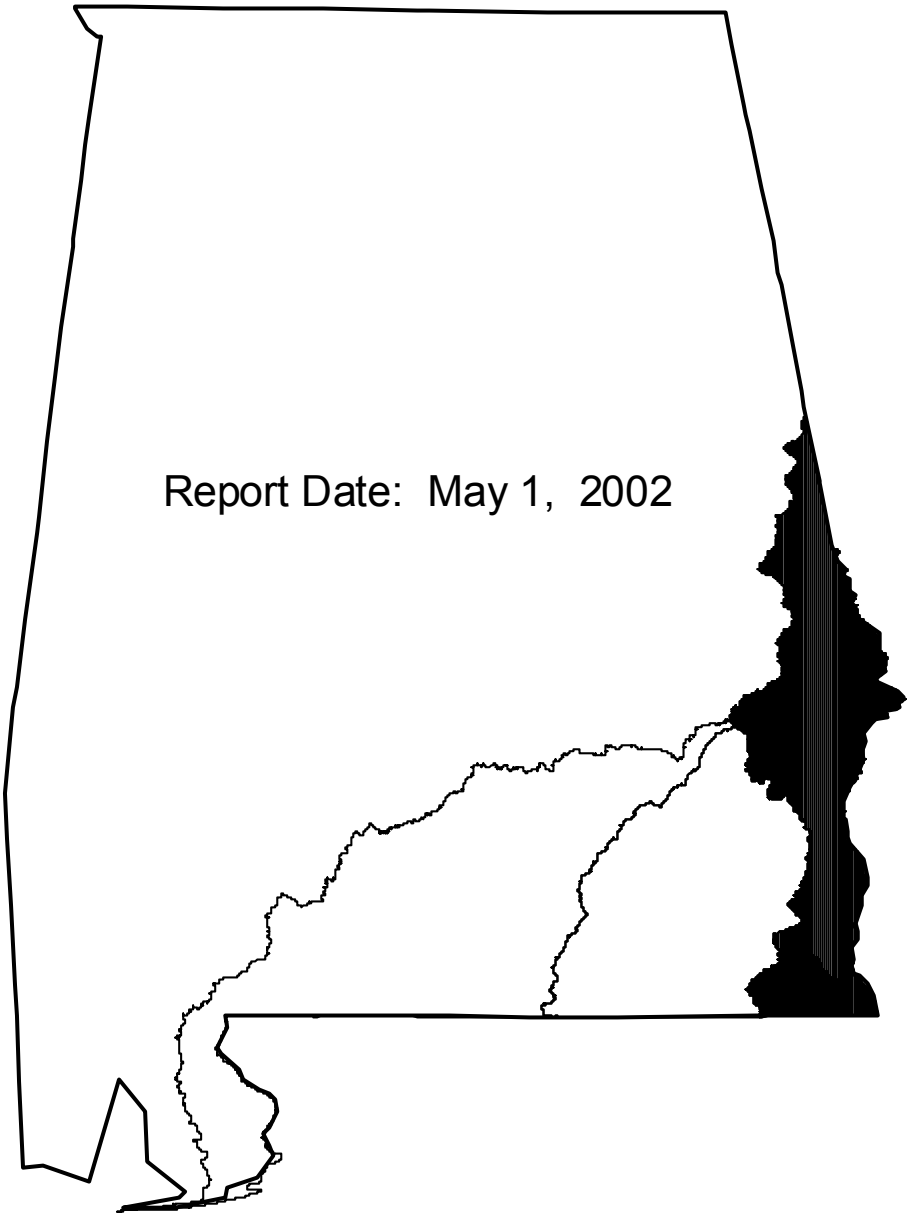
Nonpoint Source Screening Assessment of Southeast Alabama River Basins -- 1999

Volume I
Chattahoochee and Chipola Basins



Report Date: May 1, 2002

Aquatic Assessment Unit
Montgomery Branch - Field Operations Division
Alabama Department of Environmental Management

NONPOINT SOURCE SCREENING ASSESSMENT OF SOUTHEAST ALABAMA RIVER BASINS – 1999

VOLUME I

CHATTAHOOCHEE AND CHIPOLA BASINS

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AQUATIC ASSESSMENT UNIT ✦ FIELD OPERATIONS DIVISION
ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

THIS PROJECT WAS FUNDED OR PARTIALLY FUNDED BY THE ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT USING A CLEAN WATER ACT §319(H) NONPOINT SOURCE DEMONSTRATION GRANT PROVIDED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY - REGION 4.

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EXECUTIVE SUMMARY

***Background*:** In 1996, the Alabama Department of Environmental Management (ADEM) adopted a basinwide approach to nonpoint source monitoring and management using a repeating 5-year management cycle. Because of the 5-year rotation, basins are placed into groups so that all basins receive equal focus. Concentrating planning and implementation efforts within one basin group allows a focused review of available data and provides coordinated water quality monitoring and assessment efforts, efficient implementation of control activities on a geographic basis, and consistent and integrated decision-making for awarding CWA §319 funds.

During 1999, the Aquatic Assessment Unit (AAU) of the Field Operations Division completed basinwide screening assessments of the Southeast Alabama River basins. This document provides an overview of the basinwide screening assessment conducted in the Chattahoochee and Chipola Basins. Land use information and assessment data available from each of the 30 sub-watersheds in the Chattahoochee and Chipola basins are summarized.

Land use: Land use percentages and estimates of animal populations and sedimentation rates were obtained from information provided to ADEM by the Alabama Soil and Water Conservation Committee (ASWCC) and local Soil and Water Conservation Districts (SWCD). This information was provided on Conservation Assessment Worksheets completed in 1998 (FY97 CWA §319 Workplan Project #4) and entered into an ACCESS database by ADEM.

Estimates of percent land cover differed among the 4 cataloging units (CU) (Table E-1). Percent row crop was higher in the Lower Chattahoochee and Chipola River CUs. Percent pasture land was also slightly higher in these CUs. Percent urban land was highest in the Chipola River basin.

Table E-1. Estimates of percent land cover within the Lake Harding, Walter F. George, Lower Chattahoochee and Chipola River CUs (ASWCC and SWCD 1998).

Cataloging Unit	Forest	Row crop	Pasture	Mining	Urban	Open Water	Other
Lake Harding	82%	1%	8%	0%	5%	4%	0%
W. F. George	73%	7%	10%	0%	5%	2%	2%
Lower Chattahoochee	47%	33%	14%	1%	3%	1%	2%
Chipola	35%	35%	18%	0%	10%	1%	2%

Nonpoint source (NPS) impairment potential: The potential for NPS impairment was estimated for each sub-watershed in the Chattahoochee and Chipola Basin using data compiled by the local SWCD (1998) and information on the number of current construction/stormwater authorizations (Tables E-2a and E-2b). Seventeen of the 30 sub-watersheds were estimated to have a *moderate* or *high* potential for impairment from nonpoint sources. The main NPS concerns within each CU varied. Pasture, sedimentation, and forestry were the main concerns within the Lake Harding and W. F. George CU's. Animal husbandry, row crops, and pasture were concerns within the Lower Chattahoochee and the Chipola River CUs.

Table E-2a. Number of sub-watersheds with moderate or high ratings for each NPS category

Cataloging Unit	Total # sub-watersheds	Overall Potential	Animal husbandry	Aqua-culture	Row crop	Pasture	Mining	Forestry	Sediment
Lake Harding	11	5	2	0	0	5	0	4	5
W. F. George	11	4	1	1	0	7	4	0	3
Lower Chattahoochee	6	6	4	2	6	5	2	2	4
Chipola	2	2	2	1	2	2	0	0	0

Table E-2b. Number of sub-watersheds with moderate or high ratings for each point source or urban category

Category	% Urban	Development	Septic tank failure
Lake Harding	4	3	2
W. F. George	5	9	3
Lower Chattahoochee	3	3	0
Chipola	2	1	0

***Historical data/studies*:** The majority of assessments conducted within the Chattahoochee and Chipola Basins were from 8 major projects conducted by ADEM, Auburn University, and the city of Columbus, Georgia. These data include both monitored and evaluated assessments. Monitored assessments are based on chemical, physical, and/or biological data collected using commonly accepted and well-documented methods. Evaluated assessments are based on observed conditions, limited water quality data, water quality data older than 5 years, or estimated impacts from observed or suspected activities.

Results of monitored assessments were used in this report to assess habitat, biological, and chemical conditions within a sub-watershed. Monitored assessments were conducted during 6 projects (Table E-3). Evaluated assessments were conducted in conjunction with ADEM's ALAMAP Program (Appendix F-5) and Clean Water Strategy Project (Appendix F-6). A summary of each project, including lead agency, project objectives, data collected, and applicable quality assurance manuals, is provided in the appendices.

Table E-3. Projects that have generated monitored assessment information.

Project	Tables and appendices
ADEM's Ecoregional Reference Site Program	T-6a, T-7a, F-1
ADEM's §303(d) Waterbody Monitoring Program	T-6a, T-7a, F-2
Southeast Alabama Poultry Industry Impact Study	T-6a, T-7a, F-3
Middle Chattahoochee Water Quality Study	T-6a, T-7a, F-7
Water Quality Study of the Lower Chattahoochee	T-6a, T-7a, F-8
University Tributary Nutrient Project	F-4

Assessments conducted during the SE Alabama NPS Screening Assessment: Sub-watersheds were selected for assessment if recent monitoring data were not available, potential impacts from point sources or urban areas were minimal, and the sub-watershed was ranked as a priority by the local SWCD. In addition, sampling was coordinated among projects, such as ALAMAP, CWA §303d Monitoring, and the Middle Chattahoochee Water Quality Study to maximize the number of streams assessed and to prevent duplication of effort. Assessments were conducted in 5 sub-watersheds in the Chattahoochee and Chipola Basins.

***Sub-watershed summaries*:** Current and historical monitoring data were combined to provide a comprehensive assessment. A summary of information available for each of the 30 sub-watersheds is provided. The summaries are organized into 4 sections by CU. Each summary discusses land use, NPS impairment potential, assessments conducted within the sub-watershed, and the NPS priority rating based on available data. The summaries point out significant data and reference appropriate tables and appendices. Assessment of habitat, biological, and chemical conditions are based on long-term data from ADEM's Ecoregional Reference Site Program. Tables and appendices referenced in the summaries are located at the end of the report.

Sub-watershed assessments: Habitat, chemical/physical, and biological indicators of water quality were monitored at 17 stations within 14 sub-watersheds. These data are summarized in Table 12a. Habitat and macroinvertebrate assessments were conducted at each of the 17 stations. Fish community Index of Biotic Integrity (IBI) assessments were conducted at 9 of these stations. Overall condition for each station was rated as the lowest biological assessment result obtained. Sixteen of the 17 stations were assessed as *fair* or *poor*. It should be noted, however, that results of assessments conducted during 1999 may have been affected by drought conditions and should be reassessed under normal flow regimes to verify impairment status.

***Priority sub-watersheds*:** Biological impairment was detected within 13 sub-watersheds. Six were primarily impacted by urban sources. The remaining 7 were recommended as priority sub-watersheds (Table E-4). Two (40%) were located within the Lake Harding-Middle Chattahoochee River CU, 2 (40%) in the W. F. George-Middle Chattahoochee River CU, and 1 (20%) was located within the Lower Chattahoochee River CU.

Table E-4. Sub-watersheds recommended for NPS priority status.

Subwatershed Number	Subwatershed Name	Lowest Station Assessment	Suspected Cause(s)	Suspected nonpoint source(s)
0002-190	Wehadkee Creek	Fair	Sedimentation	Animal husbandry, pasture runoff
0002-220	Oseligee Creek	Fair	Unknown	Unknown
0003-060	Little Uchee Creek	Fair	Sedimentation	Pasture, Row crop
0003-100	Ihagee Creek	Poor	Sedimentation	Pasture runoff
0003-180	Barbour Creek	Fair	Sedimentation, nutrient enrichment	Silviculture, agriculture
0003-120	Hatchechubbee Creek	Fair	Sedimentation	Pasture
0004-020	McRay Mill Creek	Fair	Sedimentation	Cropland, pasture, forestry

Wehadkee Creek (0313-0002-190): Two fish bioassessments indicated Wehadkee Creek to be in *fair* condition. Animal concentrations and sedimentation rates were estimated as *high* within the sub-watershed. Five-day biochemical oxygen demand (BOD-5) was elevated.

Oseligee Creek (0313-0002-220): Macroinvertebrate assessments conducted at 2 stations indicated the communities to be in *fair* condition. The potential for NPS impairment from forestry was estimated to be *moderate*.

Little Uchee Creek (0313-0003-060): A macroinvertebrate assessment of Little Uchee Creek conducted at LUC-3 indicated impaired biological conditions at this site. Sedimentation and pasture were NPS concerns within the sub-watershed. There was a moderate potential for impairment from urban sources. However, the immediate sub-watershed of Little Uchee Creek at LUC-1, LUC-2, and LUC-3 was primarily affected by cropland and agricultural land uses.

Ihagee Creek (0313-0003-100): ADEM established a least-impaired ecoregional reference site on Ihagee Creek in 1995. Results of a fish IBI assessment conducted at the site indicated impaired biological conditions. Land use was estimated at 20% pasture and 15% cropland. SWCD estimated a *high* potential for impairment from pasture runoff. Embeddedness and sedimentation have been noted as problems at the site since it has been established.

Barbour Creek (0313-0003-100): Assessments conducted at Barbour Creek indicated the macroinvertebrate community to be in *fair* condition. Intensive chemical sampling showed fecal coliform, TKN, and BOD concentrations to be periodically high and a potential source of biological impairment. SWCD estimates indicated aquaculture, mining, and sedimentation rates to be NPS concerns within the sub-watershed. Reconnaissance of sites located on Barbour Creek indicated silviculture and agricultural land uses to also be prevalent.

Hatchechubbee Creek (0313-0003-120): The macroinvertebrate assessment conducted at HECR-2 indicated biological impairment at this segment of Hatchechubbee Creek. Local SWCD estimates indicated sediment deposition and pasture runoff to be NPS concerns within the sub-watershed. Site observations supported these findings.

McRay Mill Creek (0313-0004-020): McRay Mill Creek is recommended as a NPS priority sub-watershed due to impaired biological conditions at Bennett Mill Creek and McRay Mill Creek. Water quality samples did not suggest a cause of impairment. The main NPS concerns within the sub-watershed were runoff from cropland and pastures, forestry, and sedimentation.

ACKNOWLEDGEMENTS

Thank you to Thomas L. Anderson, Dr. Timothy Kramer, and Dr. Clifford Lange of the Auburn University Civil Engineering Department for providing data included in this report and to Dr. Patrick O'Neil of the Geological Survey of Alabama for efforts in helping develop Fish IBI metrics for the Southeast Alabama Basins. Thank you to Vic Payne, the State Soil and Water Conservation Committee, and the Local Soil and Water Conservation Districts (SWCDs) in the Southeast Alabama Basins for providing the Conservation Assessment Worksheet information for inclusion in this report.

