and tree awareness days
4. Number of stakeholders participating in special natural resource protection programs

STRATEGY C

Utilize the TREASURE Forest and Tree Farm programs to promote forest land stewardship. A forest land stewardship ethic 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, CSCWP facilitator
Potential Funding: AFC, AFA
Schedule: Ongoing beginning third quarter 2005
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. Provide public recognition and signage to identify outstanding sites
2. Encourage participation in Alabama TREASURE Forest Association (AFTA) tp 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 NONPOINT SOURCE POLLUTION FROM URBAN SOURCES

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 CSBRW.

Responsible Parties: NRCS, ADEM, local governments/municipalities, ADOT, EPA
Cooperators: CSCWP and facilitator, CAC
Potential Funding: Section 319, local municipalities, EPA
Schedule: Ongoing, beginning first quarter, 2005
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

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
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 urban construction and land-clearing activities are needed.

Responsible Parties: CSCWP facilitator and CAC
Cooperators: Landowners, SWCD, NRCS, ADEM, local governments, builders and homebuilders associations
Potential Funding: Section 319, local governments, builders and homebuilders associations
Schedule: Ongoing, beginning second quarter, 2004
Load Reduction Estimates: reduce erosion to "T"; reduce nutrients, chemicals, toxic and other polluted runoff; TBD
Estimated Cost: No new funding needed

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. Replication of demonstrated protection measures 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 homeowners Households produce an assortment of pollutants from a variety of sources. As an efficient and effective way to mass-educate people about responsible homeownership, a homeowner's 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 wastes, water conservation, groundwater protection, lawn and gardening polluted runoff prevention tips, and lists of relevant agencies and phone numbers.

Responsible Parties: CSCWP and CAC committees, CSCWP facilitator
Cooperators: Realtors association, utility companies, master gardeners, homebuilders association, county health departments, environmental groups, ADEM, CES
Potential Funding: Section 319, utilities, realtors, homebuilders and developers
Schedule: Third quarter, 2004, then on an as needed basis
Load Reduction Estimates: TBD
Estimated Cost: $200,000 (2003); reprint cost, thereafter

ACTION ITEMS

1. Compile homeowner information packets
2. Distribute packets through local utility companies, realtor associations, Extension System offices, public health departments, or at meetings/conferences
3. Survey a select number of homeowners 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
2. Number or percent of homeowners instituting pollution management measure presented in the packets

STRATEGY D

Provide environmental protection presentations to home owners/boat owners and other lake. Home owners/boat owners and other lake users have a keen interest in protecting the water quality and aesthetics of lake residential and recreational areas. When deposited in lakes and waterways, pollutants may impair water quality, discourage recreation uses, contaminate drinking water supplies, and interfere with habitat and survival of fish and other aquatic organisms and wildlife. In addition erosion and sedimentation problems may result in degraded shorelines, loss of reservoir storage

capacity, increased flooding, and may impact boating and navigation. Education and outreach is needed to address lake resources, benefits and problems.

Responsible Parties: CSCWP
Cooperators: ADEM, CES, AWW, AEC
Potential Funding: Section 319, APC, Bass Anglers Society
Schedule: Fourth quarter, 2004, annually thereafter
Load Reduction Estimates: TBD
Estimated Cost: $20,000 annually

ACTION ITEMS

1. Promote organization of lake user and landowner groups to promote and implement components of the watershed protection plan and to provide information about the causes, sources and prevention of pollution
2. Maintain open, constructive, and timely dialogue to improve communication and to promote voluntary implementation of lake use and shoreline management measures
3. Promote the Alabama Water Watch citizen volunteer water quality-monitoring program

PROGRESS AND SUCCESS CRITERIA

1. Number of groups and individuals involved in lake and shoreline protection efforts
2. Number or type of meetings conducted that address voluntary implementation of lake use, natural resource, and shoreline management measures
3. Number of lake groups and individuals involved in citizen volunteer water quality-monitoring

STRATEGY E

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: CSCWP and CWP facilitator; 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: $350,000 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 F

Provide education and outreach to landscape, nursery, and sod farm industries. Businesses and river/lakeshore 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: CSCWP facilitator
Cooperators: AU-Agriculture/Horticulture; ADEM, CES, producer associations
Potential Funding: Section 319, producer associations
Schedule: First quarter, 2004, annually thereafter
Load Reduction Estimates: TBD
Estimated Cost: $50,000 annually

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

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 G

Promote the use of stormwater drain stenciling. Stormwater 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 CSCWP
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: $3500 per two week program

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
2. Use stencils to paint 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

PROGRESS AND SUCCESS CRITERIA

1. Stencils provided and groups organized to use stencils in all counties.
2. Water quality protection phrases painted 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