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LIST OF ABBREVIATIONS

Abbreviation	Interpretation
§	Section
AAU	Aquatic Assessment Unit of ADEM's Field Operations Division (Formerly EIS)
ADEM	Alabama Department of Environmental Management
ALAMAP	Alabama Monitoring and Assessment Program
AU	Animal Unit as defined by ADEM CAFO Rules
BMP	Best Management Practices
Br	Branch
CAFO	Concentrated Animal Feeding Operation
cfs	Cubic Feet per Second
Chem.	Chemical/Physical Water Quality
CR	County road
Confl.	Confluence
Cr	Creek
CU	Cataloging Unit
CWA	Clean Water Act
CWP	Clean Water Partnership
ds	Downstream
EIS	Environmental Indicators Section of ADEM's Field Operations Division
EPA	U.S. Environmental Protection Agency
FOD	Field Operations Division
GPS	Global Positioning System
GSA	Geological Survey of Alabama
H	High
IBI	Index of Biotic Integrity (fish community)
L	Low
M	Moderate
Macroinv.	Aquatic Macroinvertebrate Assessment
Macroinvertebrate	Aquatic Macroinvertebrate Community
MB-EPT	Multihabitat Bioassessment for Ephemeroptera, Plecoptera and Trichoptera
mg/L	Milligrams per Liter
mi^2	square miles
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
nr	Near
NRCS	Natural Resources Conservation Service
OE/DO	Organic Enrichment/Dissolved Oxygen
R	River
RM	River Mile
SE	Southeast
SSWCC	State Soil and Water Conservation Committee
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
TNTC	Too numerous to count
TVA	Tennessee Valley Authority
ug/g	Micrograms per Gram
ug/L	Micrograms per Liter
us	Upstream
WQDS	Water Quality Demonstration Study

INTRODUCTION

The Alabama Department of the Environmental Management (ADEM) is charged with monitoring the status of the state's water quality pursuant to the Clean Water Act and the Alabama Water Pollution Control Act. Under the Clean Water Act (CWA) of 1977, the EPA emphasized programs addressing the chemical contamination of the nation's waters (National Research Council 1992). State and federal programs initiated to meet these water quality guidelines have been largely successful in controlling and reducing certain kinds of chemical pollution from point source discharges (National Research Council 1992, ADEM 1996c). The detection, assessment, and control of impairment from point sources is fairly well understood because the pollutants, their concentrations, and probable points of impact are known (National Research Council 1992, USEPA 1997a)

Nonpoint source (NPS) pollution, defined as any unconfined or diffuse source of contamination, accounts for approximately two-thirds of the water quality impairments in Alabama's streams (ADEM 2001). It is generated irregularly and often associated with storm water runoff or atmospheric deposition (USEPA 1997a). Nonpoint source impairment is associated with land use within a watershed, such as agriculture, silviculture, and mining. The pollutants, their concentrations, and/or their source(s) may not be known or well defined. Because of their transient nature, these pollutants may not be detected by periodic water quality measurements (National Research Council 1992).

The 1987 amendments to the Clean Water Act added Section 319, which established a national program to assess and control nonpoint source pollution. Under this program, states are asked to assess their nonpoint source pollution problems and submit these assessments to USEPA. In 1996, ADEM adopted a basinwide approach to water quality monitoring using a 5-year rotating basin group cycle. Concentrating monitoring efforts within one basin provides the Department with a framework for more centralized management and implementation of control efforts and provides consistent and integrated decision making for awarding CWA §319 NPS funds.

In 1997, the Aquatic Assessment Unit (AAU) of the Field Operations Division developed basinwide screening assessment methods that could be used to identify sub-watersheds with the highest potential for NPS pollution, assess water quality within selected sub-watersheds, and prioritize sub-watersheds most impaired by NPS pollution. The projects are completed in 4 phases. During Phase I, land use information, Departmental regulatory databases, available historical data, and other assessment information are used to identify data gaps and to prioritize sub-watersheds with the greatest potential for NPS impairment. During Phase II, selected sites are assessed using macroinvertebrate and fish community assessments, habitat assessments, and collection of chemical data. Assessments are based on long-term data from ADEM's Ecoregional Reference Site Program. During Phase III, data collected during Phase II, as well as existing data and assessment information, are analyzed to evaluate the level of impairment within each sub-watershed and determine the cause and source of impairment. A comprehensive report is completed during the final phase.

The AAU has completed basinwide NPS screening assessments of the Black Warrior (1997) and Tennessee (1998) basins. The results of the studies have been reported in two separate documents (ADEM 1999h, ADEM 2000a). During 1999, the AAU completed a basinwide screening assessment of the Chattahoochee-Chipola, Choctawhatchee, and Perdido-Escambia River basins. The area encompasses 137 sub-watersheds within 16 hydrologic cataloging units. Although completed as one basinwide screening project, the results of the NPS Screening Assessment have been reported in 3 separate documents. This document summarizes the assessment information and results obtained within the Chattahoochee and Chipola Basins. Data collected within the Perdido and Escambia Basins are reported together in Volume III. Volume II presents the results obtained within the Choctawhatchee River basin.

METHODOLOGY

Study Area

The Chattahoochee-Chipola Basins compose the Apalachicola Accounting Unit. The basins include 4 hydrologic CUs and 30 sub-watersheds (fig. 1). The Chattahoochee River has 2,832 mi^2 of drainage in Alabama and is located within portions of Randolph, Chambers, Lee, Russell, Barbour, Henry, and Houston Counties. The headwaters of the Chipola River basin drain 258 mi^2 of Houston and Geneva Counties in the southeast corner of Alabama.

Ecoregions

Ecoregions are relatively homogeneous ecological areas defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables. Since 1991, ADEM has maintained a network of least-impaired ecoregional reference sites. Intensive monitoring assessments, including chemical, physical, habitat, and biological data, are collected to develop baseline reference conditions for each of Alabama's 29 Level IV subecoregions (Griffith et al. 2001). The reference condition establishes the basis for making comparisons and detecting use impairment.

The Chattahoochee and Chipola basins are located in the *Southeastern Plains (65)* and the *Piedmont (45)* ecoregions (fig. 2).

Piedmont (45): The Outer Southern Piedmont (45b) subecoregion, which drains the upland areas of the Chattahoochee River basin in Randolph, Chambers, and Lee Counties, is characterized by dissected irregular plains and low-to-moderate gradient streams with cobble, gravel, and sand substrates. Elevations are generally 335-945 feet; relief ranges from 100-300 feet (Griffith et al. 2001).

Widespread forest clearing and farming in the 1800's and early part of the 1900's led to high rates of soil erosion (Trimble 1974). The history of soil erosion greatly increased sediment loads in the streams and rivers with extensive deposits of sand and silt on the floodplains (Mulholland and Lenat 1992). These deposits continue to serve as a source for sediment transport.

The Piedmont has little original topsoil, and the red clay subsoil remaining is not as productive. With loss of soil fertility and abandonment of farmland, much of the Piedmont is used for pasture, hay, and cattle production.

Southeastern Plains (65): The flat to undulating ***Blackland Prairie*** (65a) is characterized by distinctive Cretaceous-age chalk, marl, and calcareous clay with poor drainage. Stream flows tend to vary with both season and rainfall. Elevations are generally 150-250 feet. The area's natural vegetation of sweetgum, post oak, red cedar, and blue stem prairie has been transformed to cropland and pasture, with small patches of mixed hardwoods. Pond-raised catfish aquaculture has increased in recent years.

The ***Flatwoods/Blackland Prairie Margins*** (65b) subecoregion combines two slightly different areas. The Flatwoods consist of a mostly-forested lowland area of little relief, formed primarily on dark, massive marine clay. Soils are deep, clayey, poorly drained, and acidic. The Blackland Prairie Margins are undulating, irregular plains, with slightly more relief than the Flatwoods, but also tend to have heavy clay soils with generally poor drainage.

The ***Southern Hilly Gulf Coastal Plain (65d***) drains portions of the Middle Chattahoochee - W.F. George and Lower Chattahoochee CUs. This subecoregion is characterized by dissected irregular plains and gently rolling hills. It developed over diverse east-west trending bands of sand, clay, and marl formations. Broad cuestas with gentle south slopes and steeper north facing slopes are common. It has more rolling topography, higher elevations, more relief, and higher-gradient streams than 65a, 65b, and 65g. The natural vegetation of oak-hickory-pine forest grades into

southern mixed forest to the south. Land cover is mostly forest and woodland with some cropland and pasture.

The ***Dougherty Plains subecoregion (65g)*** is located in the Dougherty Plains of Southeast Alabama. These are flat to rolling plains with elevations generally 100-300 feet. Soils are sandy to clayey over residuum geology derived from solution and collapse of limestone. The streams in this area are characterized by braided channels and slightly- to moderately-tannic water. The floodplains are large with low stream banks and shaded channels.

The northern-most section of the Chattahoochee River basin falls within the ***Fall Line Hills (65i)*** subecoregion. This area is composed primarily of Cretaceous age loamy and sandy sediments. It is mostly forested terrain of oak-hickory-pine on hills with 200-400 foot relief.

The ***Southeastern Floodplains and Low Terraces (65p)*** comprise a riverine ecoregion of large sluggish rivers and backwaters with ponds, swamps, and oxbow lakes. Within these basins, the subecoregion defines the riparian zone of the Chattahoochee River. River swamp forests of bald cypress and water tupelo and oak-dominated bottomland hardwood forests provide important wildlife corridors and habitat. In Alabama, cropland is typical on the higher, better-drained terraces, while hardwoods cover the floodplains.

Topography/soils

Four different soil regions influence the basins of Southeast Alabama. The majority of the area is influenced by Coastal Plain soils with the northern portions of the area draining primarily the Piedmont Plateau, and Blackland Prairie soils. Flood plain soils influence drainage in areas of the southern tier counties along the Choctawhatchee and Conecuh Rivers (NRCS 1997).

Underlying geologic formations are among factors that influence natural water quality. Physiographic sections within Perdido River and Escambia River Accounting Units include the Piedmont Upland and the East Gulf Coastal Plain. The Piedmont Upland Section is the non-mountainous section of the "older Appalachians". Piedmont geology is complex, consisting of high and low grade metamorphic and igneous rocks, including quartzite, phyllite, slate, schist, amphibolite and gneiss. Streams of this section flow over bedrock between steep hillsides. They are generally swift and have high gradients. The East Gulf Coastal Plain Section is characterized by gentle rolling hills, sharp ridges, prairies and broad alluvial floodplains. The greater part of this section is underlain by permeable sands and gravel, which have excellent water bearing properties. Streams in this section are generally slow and have muddy sand bottoms. (Mettee et al. 1996)

Preliminary Selection of Sub-watersheds

Sub-watershed selection included review of data from previous assessments within the Southeast Alabama basins to concentrate efforts in areas not recently assessed. Additionally, Departmental municipal and industrial databases were reviewed to screen out areas primarily impacted by point sources. Sub-watersheds were not considered for assessment if they were not primarily located in Alabama or were relatively small (<30 mi^2) (USDASCS 1995).

The Alabama Soil and Water Conservation Committee (ASWCC) and local Soil and Water Conservation Districts (SWCD) provided ADEM with estimates of land use, animal populations, and sedimentation rates on conservation assessment worksheets completed by each county during 1998 (FY97 CWA 319 Workplan Project #4) (Tables 2, 3, and 4). Additional land use information was obtained from EPA-published estimates of percent land cover for the entire southeastern U.S. (EPA 1997a) based on leaves-off Landsat TM data acquired in 1988, 1990, 1991, 1992, and 1993. Recent ground-truthing of these estimates have indicated 40-60% accuracy due to changes in land use within the last 10 years (Olson and Gore 2000, Pitt 2000). A comparison of land use estimates

from the conservation assessment worksheets and the EPA Landsat data is provided in Tables 2a and 2b. The finer land use categories defined by the EPA land use dataset are provided in Appendix A-1. Descriptions of the Landsat TM data are provided in Appendix A-2.

The data compiled by the local SWCD was used as a desktop screening tool to target sub-watersheds with the greatest potential for impairment from nonpoint sources. Criteria used to identify target sub-watersheds included a priority rating of 1-5 by the SWCD, total area <20% urban, <0.04 septic tanks/acre, and cattle present within the sub-watershed. Based on location of previous assessments, concentrated point sources, and analysis of SWCD data, 27 sub-watersheds were selected for assessment.

Nonpoint Source Impairment Potential

The local SWCD Conservation Assessment Worksheets were used to assess the potential for NPS impairment in several categories: animal husbandry, cropland, pasture runoff, mining, forestry practices, and sedimentation. Where the information was available, 3 categories were summed to assess the potential for impairment from forestry practices: percent acres clear-cut, percent of acres harvested annually, and percent of forest needing improvement. This information was provided by the local SWCD and the Alabama Forestry Association.

The potential for NPS impairment from activities associated with animal husbandry was estimated. Potential of impairment among the different types of animals was standardized by converting animal population estimates into animal densities. Animal Unit (AU) estimates were calculated for each of the animal types based on the current conversion factors found in ADEM Administrative Code Chapter 335-6-7 (Table 1a). These values considered characteristics such as live weight equivalent waste quantity and constituent composition (limiting nutrients, moisture, additive compounds, etc.). (ADEM 1999b). Animal units were further standardized to animal unit densities (AU/acre of sub-watershed). Percent urban land, number of current construction/stormwater authorizations, and septic tanks were used to identify sub-watersheds potentially impacted by urban land uses.

Table 1a. Current Conversion Factors found in ADEM Admin. Code Chapter 335-6-7 (CAFO Program Rules).

Animal Type (CAFO Definition)	Numbers of Animals	Animal Unit (AU) Equivalent
Cattle (slaughter, feeder, dairy heifers)	1	1.0
Dairy (mature)	1	1.4
Swine (>55 lbs.)	1	0.4
Poultry (Broiler & Layer)	125	1.0

Each sub-watershed was assigned an impairment potential for each category. Table 2 shows the range of values used to define low, moderate, and high impairment potential for each category. These ranges were determined using the mean and standard deviation of SE Alabama basin data for each parameter. A value of less-than-or-equal-to the calculated mean was assigned a *low* potential. Values greater than the mean, but equal-to-or-less-than 2-standard deviations above the mean were assigned a *moderate* potential and values greater than 2-standard deviations above the mean were assigned a *high* potential for NPS impairment. The potential for impairment from percent forestry activities was estimated by summing the percent of acres clear-cut, percent of acres harvested annually, and percent of forest in need of improvement.

For each sub-watershed and CU, the impairment potential for each category was converted from low, moderate, and high to scores of 1, 3, and 5, respectively. These values were summed to

rate overall NPS impairment potential. Scores greater than or equal to the 90th percentile were rated as *high*; scores greater than the 50th percentile, but less than the 90th percentile were *moderate*; scores less than the 50th percentile were *low*. Sub-watersheds and CUs that scored in the *moderate* range, but received a *high* rating in at least two categories were rated as *high* for overall NPS potential. Sub-watersheds ranked as high in both rural and non-rural NPS potential were further evaluated to determine the point-source location in relation to potential assessment sites.

Table 1b. Range of values used to define Low, Moderate, and High potential for impairment for each rural NPS category.

Category	Low	Moderate	High
% Cropland	<16%	16% to 39%	>39%
% Pastureland	<9%	9% to 20%	>20%
% Mining	<0.1%	0.1% to 0.4%	>0.4%
% Forestry Practices	<21%	21% to 49%	>49%
% Aquaculture	<0.01%	0.01% to 0.05%	>0.05%
Animal Units/acre	<0.08	0.08 to 0.19	>0.19
Sedimentation rate (tons/acre)	<4	4 to 12	>12
Overall Rural NPS Potential	**<10**	**10 to 17**	**>17**

Table 1c. Range of values used to define Low, Moderate, and High potential for impairment for each non-rural NPS category.

Category	Low	Moderate	High
% Urban	<4%	4% to 14%	>14%
# Construction/stormwater authorizations	<3	3 to 6	>6
Failing septic tanks/acre	<0.01	>0.01	---

The nonpoint source categories and ranges used for the Southeast Alabama Basins may not be applicable to water quality conditions and activities in other basins of the State. They are intended to be descriptive, but are open to differing interpretations considering alternative data analysis techniques and are subject to refinement as data availability and analysis warrants.

The local SWCD also evaluated streams for each of the sub-watersheds located in their respective counties. These evaluations were discussed during public meetings and were used to rank the sub-watersheds as to their perceived priority for conducting water quality improvement projects. The 1st priority was given to the sub-watershed with the greatest need. A single sub-watershed may have more than one priority, if two or more of the counties containing the sub-watershed gave it a top-five priority ranking. This information was used to supplement the sub-watershed estimates of NPS impairment potential.

Habitat Assessment

Biological condition of the fish and aquatic macroinvertebrate communities is generally correlated with the quality of available habitat (without considering influences of water quality). The presence of stable and diverse habitat usually supports a diverse and healthy aquatic fauna (Barbour and Stribling 1991). Therefore, habitat quality was assessed at each site to evaluate stream condition and to assist in the interpretation of biological data. Primary, secondary, and tertiary habitat parameters were evaluated to assess overall habitat quality at each site. Primary

habitat parameters evaluate the availability and quality of substrate and instream cover. They include those characteristics that directly support aquatic communities, such as substrate type, stability, and availability. Secondary habitat parameters evaluate channel morphology, which is determined by flow regime, local geology, land surface form, soil, and human activities. Channel morphology indirectly affects the biological communities by affecting sediment movement through a stream (Barbour and Stribling 1991). Secondary habitat parameters include an evaluation of flow regime, sinuosity/instream geomorphology, and sediment deposition and scouring. Tertiary habitat characteristics evaluate bank structure and riparian vegetation. Bank and riparian vegetation prevent bank erosion and protect the stream from stormwater runoff from impervious surfaces. The presence of overhanging riparian vegetation also determines the primary energy source for aquatic macroinvertebrate communities—the base of the fish food chain (Vannote et al. 1980). Tertiary parameters include bank condition, bank vegetative protection, and riparian zone width.

The revised EPA habitat assessment forms evaluate riffle/run (Appendix B-1) and glide/pool (Appendix B-2) streams separately (EPA 1997b). The primary habitat parameters of the glide/pool habitat assessment place more emphasis on habitat characteristics important to this stream-type, primarily pool structure and variability. Because the revised habitat assessment forms more accurately assess habitat quality and degradation to glide/pool streams, the ADEM began using the revised forms in 1996 (ADEM 1996c). In addition, because they measure impairment to habitat quality, the scores (converted into percent of maximum) were comparable between stream types and can be used to evaluate streams throughout the basin.

One physical characterization sheet was filled out at each station (Appendix C). Depending upon stream geomorphology, each team member completed a riffle/run or glide/pool habitat assessment.

Aquatic Macroinvertebrate Assessment: Multi-habitat EPT Method

The aquatic macroinvertebrate communities were assessed at all wadeable sites during May and June of 1999. A modified multihabitat EPT bioassessment method was used to evaluate the integrity of the aquatic macroinvertebrate communities (ADEM 1999f). The multihabitat EPT method is a screening technique used in basinwide screening assessment studies. Since assessments were conducted at multiple sites over a large area, collection effort and analysis time were decreased by processing samples in the field and focusing on the collection of the pollution sensitive Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa. EPT taxa were collected from all productive in-stream habitats available at each sampling site. These included: riffles, CPOM (course particulate organic matter), rocks and/or logs, undercut banks, and sand. The samples collected from each habitat were field processed and returned to the laboratory for identification. The total number of EPT families collected from each station was compared to data collected from least-impaired ecoregional reference sites to indicate the health of each stream. A designation of *excellent, good, fair, or poor* was assigned to each station.

Fish Community Index of Biotic Integrity (IBI) Assessment

Fish community assessments were conducted during July of 1999. The fish assessments were conducted at established reference sites and stream reaches in which the aquatic macroinvertebrate assessment bordered between 2 impairment categories. The fish IBI sampling protocol, developed by Geological Survey of Alabama (O'Neil and Shepard 1998), uses a time-based multihabitat approach. A 3-person crew sampled all available habitats including riffles, snags, pools, runs and rootbanks, using an 8 ft long, 3/16 inch mesh minnow seine and backpack electro-shocker. Each sample required 30 to 40 minutes to complete. Samples were fixed with

10% formalin and transported to the laboratory. At the laboratory samples were identified to species, counted, weighed, and preserved in 70% ethanol.

The data were analyzed using 12 metrics of the fish community related to species richness (# of species) and composition, trophic composition, fish abundance, and condition. The total number of fish captured was standardized to catch-per-hour. Each metric was given a score according to the associated criteria and totaled to determine the Index of Biotic Integrity (IBI) score. The integrity of the fish community was determined to be *excellent, good, fair, poor, or very poor* based on the total IBI score.

Chemical Assessment

Water chemistry samples were analyzed for parameters selected as indicators of impairment from land uses present within the Southeast Alabama river basins, including sedimentation (total suspended solids, total dissolved solids), nutrient enrichment (total phosphate, nitrate/nitrite, BOD-5), and metals.

Stream flow estimates, routine field parameters, and water quality samples were collected at twenty-seven stations in July of 1999 (Appendices D-1, D-2). Chemical analyses of water samples were conducted by the ADEM's Central Laboratory in Montgomery in accordance with analysis and quality assurance procedures outlined in Quality Assurance Manual for the ADEM Central Laboratory (1999j). Water quality samples for laboratory analysis were collected, preserved, and transported to the ADEM Laboratory as described in ADEM Field Operations Standard Operating Procedures and Quality Control Assurance Manual, Volume I- Physical/ Chemical (2000f). Duplicate field parameters and samples were collected during 10% of the sampling events.

Chain of Custody

Sample handling and chain-of custody procedures were used for all biological and chemical samples as outlined in ADEM Field Operations Standard Operating Procedures and Quality Control Assurance Manual, Volumes I and II to ensure the integrity of all samples collected (1999f, 2000f).

Final Assessment and Ranking of Sub-watersheds

Fish and macroinvertebrate communities may respond to changes in water quality in different ways and to varying degrees over time. Consequently, monitoring changes in biological communities can detect impairment from nonpoint source pollution, which can be infrequent or low-level. The fish community seems particularly well-suited to identifying impairments due to habitat modification. The macroinvertebrates provide more information about water column effects as potential causes of impairment. In addition, each group has different recovery rates with macroinvertebrate communities generally quicker to recover than fish communities.

Fish and aquatic macroinvertebrate assessment results indicating these communities to be in *poor* or *fair* condition were used to designate priority sub-watersheds. Physical/chemical data and land use information were used to evaluate the potential source(s) of impairment.

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Apalachicola Accounting Unit (0313-00) Summary

Land use: The Apalachicola Accounting Unit, composed of the Chattahoochee and Chipola basins, includes 4 cataloging units (CUs) and 30 sub-watersheds. It drains approximately 2,830 mi^2 within a 10-county area and defines the southeastern border between Alabama and Georgia (fig. 1). The basins contain 8 subecoregions of the Piedmont and Southeastern Plains ecoregions (fig. 2).

Table R-1 summarizes SWCD estimates of percent land cover within the Middle Chattahoochee - Lake Harding, Middle Chattahoochee - W. F. George, Lower Chattahoochee, and Chipola River CUs. Estimates differed among the 4 CU's. Percent row crop was higher in the Lower Chattahoochee and Chipola River CUs. Percent pasture was also slightly higher in these CUs. Percent urban area was highest in the Chipola River CU.

Table R-1. Estimates of percent land cover within the Lake Harding, Walter F. George, Lower Chattahoochee and Chipola River CUs (ASWCC and SWCD 1998).

Cataloging Unit	Forest	Row crop	Pasture	Mining	Urban	Open water	Other
Lake Harding	82%	1%	8%	0%	5%	4%	0%
W. F. George	73%	7%	10%	0%	5%	2%	2%
Lower Chattahoochee	47%	33%	14%	1%	3%	1%	2%
Chipola	35%	35%	18%	0%	10%	1%	2%

NPS impairment potential: The overall potential for NPS impairment was estimated to be *moderate* or *high* in 17 sub-watersheds (fig. 3). Pasture (fig. 4) and sedimentation (fig. 5) were the primary NPS concerns within the study area. Impairment from animal husbandry (fig. 6) and cropland runoff (fig. 7) were concerns within the Lower Chattahoochee and Chipola Basins.

Historical data/studies: The majority of assessments conducted within the Chattahoochee and Chipola Basins were collected during 8 major projects conducted by ADEM, Auburn University, and the city of Columbus (fig. 8).

These data include both monitored and evaluated assessments. Monitored assessments are based on chemical, physical, and/or biological data collected using commonly accepted and well-documented methods. Evaluated assessments are based on observed conditions, limited water quality data, water quality data older than 5 years, or estimated impacts from observed or suspected activities.

Results of monitored assessments were used in this report to assess habitat, biological, and chemical conditions within a sub-watershed. Monitored assessments were conducted during 6 projects (Table E-3). Habitat and biological data are provided in Tables 6a and 7a, respectively. Chemical and physical data are provided in the appendices listed below. Evaluated assessments were conducted in conjunction with ADEM's ALAMAP Program (Appendix F-5) and Clean Water Strategy Project (Appendix F-6). A summary of each project, including lead agency, project objectives, data collected, and applicable quality assurance manuals, is provided in the appendices.

Table E-3. Projects that have generated monitored assessment information.

Project	Appendices
ADEM's Ecoregional Reference Site Program	F-1
ADEM's §303(d) Waterbody Monitoring Program	F-2
Southeast Alabama Poultry Industry Impact Study	F-3
Middle Chattahoochee Water Quality Study	F-7
Water Quality Study of the Lower Chattahoochee and Choctawhatchee Basins	F-8
University Tributary Nutrient Project	F-4

Assessments conducted during the SE Alabama NPS screening assessment: Sub-watersheds were selected for assessment if recent monitoring data were not available, potential impacts from point sources or urban areas were minimal, and the sub-watershed was ranked as a priority by the local SWCD. In addition, sampling was coordinated among projects, such as ALAMAP, §303d Monitoring, and the Middle Chattahoochee Water Quality Study to maximize the number of streams assessed and to prevent duplication of effort. Assessments were conducted in 5 sub-watersheds in the Chattahoochee and Chipola basins (fig. 8).

***Sub-watershed summaries*:** Current and historical monitoring data were combined to provide a comprehensive assessment. A summary of information available for each of the 30 sub-watersheds is provided. The summaries are organized into 4 sections by CU. Each summary discusses land use, NPS impairment potential, assessments conducted within the sub-watershed, and the NPS priority rating based on available data. The summaries point out significant data and reference appropriate tables and appendices. Assessment of habitat, biological, and chemical conditions are based on long-term data from ADEM's Ecoregional Reference Site Program (ADEM 2000a). Tables and appendices referenced in the summaries are located at the end of the report.

Sub-watershed assessments: Habitat, chemical/physical, and biological indicators of water quality were monitored at 17 stations within 14 sub-watersheds. These data are summarized in Table 12a. Habitat and macroinvertebrate assessments were conducted at each of the 17 stations (fig. 9). Fish community Index of Biotic Integrity (IBI) assessments were conducted at 9 of these stations (fig. 10). The overall condition for each station was rated as the lowest biological assessment result obtained. Sixteen of the 17 stations were assessed as *fair* or *poor* (fig. 11).

***Priority sub-watersheds*:** Seven priority sub-watersheds were identified within the Chattahoochee River Basin (fig. 11). Two (28%) were located within the Lake Harding-Middle Chattahoochee River CU, 4 (57%) in the W. F. George-Middle Chattahoochee River CU, and 1 (14%) was located within the Lower Chattahoochee River CU.

Figure 1. Sub-Watersheds of the Chattachoochee and Chipola River Basins.

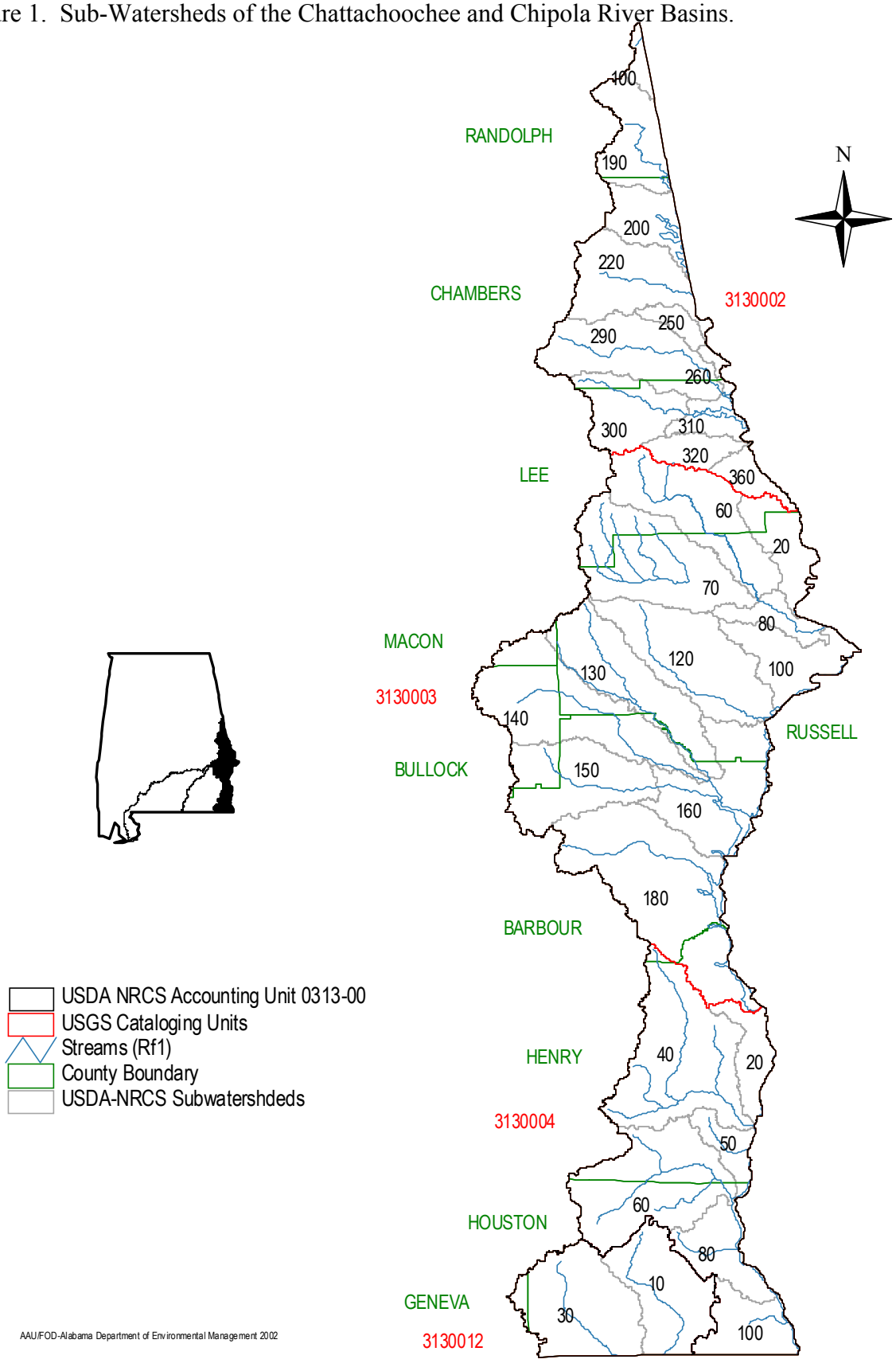

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Figure 2. Level III and IV Sub-Ecoregions of the Chattachoochee and Chipola River Basins.

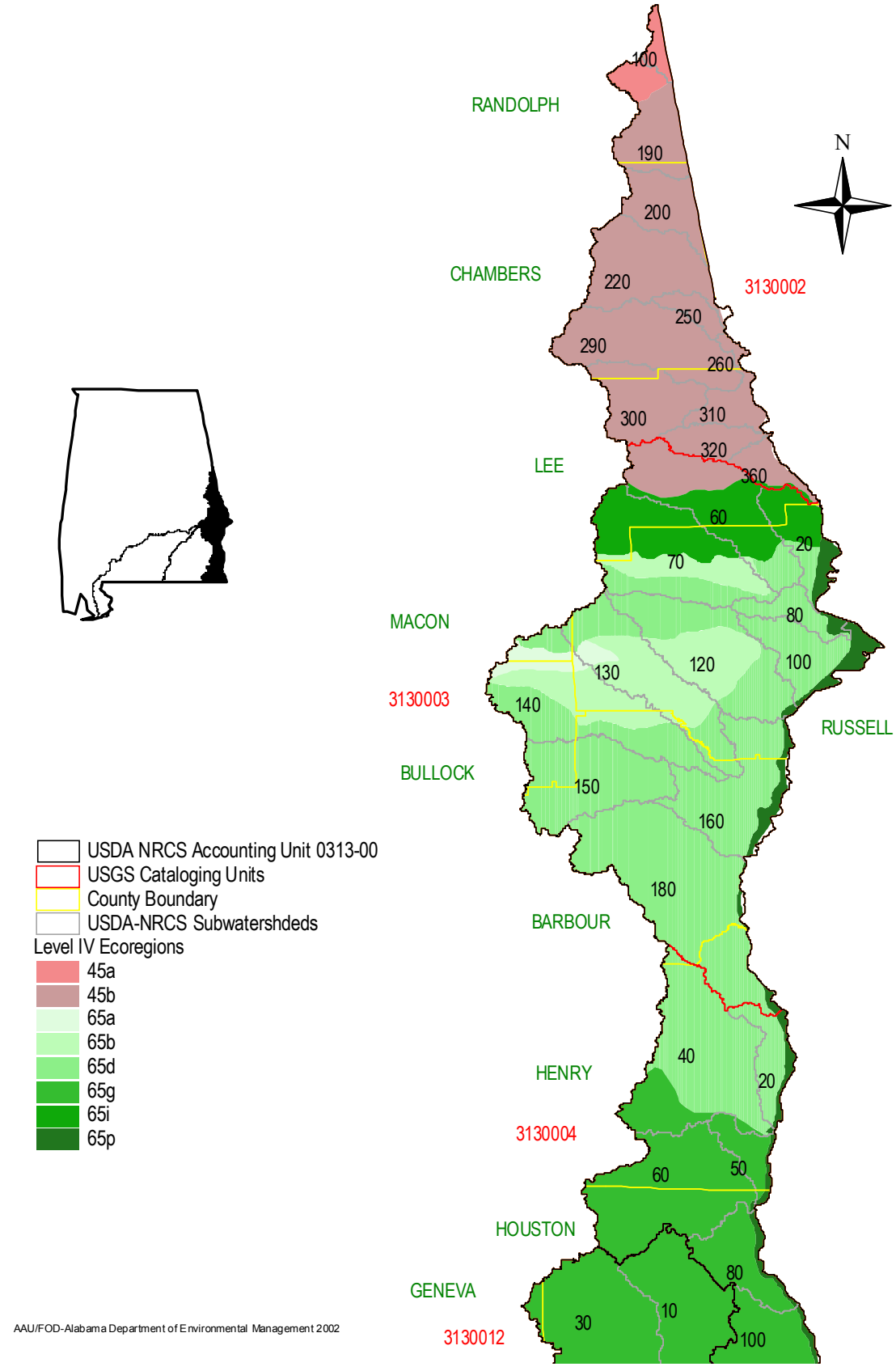

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Figure 3. NPS Impairment Potential for Sub-Watersheds Located in the Chattachoochee and Chipola River Basins.