OBJECTIVE 9: 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 CSBRW 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: ADAI, ADEM, EPA, water systems, municipalities
Cooperators: CSCWP, Ground Water Guardian Program, CES, ADPH, GSA, USGS, AWW, ADECA, Alabama Rural Water Association, Legacy
Potential Funding: ADEM, EPA, ADAI
Schedule: Ongoing beginning second quarter 2006
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 CSBRW
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 CSBRW 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: CSCWP; ADEM
Cooperators: Academia, city and county governmental units, water boards, EPA, GSA, USGS, ADAI, ADPH, USDA, SWCDs, ADECA
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 informational material highlighting the importance of water conservation and groundwater pollution prevention to homeowners
2. Facilitate Groundwater Festivals to student's throughout the CSBRW
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 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 throughout the CSBRW
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. 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 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, CSCWP, Turtle Point
Potential Funding: County governmental units, ADEM
Schedule: Ongoing beginning second quarter 2006
Load Reduction Estimates: Reduced nutrients, pathogens, pesticides, toxics and other pollutants to groundwaters
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. Groundwater users are provided information to help them protect their groundwater sources
4. Groundwater development practices consider both ground-water quality protection and economic sustainability

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 local development of a watershed specific plan. 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, CWP and CAC committees
Potential Funding: County funds, USDA, COE, ADCNR, USFWS, ADEM, APC, EPA
Schedule: Ongoing beginning second quarter 2006
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 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 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 CSBRW is needed.

Responsible Parties: Alabama Natural Heritage, FWS
Cooperators: ADCNR, ADEM, CSCWP
Potential Funding: FWS, Section 319
Schedule: Ongoing beginning third quarter 2006
Load Reduction Estimates: TBD
Estimated Cost: Unknown

ACTION ITEMS

1. The Alabama Natural Heritage will use 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 CSBRW developed
2. Implementation of applicable components of the CSBRWPP 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: CSCWP
Potential Funding: FWS, ADCNR, NRCS, Section 319
Schedule: Ongoing beginning fourth quarter 2006
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: CSCWP
Cooperators: USDA, FWS, ADEM, ADCR, DCNR
Potential Funding: USDA, FWS, Section 319
Schedule: Ongoing beginning first quarter 2005
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 Environmental Quality Incentives Program (EQUIP), Wetlands Reserve Program (WRP), Conservation Reserve Program (WHIP), and the F&WS – 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 is 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: CSCWP
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 2005
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 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 CSBRW. 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: CSCWP, COE
Cooperators: ADEM
Potential Funding: Unknown
Schedule: Ongoing beginning first quarter 2005
Load Reduction Estimates: Reduced sediment and pollutant transport
Estimated Cost: Unknown

ACTION ITEMS

1. Review COE permit applications for the CSBRW (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

STRATEGY G

Participate and provide input into the Federal Energy Regulatory Commissions (FERC) relicensing and permitting process for AEC's Gantt and Point A hydroelectric facilities as well as any other industrial licensing process. Alabama Electric Cooperative owns and operates two Conecuh River hydroelectric projects, Gant and Point A, which influence the environment and economy of the CSBRW. The current FERC license for the management of these dams expires in 2005. An important part of the relicensing process is public participation. The FERC is required to consider not only

the power generation of a river, but also energy conservation, protection of fish and wildlife, protection of recreational opportunities, and preservation of other environmental quality aspects. Once a license is re-issued, stipulations are applicable for the next 30-50 years. Input is needed from CSBRW stakeholders since this process will affect quality of life for many years. In addition, any new or existing license for industrial discharge should be evaluated by stakeholders

Responsible Parties: AEC, CSCWP, ADEM, EPA, FERC
Cooperators: All river basin stakeholders
Potential Funding: No funding needed
Schedule: Ongoing beginning fourth quarter 2001
Load Reduction Estimates: TBD
Estimated Cost: No funding needed

ACTION ITEM

1. Stakeholders address dam operations and industrial discharges to safeguard the survival of threatened and endangered species through improved downstream flows, protection of water quality, protection of lands and tributaries, and stabilization of reservoir levels

PROGRESS AND SUCCESS CRITERION

1. Stakeholder comments provided to FERC for dam relicensing and ADEM for industrial discharges

OBJECTIVE 11: ASSESS THE EFFECTIVENESS OF THE CSBRW 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: CSCWP facilitator
Cooperators: All stakeholders
Potential Funding: No additional funding needed
Schedule: Annually beginning fourth quarter 2004
Load Reduction Estimates: Reduction in pollutants to all surface and groundwaters in the CSBRW, 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 CSBRW. Additional resources and stakeholder coordination is needed to achieve the goal and objectives of this basin plan as expeditiously as possible.