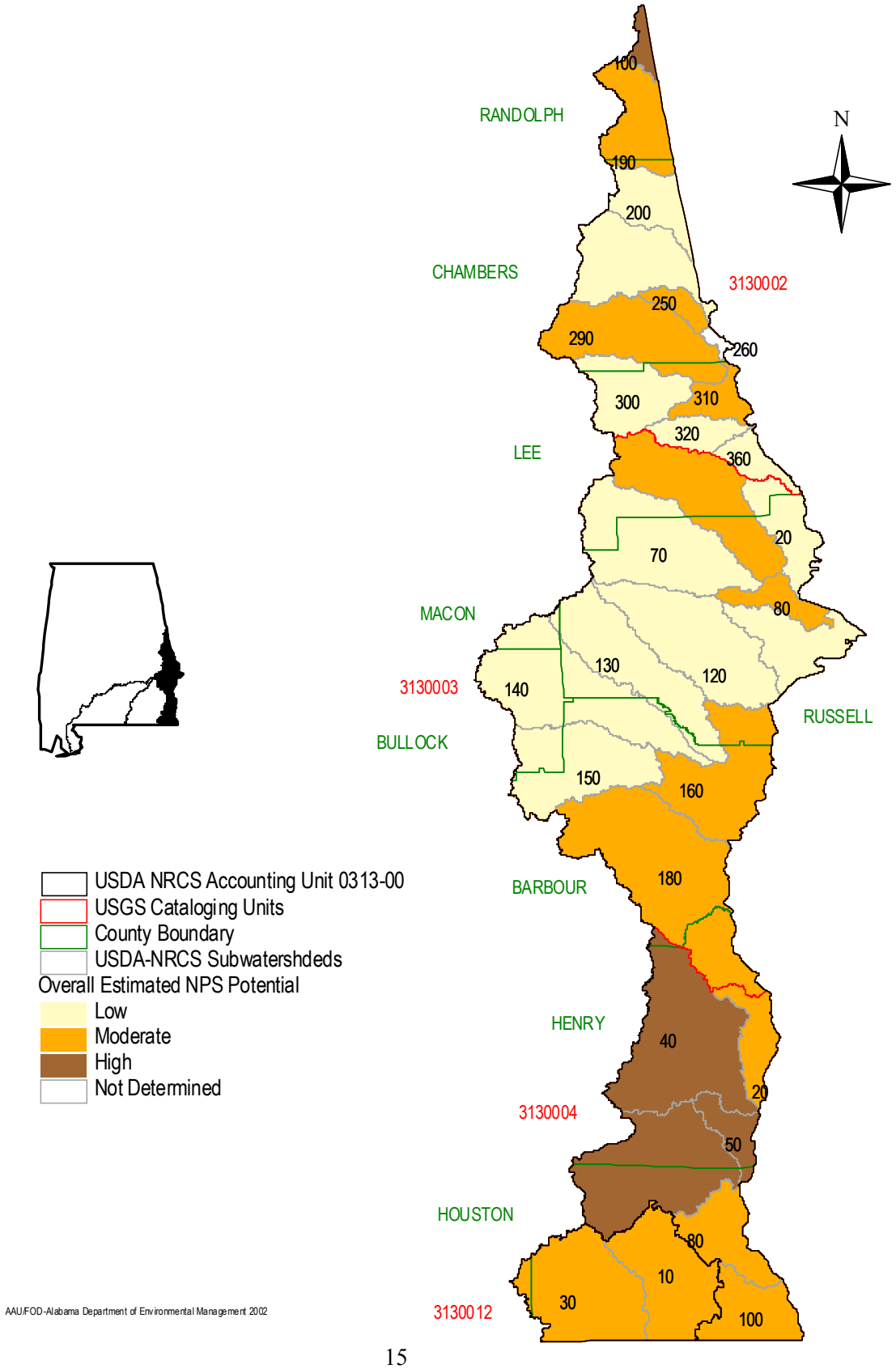

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Figure 4. Estimates of NPS Impairment Potential from Pasture Land Use Based Upon Local SWCD Landuse Estimates for the for Sub-Watersheds of the Chattachoochee and Chipola River Basins.

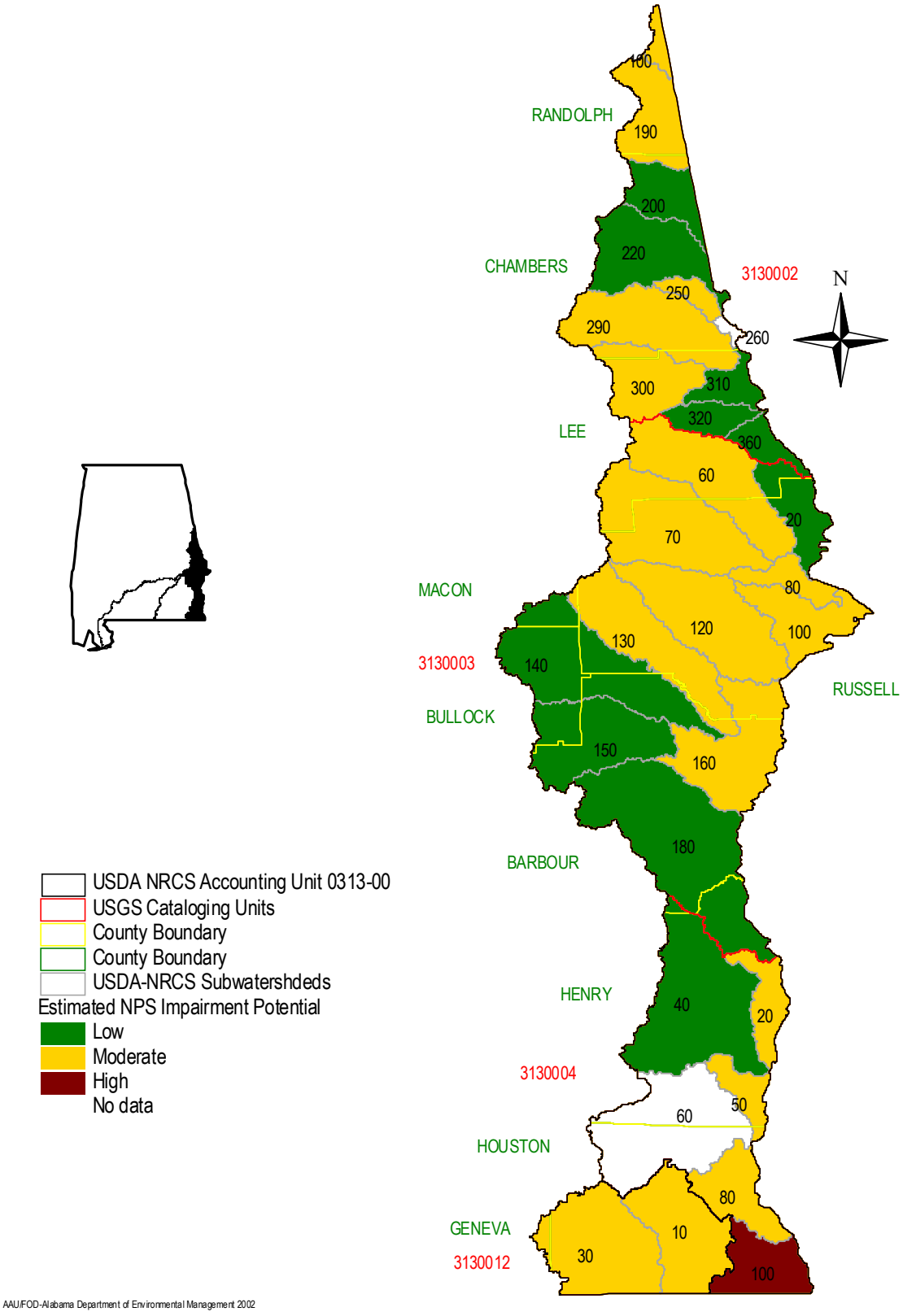

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Figure 5. Estimates of NPS Impairment Potential from Sedimentation Based upon Local SWDC Sedimentation Rate Estimates for the Chattachoochee and Chipola River Basins.

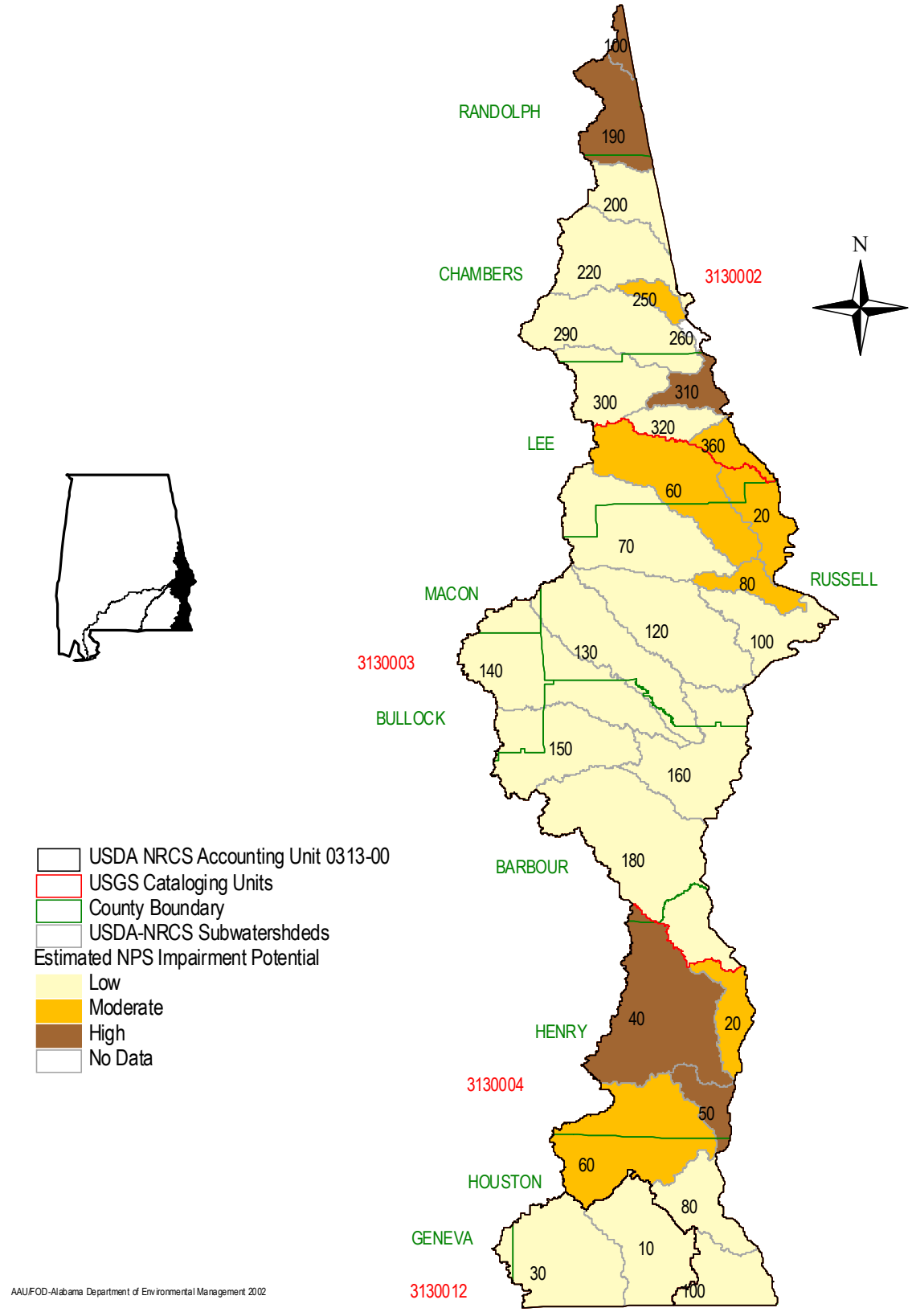

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Figure 6. Estimates of NPS Impairment Potential from Animal Husbandry Activities Based upon Local SWCD Animal population Estimates for the Chattachoochee and Chipola River Basins.

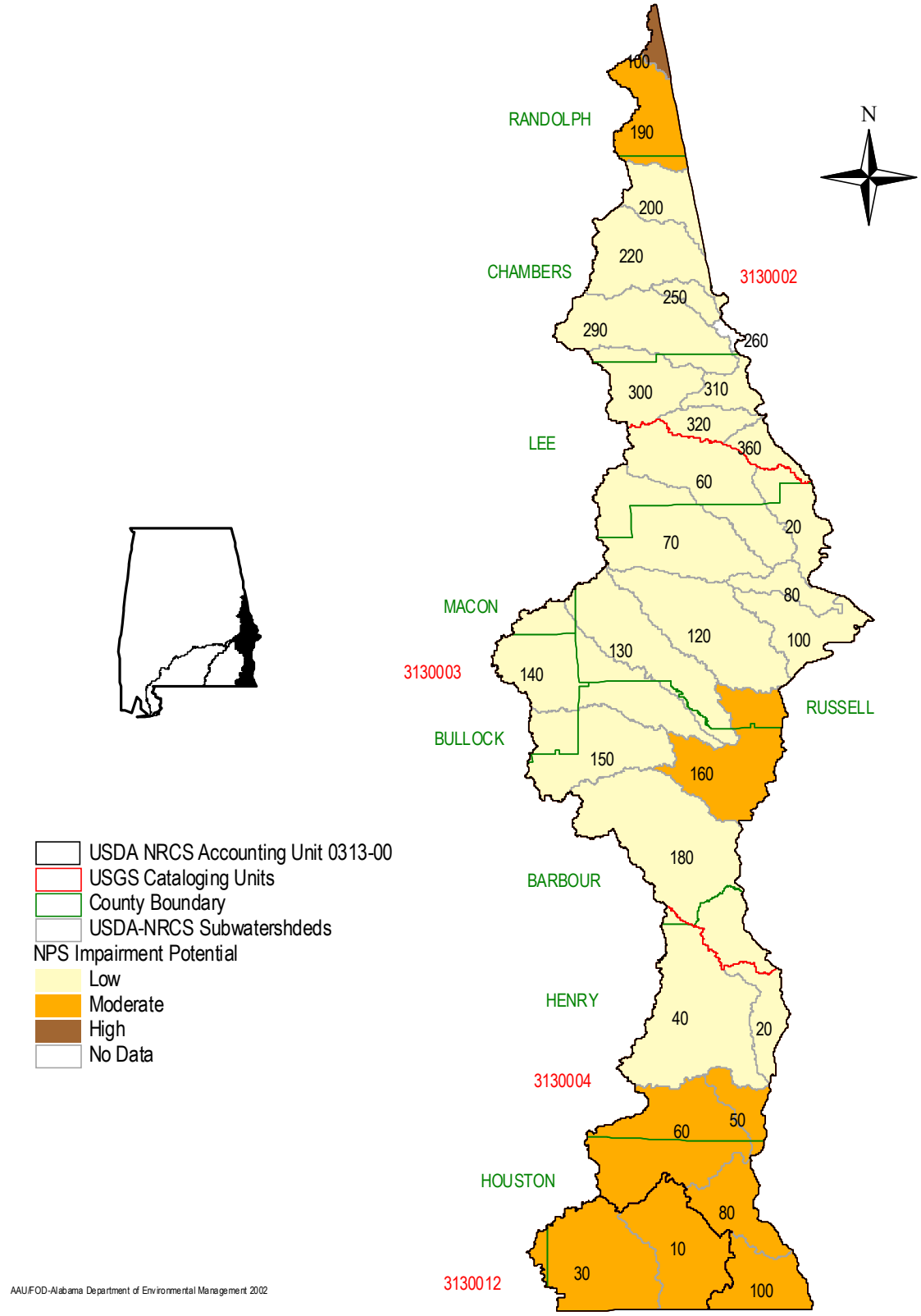

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Figure 7. Estimates of NPS Impairment Potential from Row Crop Land Use Based upon Local SWCD Land Use Estimates for the Sub-Watersheds of the Chattachoochee and Chipola River Basins.