Responsible Parties: CSCWP 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 CSBRW
Estimated Cost: Unknown

ACTION ITEMS

1. Utilize the CSCWP and CAC committees to implement components of this watershed protection plan in subwatersheds throughout the CSBRW
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 Total Maximum Daily Loads (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 csbrw
Estimated Cost: Unknown

ACTION ITEMS

1. Establish Total Maximum Daily Loads (TMDLs) for all 2002 Section 303(d) listed waterbodies in the CSBRW
2. Provide ADEM with data or other information that will be beneficial in the development of CSBRW TMDLs
3. Encourage public participation throughout the TMDL development process, as well as written comments during the public comment period
4. Coordinate TMDL implementation plans with this watershed protection plan
5. Give higher priority to polluted waters that are a source of drinking waters or support threatened or endangered species
6. Target protection practices to reduce pollutant loads and 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 CSBRW TMDLs
2. Public provides input and comments into the TMDL development and approval process
3. TMDLs for all 2002 Section 303(d) listed waterbodies in the CSBRW
4. TMDL implementation plans coordinated with or become addendum's to this protection plan
5. Protection practices installed on polluted waters that are a source of drinking waters or support threatened or endangered species

6. 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 CSBRW is in place to coordinate the development, updating, and implementation of this watershed plan. Comments and suggestions concerning the CSBRWPP can be made at any time (in writing) to the Conecuh-Sepulga CWP facilitator. A review of the plan will be conducted annually by the CSCWP 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 CSCWP 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 Conecuh-Sepulga CWP Chair and facilitator may be contacted as follows:

Chair Conecuh-Sepulga CWP:
Willie L. (Bill) Godwin, JR.
9689 Rome Road
Andalusia, AL 36420
(334)222-5898

Facilitator Conecuh-Sepulga CWP:
Janet S. Wofford
115 South Ridge Road
Andalusia, AL 36421
(334)222-3271
janetwofford@andycable.com

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

Bullock County
(334)738-2580

Butler County
(334) 382-5111

Coffee County
(334) 894-5596

Conecuh County
(251) 578-2762

Covington County
(334) 222-1125

Crenshaw County
(334) 335-6312

Escambia County
(251) 867-7760

Lowndes County
(334) 548-2315

Monroe County
(251) 575-3477

Montgomery County
(334) 265-0233

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 Department of Economic and Community Affairs (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:

Bullock County
(334) 738-3030

Butler County
(334) 382-3154

Coffee County
(334) 347-9574

Conecuh County
(251) 578-1952

Covington County
(334) 222-1175

Crenshaw County
(334) 335-2471

Escambia County
(251) 867-5765

Lowndes County
(334) 548-2564

Monroe County
(251) 575-3109

Montgomery County
(334) 293-6400

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:

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

Butler County
(334) 376-9114
1-800-392-5679 (Burn permit or report wildfire)

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

Conecuh County
(251) 578-3226
1-800-672-3076 (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)

Escambia County
(251) 867-7798
1-800-672-3076 (Burn permit or report wildfire)

Lowndes County
(334) 227-4572
1-800-392-5679 (Burn permit or report wildfire)

Monroe County
(251) 743-2350
1-800-672-3076 (Burn permit or report wildfire)

Montgomery County
(334) 280-3701
1-800-392-5679 (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

Bullock SWCD — serviced by Tuskegee F.O. (NRCS)
(334) 738-2079 — (334) 727-3763

Butler SWCD
(334) 382-8538 ext 3

Coffee SWCD
(334) 382-8538

Conecuh SWCD
(251) 578-3594 ext 3

Covington SWCD
(334) 222-3519 ext 3

Crenshaw SWCD
(334) 335-6507 ext 3

Escambia SWCD
(251) 867-8042

Lowndes SWCD
(334) 548-2767

Monroe SWCD
(251) 743-2793 ext 3

Montgomery SWCD
(334) 223-7257 ext 3

Pike SWCD
(334) 566-2300 ext 3

Alabama Water Watch Association
www.alabamawaterwatch.org
1-888-844-4785 (toll free)

Conecuh-Sepulga Clean Water Partnership
janetwofford@andycable.com

Conecuh/Sepulga Watershed Alliance
P.O.Box 2792
Brooklyn, AL 36429-9998

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

Turtle Point Environmental Science Center
20959 Highway 31
Flomaton, AL 36441
(251) 296-3401
turtlepoint@escambiaK12.net

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

US Environmental Protection Agency (USEPA)
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 (USFS)
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
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 protection plan provides a detailed portrait of the Conecuh-Sepulga-Blackwater Rivers watershed. The watershed's physical characteristics, geology, hydrology, land use, and threatened species are thoroughly described. Programs for natural resource protection and enhancement are discussed as are current water-quality conditions.

Watershed goals and 11 primary objectives were developed by the Conecuh-Sepulga and Blackwater Rivers Watershed Protection Plan oversight committee and technical committee. The strategies to achieve the objectives are based on water quality data, land use/land cover information, and best professional judgment of GSA, 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 1998 CWP Section 303(d) List of Impaired Waters. 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 Conecuh-Sepulga and Blackwater Rivers watershed.

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.

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.

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.

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.

Southeastern regional climate center web page

SWCC, Watershed Assessments, 1998-99

Smith, 2001

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.

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

____, 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: State and County QuickFacts, 2000

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