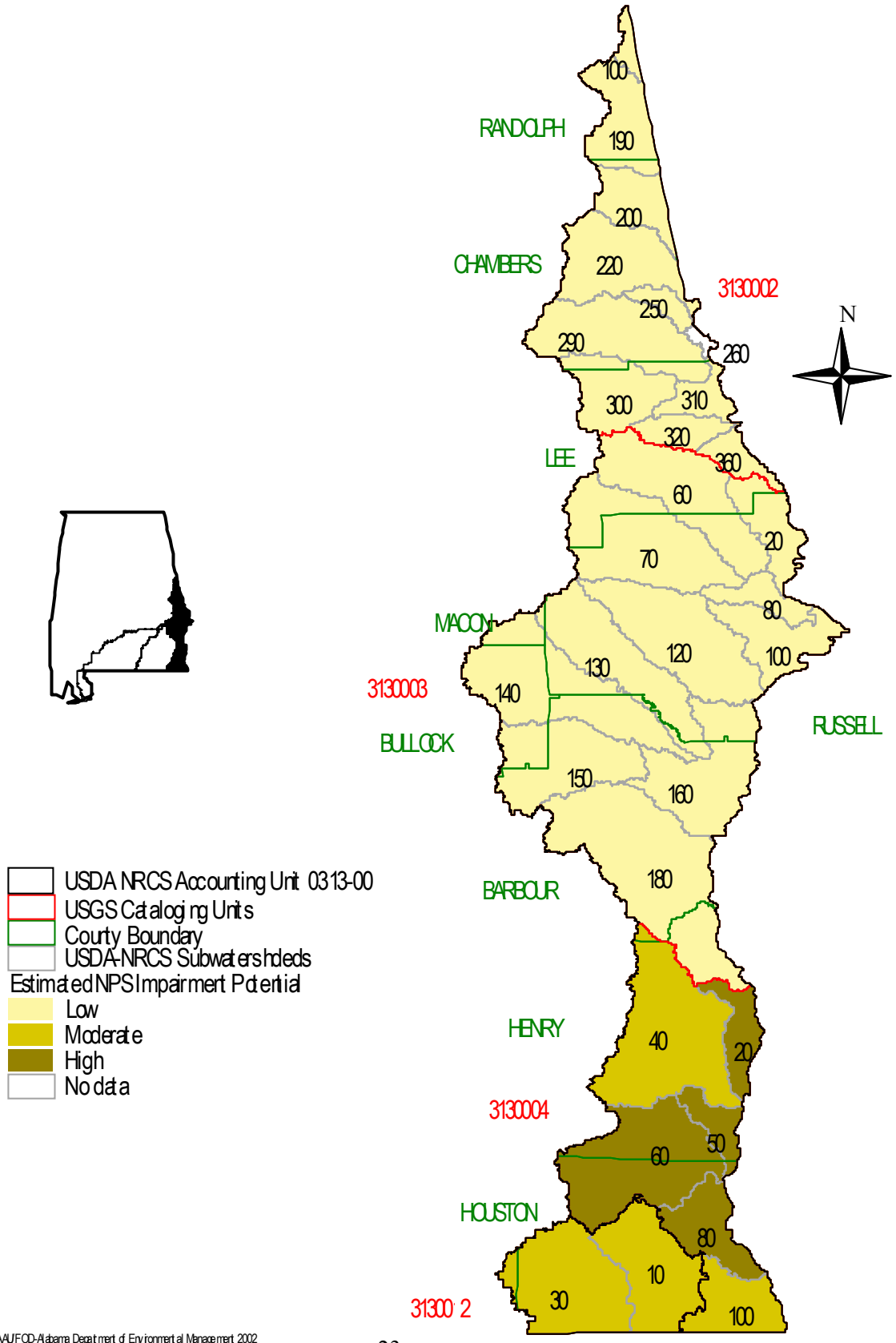

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Figure 8. Stations Sampled Within the Chattahoochee and Chipola River Basins in Conjunction with Studies Conducted by ADEM, Auburn University, Troy State University, and Columbus State University.

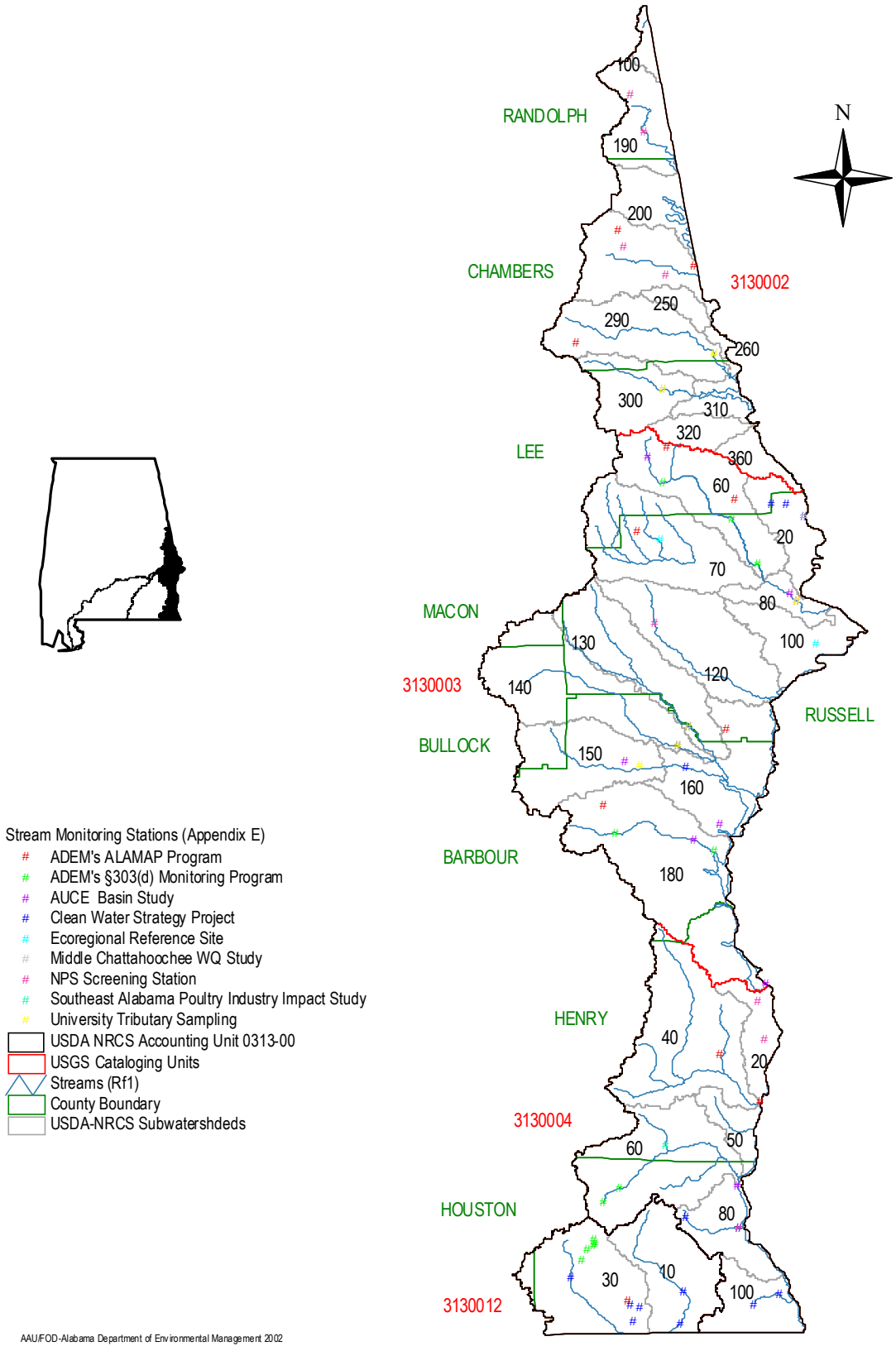

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Figure 9. Habitat and Aquatic Macroinvertebrate Assessments Conducted in the Chattachoochee and Chipola River Basins.

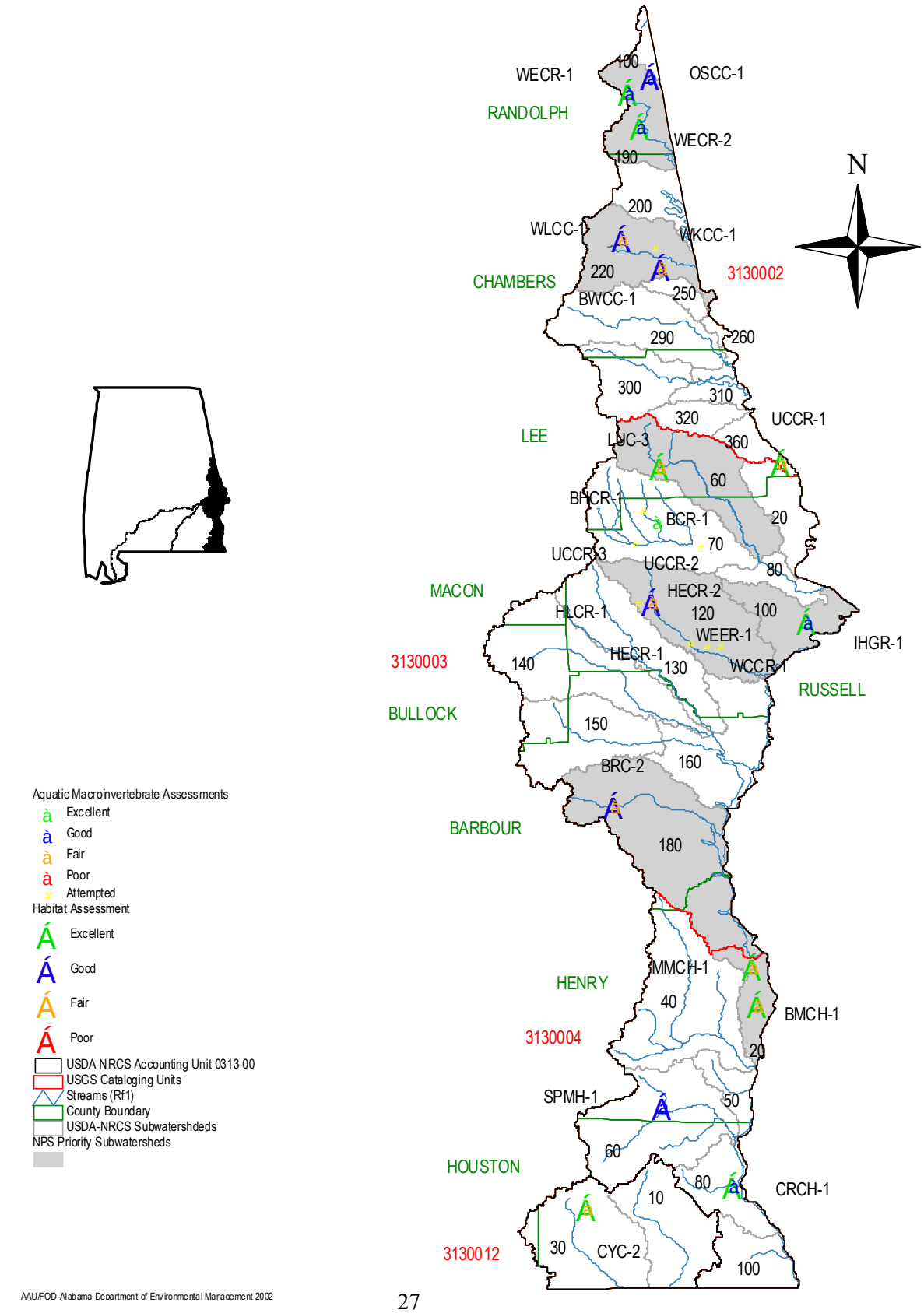

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Figure 10. Fish Community IBI Assessments Conducted in the Chattachoochee and Chipola River Basins.

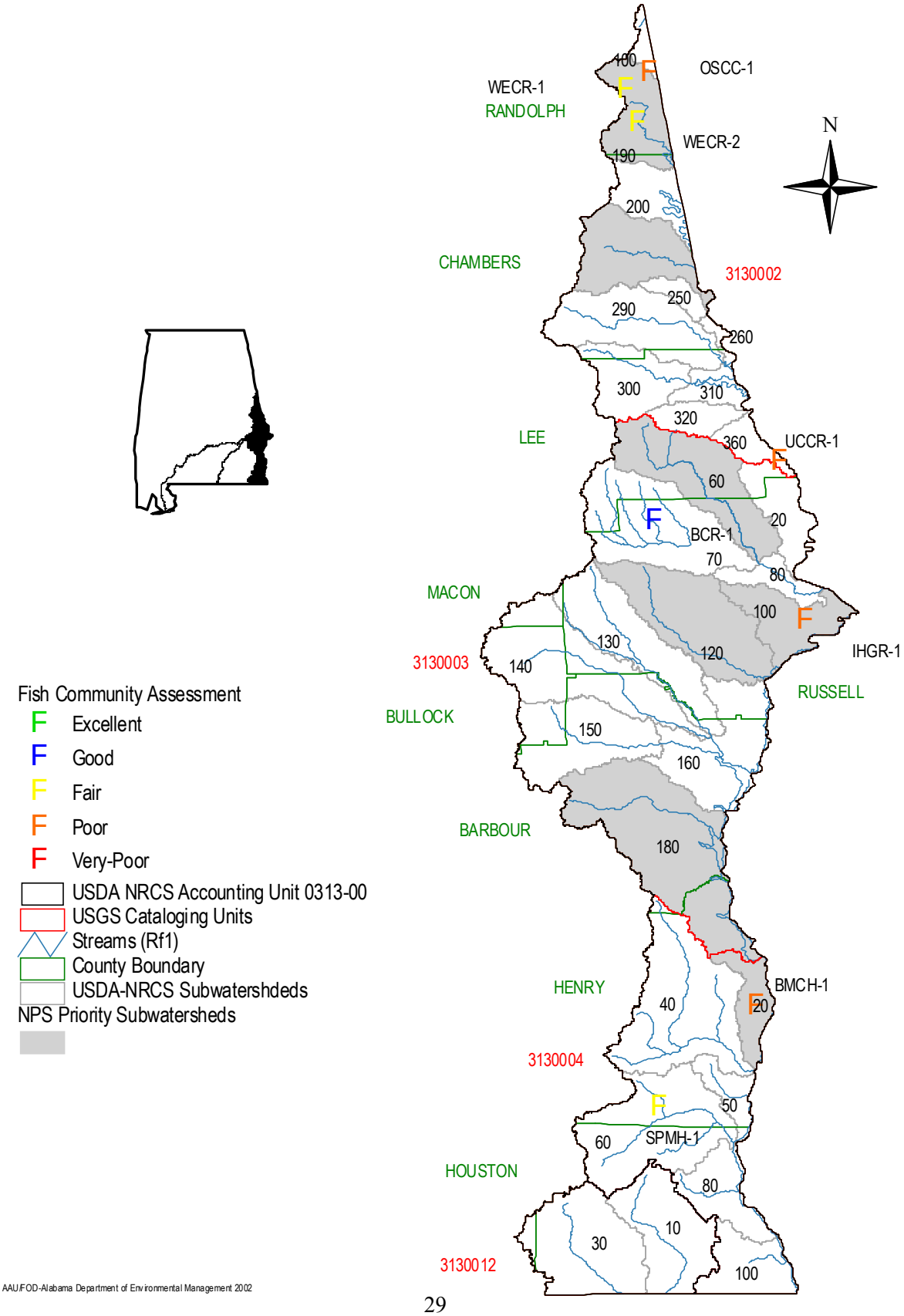

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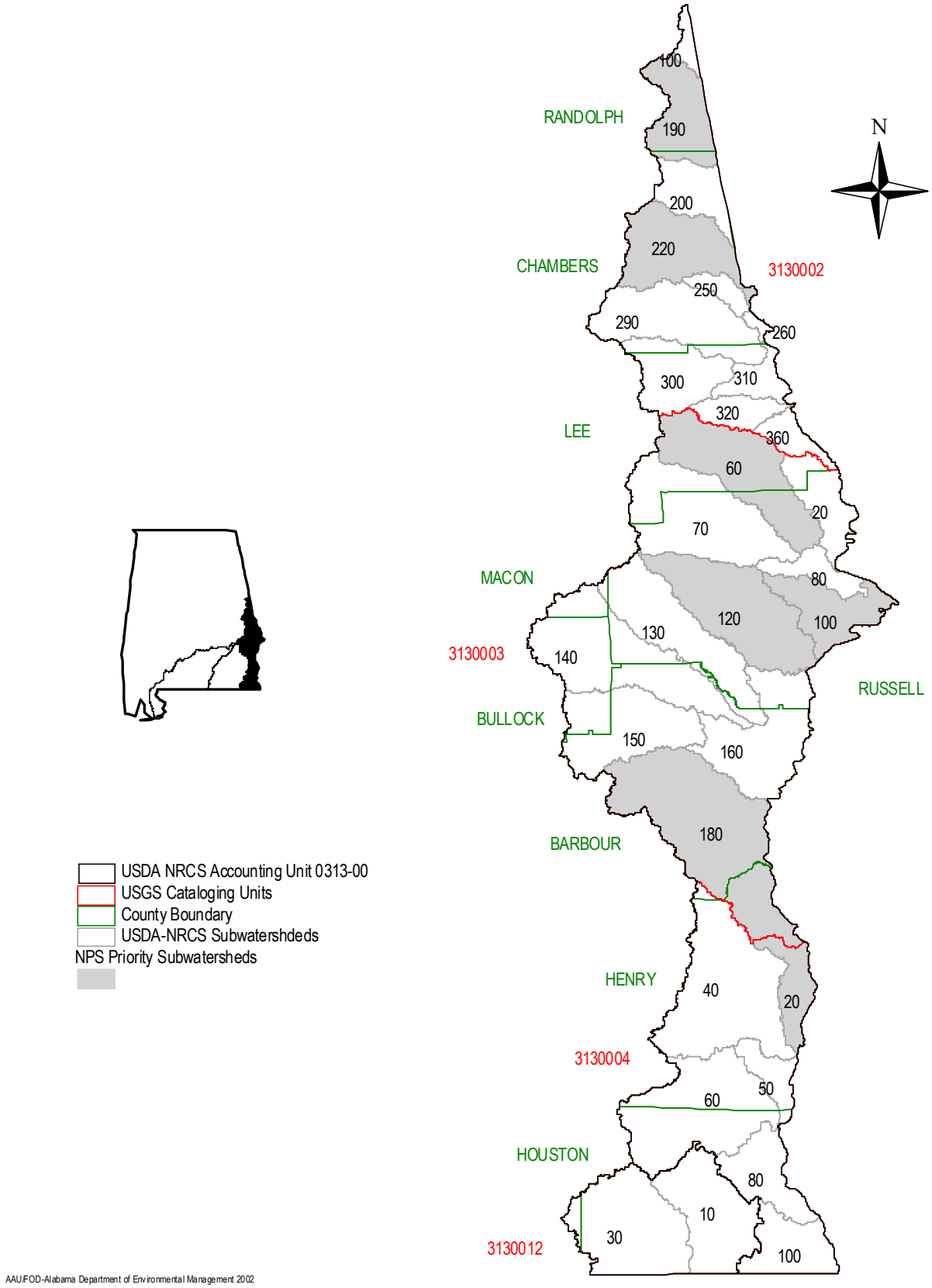
Figure 11. Priority NPS Sub-Watersheds Identified Within the Chattachoochee and Chipola River Basins.



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Land use: The Middle Chattahoochee – Lake Harding CU contains 11 sub-watersheds located within Randolph, Chambers, Lee, Russell, Macon, Bullock, Barbour, and Pike Counties (fig. 1). It is located in the Piedmont Ecoregion (Subecoregions 45a and 45b) (fig. 2). The primary land use category throughout the Middle Chattahoochee – Lake Harding CU was forest. Sections of West Point Lake and Lake Harding are currently on ADEM's §303(d) list of impaired waterbodies for not meeting their water use classifications (Table 11a). However, based on extensive chemical and biological sampling conducted during 2000, both segments have been recommended for removal from the list (Appendix G).

Percent land cover estimated by local SWCD (ASWCC 1998)

Forest	Row crop	Pasture	Mining	Urban	Open Water	Other
82%	1%	8%	0%	5%	4%	0%

NPS impairment potential: Five sub-watersheds were estimated to have a *moderate* or *high* potential for impairment from nonpoint sources. The main NPS concerns were runoff from pasture and forestry areas and sedimentation. Impairment from urban runoff and development was a concern within 5 sub-watersheds (Table 5a).

Number of sub-watersheds with (M)oderate or (H)igh ratings for each NPS category (Table 5a).

Category	Overall Potential	Animal husbandry	Aqua-culture	Row crop	Pasture	Mining	Forestry	Sediment
Moderate	4	1	0	0	5	0	4	2
High	1	1	0	0	0	0	0	3

Number of sub-watersheds with (M)oderate or (H)igh ratings for each point source category (Table 5a).

Category	% Urban	Development	Septic tank failure
Moderate	3	2	2
High	1	1	0

Historical data/studies: Assessments have been conducted recently in the Oseligee Creek (220), Osanippa Creek (290), and Upper Halawakee Creek (300) sub-watersheds (Table 8a). The majority of assessments were from 3 studies conducted by ADEM, Auburn University, and Columbus State University. Intensive water quality data was collected by Auburn University in conjunction with the University Tributary Nutrient Loading Project (Appendix F-4) and the Middle Chattahoochee Water Quality Study (ADEM 1999f). Assessments of habitat quality and macroinvertebrate and fish communities conducted in conjunction with the Middle Chattahoochee Water Quality Study are provided in Tables 6a and 7a, respectively. Evaluated assessment data has been collected in conjunction with ADEM's ALAMAP Program (Appendix F-5). A summary of each of these studies, including lead agency, project objectives, data collected, and applicable quality assurance manuals is provided with the appropriate appendices.

Assessments conducted during the SE Alabama NPS screening assessment: Table 10a lists the stations assessed in conjunction with the southeast Alabama screening assessment. Four stations located within the Wehadkee Creek (190) and Oseligee Creek (220) sub-watersheds were assessed. Results of habitat and biological assessments are presented in Tables 6a and 7a, respectively. Chemical/physical data are provided in Appendix D-1.

Sub-watershed summaries: Current and historical monitoring data were used to provide a comprehensive assessment. A summary of the information available for each sub-watershed is provided. Each summary discusses land use, NPS impairment potential, assessments conducted within the sub-watershed, and NPS priority rating based on available data. The summaries point out significant data and reference appropriate tables and appendices. Assessment of habitat, biological, and chemical conditions is based on long-term data from ADEM's Ecoregional Reference Site Program (ADEM 2000a). Tables and Appendices referenced in the summaries are located at the end of this report.

Sub-watershed assessments: Habitat, chemical/physical, and biological indicators of water quality were monitored at 6 stations located within 4 sub-watersheds (Table 12a). Habitat quality was generally assessed as *good* or *excellent* (Table 6a). Results of the macroinvertebrate assessments indicated the macroinvertebrate community to be in *good* condition at 4 (67%) stations and *fair* condition at 2 (33%) stations (Table 7a). Fish community assessments were conducted at 4 of these stations (Table 7a). Results indicated the fish community to be in *fair* condition at 3 (75%) stations and *poor* condition at 1 (25%) station.

The overall condition for each station was rated as the lowest assessment result obtained (Table 12a). Five stations were assessed as *fair* and 1 station was assessed as *poor*.

NPS priority sub-watersheds: A sub-watershed was recommended for NPS priority status if the macroinvertebrate or fish community was assessed as *fair* or *poor* and impairment was caused by rural nonpoint sources. Bioassessment results indicated biological impairment to the macroinvertebrate and/or fish communities at 6 stations located within 4 sub-watersheds (Table 12a). Two of these sub-watersheds were recommended for NPS priority status (Table 13a).

Sub-Watershed: Hillabahatchee Creek	NRCS Sub-Watershed Number 100

Land use: The Hillabahatchee Creek sub-watershed drains approximately 13 mi^2 in Randolph County. The SWCD estimated the sub-watershed to be mainly forest (81%) with some pasture (15%) (Table 2a). No current construction/stormwater authorizations or NPDES permits have been issued in the sub-watershed (Table 9a).

NPS impairment potential: The local SWCD estimated the impairment potential associated with animal husbandry activities as *high* (0.77 AU/acre, Table 3a). Estimated at 25.9 tons/acre/year, this sub-watershed had the highest sedimentation rate in the southeast Alabama basins (Table 4a). The potential for impairment from pasture runoff was estimated as *moderate* (Table 2a). The overall potential for impairment from nonpoint sources was estimated as *high* (Table 5a).

Assessments: Due to the relatively small size and close proximity to the Chattahoochee River, no assessments were conducted in the sub-watershed.

Sub-Watershed: Wehadkee Creek	NRCS Sub-Watershed Number 190

Station	Assessment Type	Date	Location	Area (mi^2)	Class
WECR-1	Chem., Hab., Macroinv., Fish	1999	Wehadkee Creek at Randolph CR 87	12	F&W
WECR-2	Chem., Hab., Macroinv., Fish	1999	Wehadkee Creek at AL Hwy 22	34	F&W

Land use: The Wehadkee Creek sub-watershed drains 76 mi^2 of Chambers and Randolph Counties. The local SWCD land use estimates showed the sub-watershed to be primarily forest (73%), with some pasture (15%) and open water (7%) (Table 2a). Two current construction/stormwater authorizations have been issued in the sub-watershed (Table 9a).

NPS impairment potential: The local SWCD estimates of animal concentrations indicated a *high* impairment potential (0.15 AU/acre), with cattle being the dominant animal (Table 3a). Soil erosion estimates were the 2nd highest in the southeast Alabama basins (24.3 tons/acre/year) and indicated a *high* potential for NPS impairment (Table 4a). There was a *moderate* potential for impairment from pasture runoff (Table 2a). The overall potential for impairment from nonpoint sources was estimated as *moderate* (Table 5a).

Assessments: Two stations on Wehadkee Creek were assessed during the NPS screening assessment of southeast Alabama basins (Table 10a). Station descriptions are listed in Appendix E-1.

Wehadkee Creek: Wehadkee Creek is a riffle-run stream located in the Outer Southern Piedmont subecoregion (Table 6a). At WECR-1, the substrate was composed of sand, cobble, gravel, and silt. Bedrock, boulder, and silt comprised a greater proportion of the substrate at the downstream station, WECR-2. At both sites, the habitat was assessed as *excellent* (Table 6a). The macroinvertebrate communities were assessed as *good* (Table 7a). The fish IBI assessments conducted in July indicated that the fish community was in *fair* condition and at WECR-1 and WECR-2 (Table 7a).

Water samples were collected at both stations during July of 1999 (Appendices D-1 and D-2). At WECR-1, chemical parameters were similar to reference sites within the region, although

turbidity was elevated (45.8 ntu). At WECR-2, 5-day biochemical oxygen demand (BOD-5, 1.6 mg/L) and magnesium (Mg, 1.03 mg/L) were elevated (Appendices D-1 and D-2).

NPS priority status: Bioassessments conducted at WECR-1 and WECR-2 indicated biological impairment within some sections of Wehadkee Creek (Table 12a). Animal concentrations and sedimentation rates were estimated as *high* within the sub-watershed. Five-day biochemical oxygen demand (BOD-5) was slightly above normal levels. Wehadkee Creek is recommended for NPS priority sub-watershed status (Table 13a).

Sub-Watershed: Stroud Creek	**NRCS Sub-Watershed Number 200**

Land use: The Stroud Creek sub-watershed drains 51 mi^2 of Chambers County. The local SWCD land use estimates indicated the sub-watershed to be mostly forest (85%), with some pasture (6%) and open water (6%). (Table 2a). One current construction/stormwater authorization has been issued within the sub-watershed (Table 9a). West Point Lake was listed on the 1998 §303(d) as not supporting its "Swimming" and "Fish and Wildlife" classifications due to contaminated sediments from pesticides (Table 11a). However, it has been recommended from removal from ADEM's draft 2000 §303(d) list due to decreased pesticide concentrations in fish tissue samples (Appendix G).

NPS impairment potential: Impairment potential from activities associated with silviculture was *moderate* (Table 4a). Potential for impairment from other NPS categories was estimated as *low* (Table 5a).

Assessments: No assessments were conducted based on the *low* NPS impairment potential rating.

Sub-Watershed: Osiligee Creek	**NRCS Sub-Watershed Number 220**

Station	Assessment Type	Date	Location	Area (mi^2)	Class
BWCC-1	Chem., Hab., Macroinv.	1999	Barrow Creek at unnamed Chambers CR, NW of Lanett	12	F&W
WLCC-1	Chem., Hab., Macroinv.	1999	Wells Creek at unnamed Chambers CR (T23N/ R27E/S27)	16	F&W
CH02U3-14	Chem., Hab.	1999	Hardley Creek appr. ¼ mile west of Chambers CR 212	8	F&W
CH3U4-58	Chem., Hab.	2000	Unnamed tributary to Wells Creek	2	F&W
CTAU02	Chem., Hab.	1999	Chattahoochee River at US Hwy 29	3550	F&W

Land use: The Osiligee Creek sub-watershed drains approximately 104 mi^2 of Chambers County. SWCD estimated land use as primarily forest (91%) with some pasture (6%) and urban areas (2%) (Table 2a). Two current construction/stormwater authorizations and 5 NPDES permits have been issued within the sub-watershed (Table 9a).

NPS impairment potential: The potential for NPS impairment from forestry practices was estimated as *moderate.* The potential for impairment from other nonpoint source categories was estimated as *low* (Table 5a).

Assessments: Barrows Creek at BWCC-1 and Wells Creek at WLCC-1, were assessed during the NPS Screening Assessment of southeast Alabama basins (Table 10a). Hardley Creek and an unnamed tributary to Wells Creek have been evaluated in conjunction with ADEM's ALAMAP Program (Appendix F-5). Intensive water quality data was collected from the Chattahoochee River at CTAU02 during a statewide tributary nutrient loading study (Appendix F-4). Station descriptions are provided in Appendix E-1.

Barrow Creek: Barrow Creek at BWCC-1 is a glide/pool stream characterized by sand and silt substrates and relatively deep, slow-moving water (Table 6a). Habitat quality was estimated as *good* for macroinvertebrate colonization (Table 6a). Six EPT families were collected, indicating that the condition of the macroinvertebrate community was *fair* (Table 7a). Field parameters collected at the time of the macroinvertebrate assessment did not indicate a cause of the impairment (Appendix D-1).

Wells Creek: Wells Creek at WLCC-1 is a low-gradient stream reach with sand and silt substrates and relatively deep, slow-moving water (Table 6a). The habitat quality was estimated as *good* for macroinvertebrate colonization (Table 6a). The macroinvertebrate community was assessed as *fair* (Table 7a). Field parameters collected at the time of the macroinvertebrate assessment did not indicate a cause of the impairment (Appendix D-1a).

NPS priority status: Although the potential for NPS impairment was estimated as *low*, the macroinvertebrate communities were assessed as *fair* at two locations (Table 12a). Osiligee Creek was included on the priority sub-watershed list (Table 13a). The cause of impairment is unknown.

Sub-Watershed: Moores Creek	**NRCS Sub-Watershed Number 250**

Land use: The Moores Creek sub-watershed drains approximately 19 mi^2 of Chambers County. Land use was estimated as primarily forest (59%), with some urban areas (30%) and pasture (9%) (Table 2a). Four current construction/stormwater authorizations have been issued in the sub-watershed (Table 9a).

NPS impairment potential: The primary NPS concerns within the sub-watershed were pasture runoff, forestry activities, and sedimentation (Table 5a). Overall potential for NPS impairment was estimated as *moderate* (Table 5a). Concerns of the local SWCD within the sub-watershed included gully erosion on agricultural land, excessive sediment from road-bank erosion and urban development, and access of livestock to streams (Table 4a). Urban runoff and development were also concerns within the sub-watershed (Table 5a).

Assessments*:* No assessments have been conducted within the sub-watershed.

Sub-Watershed: Lake Harding Tributaries	**NRCS Sub-Watershed Number 260**

Land use: The drainage area of this sub-watershed is less than 6 mi^2. Conservation assessment worksheets were not required for sub-watersheds of <5000 acres (SWCD 1998). However, EPA estimated land use as 76% forest, 12% urban, and 6% wetlands (Table 2a). One current construction/stormwater authorization, 1 semi-public/private, and 1 municipal NPDES permits were issued within the sub-watershed (Table 9a).

NPS impairment potential*:* Local SWCD land use estimates were not available for this sub-watershed.

Assessments*:* No assessments have been conducted within the sub-watershed.

Sub-Watershed: Osanippa Creek	NRCS Sub-Watershed Number 290

Station	Assessment Type	Date	Location	Area (mi^2)	Class
OSCC-1	Hab., Macroinv.	1999	Osanippa Creek at AL Hwy 195	105	F&W
OSAAU01	Chem.	1998, 1999	Osanippa Creek Lee CR 55 (Chamber CR 195)	105	F&W
CH01U1	Chem., Hab.	1997	Unnamed tributary to Snapper Creek appr. 9.1 mi. us of confluence with Snapper Creek.	2	F&W

Land use: The Osanippa Creek sub-watershed drains approximately 124 mi^2 of Lee and Chambers Counties. Local SWCD land use estimates indicate the Osanippa Creek sub-watershed to be primarily forest (87%) with some pasture (9%) and urban areas (2%) (Table 2a). Two current construction/stormwater authorizations have been issued within the sub-watershed (Table 9a).

NPS impairment potential: The potential for NPS impairment from forestry practices and pasture runoff was estimated as *moderate* (Table 5a). The overall potential for NPS impairment within the sub-watershed was estimated as *low* (Table 5a).

Assessments: An assessment was not conducted within this sub-watershed during the NPS Screening Assessment of the southeast Alabama basins. Two stations on Osanippa Creek were monitored as part of the Middle Chattahoochee Water Quality Study (ADEM 1999f) and the University Tributary Nutrient Loading Study (Appendix F-4). An unnamed tributary to Snapper Creek was evaluated at CH01U1 in conjunction with ADEM's ALAMAP Program (Appendix F-5). Station descriptions are provided in Appendix E-1.

Osanippa Creek: Osanippa Creek at OSCC-1 was a relatively wide, glide/pool stream characterized by sand, gravel, and detritus. Habitat quality was estimated as *good* for this stream type (Table 6a). Twelve EPT families were collected in June, indicating the macroinvertebrate community to be in *excellent* condition (Table 7a). The fish community, however, was estimated to be in *poor-fair* condition (Table 7a) and may reflect the heavy sediment deposition (55% sand) present at the site (Table 6a).

NPS priority status: Based on results of the fish community assessment, OSCC-1 rated an overall assessment of *poor* (Table 12a). Osanippa Creek was therefore recommended as a NPS priority sub-watershed (Table 13a).

Sub-Watershed: Upper Halawakee Creek	NRCS Sub-Watershed Number 300

Station	Assessment Type	Date	Location	Area (mi^2)	Class
HACL-1	Hab., Macroinv.	1999	Halawakee Creek at Lee CR 390	42	F&W
HALAU01	Chem.	1999	Halawakee Creek at Lee CR 390	42	F&W

Land use: The Upper Halawakee Creek sub-watershed drains approximately 78 mi^2 of Lee and Chambers Counties. SWCD land use estimates for the sub-watershed were 77% forest, 10% pasture, and 9% urban (Table 2a). Eleven current construction/stormwater authorizations and 1 semi-public/private NPDES permit were issued within the sub-watershed (Table 9a).

NPS impairment potential: There was a *moderate* potential for impairment from pasture runoff, but overall potential for NPS impairment was *low* (Table 5a). There was a *moderate* potential for impairment from urban runoff and a *high* potential for impairment from development (Table 5a).

Assessments: Halawakee Creek was sampled during 1999 as part of the Middle Chattahoochee Water Quality Study (ADEM 1999f) and the University Tributary Nutrient Loading Study (Appendix F-3). Station descriptions are provided in Appendix E-1.

Halawakee Creek: HACL-1 was a relatively wide, riffle-run stream reach characterized by cobble, sand, and gravel. Habitat quality was evaluated as *excellent* for this stream type (Table 6a). Nine EPT families were collected in June, indicating the macroinvertebrate community to be in *good* condition. However, condition of the fish community was assessed as *fair* (Table 7a).

NPS priority status: Although the fish community was in *fair* condition at HACL-1, Upper Halawakee Creek was not recommended as a NPS priority sub-watershed because of the *moderate* potential for impairment from urban sources (Table 13a).

Sub-Watershed: Lower Halawakee Creek	NRCS Sub-Watershed Number 310

Land use: The Lower Halawakee Creek sub-watershed drains approximately 31 mi^2 of Lee and Chambers Counties. Land use was estimated as primarily forest, with some open water (Table 2a). One current construction/stormwater authorization has been issued within the sub-watershed (Table 9a). A portion of Lake Harding (2,180 acres) was on ADEM's 1998 CWA §303(d) list of impaired waters for not supporting its "Public Water Supply", "Swimming", and "Fish & Wildlife" water use classifications (Table 11a). However, it has been recommended for removal from ADEM's draft 2000 CWA §303(d) list (Appendix G).

NPS impairment potential: The overall potential for NPS impairment was estimated as *moderate* due to the *high* risk of impairment from sediment loading (Table 5a). Potential for impairment from other rural NPS categories was estimated as *low*. The potential for impairment from failing septic tanks was estimated as *moderate* (Table 4a).

Assessments: No assessments were conducted within this sub-watershed

Sub-Watershed: Wacoochee Creek	NRCS Sub-Watershed Number 320

Land use: The Wacoochee Creek sub-watershed drains approximately 33 mi^2 of Lee County. The sub-watershed was primarily forested (88%), with small urban areas (5%), open water (4%), and pasture (3%) (Table 2a). No current construction/stormwater authorizations have been issued in this sub-watershed (Table 9a).

NPS impairment potential: Potential for NPS impairment from all rural categories was estimated as *low* (Table 5a). There was a *moderate* potential for impairment from urban runoff (Table 5a).

Assessments: No assessments were conducted within this sub-watershed.

Sub-Watershed: Soap Creek	NRCS Sub-Watershed Number 360

Land Use: Soap Creek drains approximately 26 mi^2 in Lee County. SWCD land use estimates within the sub-watershed were 74% forest, 15% open water, and 10% urban (Table 2a). Five current construction/stormwater authorizations have been issued within the sub-watershed (Table 9a).

NPS impairment potential: Local SWCD estimated a sedimentation rate of 5.5 tons/acre/year, indicating a *moderate* potential for NPS impairment (Table 4a). Excessive sediment was also listed as a concern by the SWCD (Table 4a). The overall potential for NPS impairment within the sub-watershed was estimated as *low* (Table 5a).

Assessments: No assessments were conducted within this sub-watershed.

Land use: The Walter F. George - Middle Chattahoochee River CU drains 11 sub-watersheds in Lee, Russell, Barbour, Bullock, and Macon Counties (fig. 1). The CU is located in the Piedmont ecoregion (Subecoregions 45a and 45b) (fig. 2) and drains soils in portions of the Piedmont Plateau soil areas (NRCS 1997). The SWCD estimated land cover as mainly forest mixed with pasture, crop, and urban areas. A 22-mi. section of Barbour Creek is currently on ADEM's 2000 draft §303(d) list of priority waterbodies for impairment caused by siltation and organic enrichment/dissolved oxygen violations from unknown sources (Table 11a). However, it has been recommended for removal from the list based on results of intensive water quality data collected during 1999 (Appendix G).

Percent land cover estimated by local SWCD (ASWCC 1998)

Forest	Row crop	Pasture	Mining	Urban	Open Water	Other
35%	35%	18%	0%	10%	1%	<1%

NPS impairment potential: Pasture, mining, and sedimentation were the primary NPS concerns within the CU. Four sub-watersheds were estimated to have a *moderate* potential for impairment from rural nonpoint sources. Runoff from urban areas and development were also concerns within these 4 sub-watersheds (Table 5a).

Number of sub-watersheds with (M)oderate or (H)igh ratings for each rural NPS category (Table 5a).

Category	Overall Potential	Animal husbandry	Aqua-culture	Row crop	Pasture	Mining	Forestry	Sediment
Moderate	4	1	0	0	7	1	0	3
High	0	0	1	0	0	3	0	0

Number of sub-watersheds with (M)oderate or (H)igh ratings for each point source category (Table 5a).

Category	% Urban	Development	Septic tank failure
Moderate	4	7	3
High	1	2	0

Historical data/studies: Assessments have been conducted recently in 10 sub-watersheds (Table 8a). The majority of assessments conducted within the CU and presented in this report were from 7 major projects conducted by ADEM, Auburn University, and the city of Columbus, Georgia. Historical data included both monitored and evaluated assessments. Evaluated assessments are based on observed conditions, limited water quality data, water quality data older than 5 years, or estimated impacts from observed or suspected activities. Evaluated data has been collected in conjunction with ADEM's ALAMAP Program (Appendix 5) and 1996 Clean Water Strategy Project (Appendix F-6).

Monitored assessments are based on chemical, physical, and/or biological data collected using commonly accepted and well-documented methods. Monitored assessment data was collected during 5 projects. Results of habitat and biological assessments conducted in conjunction with these projects are presented in Tables 6a and 7a, respectively. Chemical/physical data are provided in the appendices listed below. Descriptions of each project are provided with the appropriate appendices.

Project	Appendices
ADEM's Ecoregional Reference Site Program	F-1a
ADEM's 303(d) Monitoring Program	F-2a
Middle Chattahoochee WQ Study	F-7
ADEM's SE Alabama Poultry Industry Impact Study	F-3a
University Tributary Nutrient Project	F-4a

Assessments conducted during the SE Alabama NPS Screening Assessment: Table 10a lists the stations assessed in conjunction with the 1999 screening assessment of the southeast Alabama basins. One station within the Hatchechubbee Creek (120) sub-watershed was assessed. Habitat and bioassessment results are presented in Tables 6a and 7a, respectively. Chemical/physical data are provided in Appendix D-1.

Sub-watershed summaries: Current and historical monitoring data were used to provide a comprehensive assessment. A summary of the information available for both sub-watersheds is provided. Each summary discusses land use, NPS impairment potential, assessments conducted within the sub-watershed, and NPS priority rating based on available data. The summaries point out significant data and reference appropriate tables and appendices. Assessments of habitat, biological, and chemical conditions are based on long-term data from ADEM's Ecoregional Reference Site Program (ADEM 2000a). Tables and appendices referenced in the summaries are located at the end of this report.

Sub-watershed assessments: Habitat, chemical/physical, and biological indicators of water quality were monitored at 6 stations located in 6 sub-watersheds (Table 12a). Habitat quality was generally assessed as *good* or *excellent* (Table 6a). Results of the 6 macroinvertebrate assessments conducted within the CU indicated the macroinvertebrate community to be in *good* condition at 2 (33%) stations, *fair* condition at 3 (50%) stations, and *poor* condition at 1 (17%) station (Table 7a). Fish IBI community assessments were conducted at 3 of these stations (Table 7a). Results indicated the fish community to be in *poor* condition at all 3 stations.

Overall condition was rated as the lowest assessment result obtained (Table 12a). All 6 stations were assessed as *fair* or *poor* (Table 12a).

NPS priority sub-watersheds: A sub-watershed was recommended for NPS priority status if the macroinvertebrate or fish communities were assessed as *fair* or *poor* and the impairment was caused by rural nonpoint sources. Bioassessment results indicated biological impairment to the macroinvertebrate and/or fish communities at 6 stations located within 6 sub-watersheds (Table 12a). Four of these sub-watersheds were recommended for NPS priority status (Table 13a).

Sub-Watershed: Mill Creek	NRCS Sub-Watershed Number 020

Station	Assessment Type	Date	Location	Area (mi^2)	Class
MICR-1	H, M	1999	Mill Creek at Broad Street in Phoenix City	1-2	F&W
CHTAU01	C	1999	Chattahoochee River approx. 0.5 mi. ds of Georgia RR bridge	4670	F&W
CHA01	C	1996	Mill Creek at Russell CR	5	F&W
CHA02	C	1996	Mill Creek at US Hwy 280	11	F&W
CHA03	C	1996	Mill Creek at AL Hwy 1 near mouth	25	F&W

Land use: The Mill Creek sub-watershed drains 59 mi^2 of Lee and Russell Counties. Land use was estimated as forest (54%), urban (33%), pasture (5%), and row crops (4%) (Table 2a). A total of 17 current construction/stormwater authorizations and 2 NPDES permits have been issued in the sub-watershed (Table 9a).

NPS impairment potential: The potential for impairment from sediment (9.1 tons/acre/year), primarily from sand and gravel pits and urban development, was *moderate* (Table 4a). The overall estimated potential for NPS impairment was *low* (Table 5a). The potential for impairment from urban runoff and development was estimated as *high* (Table 5a).

Assessments: Mill Creek was monitored at MICR-1 during 1999 as part of the Middle Chattahoochee Water Quality Study (ADEM 1999f). The station is located within Phenix City. Intensive water quality data was collected from the Chattahoochee River at CHTAU01 from October of 1998 to September of 1999 in conjunction with the Alabama Tributary Nutrient Loading Study (Appendix F-4). Three locations were evaluated during ADEM's 1996 Clean Water Strategy Project (Appendix F-6). Station descriptions are provided in Appendix E-1.

Mill Creek: Mill Creek at MICR-1 is a riffle-run stream characterized by sand, gravel, and cobble substrates (Table 6a). Habitat quality was estimated as *excellent* for this stream type and region (Table 6a). However, only 3 EPT families were collected, indicating the station to be in *poor* condition (Table 7a). A fish IBI assessment found the fish community to be in *poor* condition (Table 7a).

NPS priority status: Biological conditions at MICR-1 were assessed as *poor* (Table 12a). However, the primary NPS concerns within the sub-watershed were urban runoff and development. Mill Creek was therefore not recommended for NPS priority sub-watershed status.

Sub-Watershed: Little Uchee Creek	NRCS Sub-Watershed Number 060

Station	Assessment Type	Date	Location	Area (mi^2)	Class
LUC-3	Chem., Hab., Macroinv.	1999	Little Uchee Creek at Meadows Mill	32	F & W
LUC-2	Chem.	1999	Little Uchee Creek at US Hwy 80	94	F & W
LUC-1	Chem.	1999	Little Uchee Creek at US Hwy 431	127	F & W
PHEAU012	Chem.	1999	Phelps Creek at Lee CR 145	7	F & W
CH03U3-44	Chem., Hab.	1999	Unnamed tributary to Hospilika Creek approx. 0.25 mi. us of Lee CR 240	1-2	F & W
CH2U4-35	Chem., Hab.	1999	Unnamed tributary to Sturkie Creek	1-2	F & W

Land use: Little Uchee Creek drains approximately 135 mi^2 of Lee and Russell Counties. SWCD land use estimates of the sub-watershed were primarily forest (74%), pasture (11%), urban areas (6%), and row crops (5%) (Table 2a). Thirteen current construction/stormwater authorizations have been issued within the sub-watershed (Table 9a).

NPS impairment potential: The overall potential for NPS impairment was estimated as *moderate* (Table 5a). The estimated potential for NPS impairment from sedimentation and pasture runoff was *moderate* (Tables 4a and 2a, respectively). Resource concerns listed by the local SWCD included excessive erosion from agriculture, cropland, roads, and urban areas (Table 4a). The potential for impairment from urban runoff and development was *moderate* and *high*, respectively (Table 2a).

Assessments*:* An assessment was not conducted within the sub-watershed during the southeast Alabama NPS Screening Assessment. Intensive monitoring data has been collected at 4 stations in conjunction with ADEM's CWA §303(d) Monitoring Program (LUC-1, LUC-2, and LUC-3) (Appendix F-2a) and a water quality study conducted by the Auburn University Civil Engineering Department (AUCE 1999). Unnamed tributaries to Hospilika Creek and Sturkie Creek were evaluated during 1999 as part of ADEM's ALAMAP Program (Appendix F-5). Station descriptions are listed in Appendix E-1.

Little Uchee Creek: Little Uchee Creek at LUC-3 is a riffle-run stream reach characterized by bedrock, boulder, and cobble substrates (Table 6a). Habitat quality was assessed as *excellent* for this stream type and region (Table 6a). However, only 8 EPT families were collected, indicating the macroinvertebrate community to be in *fair* condition (Table 7a).

Results of water quality data are provided in Appendix F-2. Intensive water quality data collected at LUC-1, LUC-2, and LUC-3 were similar to regional reference conditions.

NPS priority status: Little Uchee Creek was recommended as a NPS priority sub-watershed due to biological impairment detected at LUC-3 (Tables 12a and 13a). Sedimentation and pasture runoff were NPS concerns within the sub-watershed. There was a *moderate* potential for impairment from urban sources. However, the immediate sub-watershed of Little Uchee Creek at LUC-1, LUC-2, and LUC-3 was primarily affected by cropland and agricultural land uses.

Sub-Watershed: Upper Uchee Creek	NRCS Sub-Watershed Number 070

Station	Assessment Type	Date	Location	Area (mi^2)	Class
BCR-1	Chem., Hab., Macroinv.	2000	Bear Creek at Russell CR 33	13	F&W
CH02U1	Chem., Hab.	1997	Unnamed tributary to Snake Cr. approx. 2.7 mi. us of confluence with Snake Cr.	1-2	F&W

Land use: Upper Uchee Creek drains approximately 165 mi^2 of Lee and Russell Counties. Land use of the sub-watershed was estimated as 67% forest, 15% row crops, and 15% pasture (Table 2a). Four current construction/stormwater authorizations have been issued within the sub-watershed (Table 9a).

NPS impairment potential: Potential for NPS impairment from pasture runoff was *moderate*. Overall potential for NPS impairment was estimated to be *low* (Table 5a). The potential for impairment from urban development was estimated as *moderate* (Table 5a).

Assessments*:* Brush Creek at BCR-1 has been sampled in conjunction with ADEM's ecoregional reference site program since 1992. Habitat and chemical assessments were conducted at an unnamed tributary to Snake Creek (CH02U1) during ADEM's 1997 ALAMAP Project (Appendix F-5). Station descriptions are located in Appendix E-1.

Brush Creek: Brush Creek at BCR-1 is characterized by glide/pool geomorphology, with bottom substrates composed of gravel, sand, and silt. Snags and organic detritus are common and constitute an important habitat for aquatic macroinvertebrates and fish communities. In 1999, when visited for sampling, the stream was not flowing. The site was assessed again in conjunction with the 2000 NPS project. Fourteen EPT families were collected, indicating that the aquatic macroinvertebrate community was in *excellent* condition (ADEM 2000a).

NPS priority status: Brush Creek at BCR-1 has been monitored as a least-impaired ecoregional reference site by ADEM since 1992. Habitat quality and biological conditions are *excellent* at this site.

Sub-Watershed: Lower Uchee Creek	NRCS Sub-Watershed Number 080

Station	Assessment Type	Date	Location	Area (mi^2)	Class
UCCR-1	Chem., Hab., Macroinv.	1999	Uchee Creek us of bridge at AL Hwy 165	322	F&W
UCCAU01	Chem.	1999	Uchee Creek us of bridge at AL Hwy 165	322	F&W
UCH (AU01)	Chem., Hab., Macroinv.	1999	Uchee Creek us of bridge at AL Hwy 165	322	F&W
CH04U3-13	Chem., Hab., Macroinv.	1999	Uchee Creek us of bridge at AL Hwy 165	322	F&W

Land use: The Lower Uchee Creek sub-watershed drains 33 mi^2 of Russell County. SWCD land use estimates within the sub-watershed were primarily forest (75%), with some of pasture (9%), row crops (8%), and urban areas (5%) (Table 2a). Three current construction/stormwater

authorizations have been issued within the sub-watershed (Table 9a).

NPS impairment potential: Potential for impairment from pasture runoff and sedimentation was estimated as *moderate* (Tables 3a and 4a, respectively). Potential for impairment from mining activities was *high* (Table 5a). Overall potential for NPS impairment in the sub-watershed was estimated as *moderate* (Table 5a). There was a *moderate* potential for impairment from urban runoff and development and failing septic tanks (Table 5a).

Assessments: An assessment was not conducted within the Lower Uchee Creek sub-watershed during the southeast Alabama NPS Screening Assessment. One location on Uchee Creek has been intensively monitored in conjunction with the Middle Chattahoochee Water Quality Study (ADEM 1999f), the University Tributary Nutrient Loading Study (UCCA01, Appendix F-4), and a water quality study conducted by the Auburn University Civil Engineering Department (AUCE 1999). The location has also been evaluated during ADEM's ALAMAP Program (Appendix F-5).

Uchee Creek: Uchee Creek at UCCR-1 is a low-gradient stream characterized by clay (60%), sand (20%), and gravel (15%) substrates (Table 6a). Habitat quality was estimated as *excellent* for this stream type (Table 6a). The bioassessments conducted in 1999 indicated *good* macroinvertebrate and *poor* fish communities (Table 7a).

NPS priority status: The fish community at UCCR-1 was assessed as *poor* (Table 12a). The main NPS concerns within the sub-watershed were mining, pasture runoff, and sedimentation. However, Uchee Creek was not recommended as a NPS priority sub-watershed due to the potential impacts from urban sources.

Sub-Watershed: Ihagee Creek	**NRCS Sub-Watershed Number 100**

Station	Assessment Type	Date	Location	Area (mi^2)	Class
IHGR-1	Chem., Hab., Macroinv., Fish	1999	Ihagee Creek at Russell CR 18	27	F&W

Land use: The Ihagee Creek sub-watershed drains 72 mi^2 in Russell County. SWCD estimated land use within the Ihagee Creek sub-watershed to be 60% forest, 20% pasture, and 15% row crops (Table 2a). Three current construction/stormwater authorizations and 1 semi/public private NPDES permit have been issued within the sub-watershed (Table 9a).

NPS impairment potential: SWCD estimated a *high* potential for NPS impairment from pasture runoff (Table 5a). Potential for impairment from other rural NPS categories was *low*. Concerns listed within the sub-watershed included excessive erosion from multiple sources and nutrients and pesticides in surface waters (Table 4a). The potential for impairment from development was estimated as *moderate* (Table 5a).

Assessments: ADEM established a least-impaired ecoregional reference site on Ihagee Creek at IHGR-1 in 1995. A complete description of the station is provided in Appendix E-1.

Ihagee Creek: Ihagee Creek at IHGR-1 is a riffle-run stream reach characterized by sand (40%) and clay (44%) substrates (Table 6a). The habitat quality was assessed as *excellent*; however, embeddedness and sediment deposition have been noted as problems at the site since it has been established (Table 6a). Eleven EPT families were collected at the site in 1999, indicating the aquatic macroinvertebrate community was in *good* condition (Table 7a). Assessment of the fish community indicated the site to be *poor-fair* (Table 7a). Field parameters collected at the site in 1999 were similar to other reference sites within the region (Appendix D-1).

NPS priority status: Results of the fish IBI assessment indicated impaired biological conditions in Ihagee Creek at the IHGR-1 stream reach (Table 12a). Ihagee Creek is therefore recommended as a NPS priority sub-watershed (Table 13a).

Sub-Watershed: Hatchechubbee Creek	**NRCS Sub-Watershed Number 120**

Station	Assessment Type	Date	Location	Area (mi^2)	Class
HECR-2	Hab., Macroinv.	1999	Hatchechubbee Creek at AL Hwy 26	15	F&W

Land use: The Hatchechubbee Creek sub-watershed drains 151 mi^2 of Russell County. The SWCD estimated land use within the sub-watershed as 70% forest, 18% pasture, 5% row crops, and 4% urban (Table 2a). Three current construction/stormwater authorizations and 1semi/public private NPDES permit have been issued within the sub-watershed (Table 9a).

NPS impairment potential: Potential for impairment from pasture runoff was estimated as *moderate* (Table 5a). Although estimates of animal concentrations and rates of sediment deposition were *low*, resource concerns listed by the local SWCD included excessive erosion from cropland and agricultural areas (Table 4a). Potential for NPS impairment throughout the sub-watershed was estimated as *low* (Table 5a). The potential for impairment from urban runoff and development was estimated as *moderate* (Table 5a).

Assessments: Hatchechubbee Creek was assessed at HECR-2 during the NPS Screening Assessments (Table 10a). Station descriptions are provided in Appendix E-1.

Hatchechubbee Creek: At HECR-2, Hatchechubbee Creek is a low-gradient stream located within the Southeastern Plains and Hills (65e) subecoregion (Table 6a). Bottom substrates were composed of 85% sand, 10% organic material, such as snags and leaf fall, and 5% silt. Although habitat quality was assessed as *good*, sedimentation and bank erosion were noted to be problems at the site (Table 6a). Seven EPT families were collected, indicating that the macroinvertebrate community was in *fair* condition (Table 7a). In-situ water quality parameters collected at the time of the macroinvertebrate assessment did not indicate a cause of impairment (Appendix D-1).

NPS priority status: The macroinvertebrate assessment conducted at HECR-2 indicated biological impairment at this segment of Hatchechubbee Creek (Table 12a). Local SWCD estimates indicated sediment deposition and pasture runoff to be NPS concerns within the sub-watershed. Site observations supported these findings. Hatchechubbee Creek was therefore recommended as a NPS priority sub-watershed.

Sub-Watershed: North Fork Cowikee	NRCS Sub-Watershed Number 130

Station	Assessment Type	Date	Location	Area (mi^2)	Class
CHA04	Chem.	1996	North Fork Cowikee Cr. at Barbour CR 13N/28E/27	114	F&W
NFCAU01	Chem.	1999	North Fork Cowikee Cr. at Russell CR 42	114	F&W

Land use: The North Fork of Cowikee Creek drains 129 mi^2 of Barbour, Macon, and Russell Counties. According to SWCD estimates, the sub-watershed consists of 68% forest, 19% pasture, and 9% row crops (Table 2a). Five current construction/stormwater authorizations and 1 municipal NPDES permit have been issued in the sub-watershed (Table 9a).

NPS impairment potential: A *moderate* impairment potential was estimated from pasture runoff. The overall impairment potential was *low* (Table 5a). The potential for impairment from urban runoff and development was estimated as *moderate* (Table 5a).

Assessments: Intensive water quality data was collected at NFCAU01 in conjunction with the University Tributary Nutrient Loading Study (Appendix F-4a). North Fork of Cowikee Creek was assessed at CHA04 during ADEM's 1996 Clean Water Strategy Project (Appendix F-6a). Chemical data did not indicate impairment. Station locations are provided in Appendix E-1.

Sub-Watershed: Middle Fork Cowikee	NRCS Sub-Watershed Number 140

Station	Assessment Type	Date	Location	Area (mi^2)	Class
CHA05	Chem.	1996	Middle Fork Cowikee Cr. at Barbour CR 12N/28E/4	160	F&W
MFCAU01	Chem.	1999	Middle Fork Cowikee Cr. at Barbour CR north of Hawkinsville	160	F&W

Land use: The Middle Fork of Cowikee Creek drains 177 mi^2 of Barbour, Bullock, Macon, and Russell Counties. Land use is primarily forest (86%), with some pasture (5%) and other land uses (6%) (Table 2a). One current construction/stormwater authorization has been issued in the sub-watershed (Table 9a).

NPS impairment potential: Overall potential for NPS impairment was estimated as *low* (Table 5a). However, mining activities constituted a *moderate* potential for NPS impairment (Table 5a). Excessive erosion from croplands, agricultural areas, and roads were also listed as concerns by the local SWCD (Table 4a).

Assessments: Intensive water quality data was collected at MFCAU01 in conjunction with the University Tributary Nutrient Loading Study (Appendix F-4). Middle Fork of Cowikee Creek was evaluated at CHA05 during ADEM's 1996 Clean Water Strategy Project (Appendix F-6). Chemical data did not indicate impairment. Station locations are provided in Appendix E-1.

Sub-Watershed: South Fork Cowikee Creek	NRCS Sub-Watershed Number 150

Station	Assessment Type	Date	Location	Area (mi^2)	Class
SFCAU01	Chem.	1999	South Fork Cowikee Cr. at Barbour CR 79	112	F&W
COW (AU008)	Chem.	1999	East Fork Cowikee Cr. at US Hwy 82 nr Midway (Mile 226)	82	F&W

Land use: South Fork of Cowikee Creek drains 125 mi^2 of Barbour and Bullock Counties. SWCD-estimated land use was primarily forest (89%) with some pasture (6%) and row crops (4%) (Table 2a). Two current construction/stormwater authorizations have been issued within the sub-watershed (Table 9a).

NPS impairment potential: Estimates of impairment potential from livestock sources were *low* throughout the sub-watershed (Table 3a). Estimated sediment erosion rates were the lowest in the cataloging unit (1.0 tons/acre/year) (Table 4a). The estimated overall potential for NPS impairment was *low* (Table 5a).

Assessments: Intensive water quality data was collected at SFCAU01 in conjunction with the University Tributary Nutrient Loading Study (Appendix F-4). East Fork of Cowikee Creek was assessed at AU008 as part of a water quality study conducted by the Auburn University Civil Engineering Department (AUCE 1999). Chemical data did not indicate impairment. Station locations are provided in Appendix E-1.

Sub-Watershed: Lower Cowikee Creek	NRCS Sub-Watershed Number 160

Station	Assessment Type	Date	Location	Area (mi^2)	Class
CH1U4-16	Chem., Hab.	2000	Unnamed tributary to Little Barbour Cr (13N/29E/29)	<1	F&W
USCG (AU010)	Chem.	1999	W.F. George Reservoir at the US Coast Guard docks	7460	F&W
CHA06	Chem.	1996	South Fork Cowikee Cr. at Barbour CR 89	130	F&W

Land use: Lower Cowikee Creek drains 131 mi^2 of Barbour and Russell Counties. SWCD estimated the sub-watershed to be mostly forest (65%) with some row crops (15%) and pasture (9%) (Table 2a). Five current construction/stormwater authorizations and 1 semi-public/private NPDES permit have been issued within the sub-watershed (Table 9a).

NPS impairment potential: Impairment potential from livestock sources was *moderate* (0.10 AU/acre), but ranked highest in the W. F. George Reservoir CU (Table 3a). Total sediment erosion was estimated at 1.4 tons/acre/year, indicating a *low* potential for NPS impairment (Tables 4a and 5a). However, erosion from multiple sources was listed as a concern by the local SWCD (Table 4a). The overall potential for NPS impairment was *low* (Table 5a).

Assessments: Intensive chemical sampling was conducted at one station located on the Walter F. George Reservoir during a water quality study conducted by the Auburn University Civil Engineering Department (AUCE 1999). One station on South Fork Cowikee Creek (CHA06) was evaluated in 1996 during ADEM's Clean Water Strategy Project (Appendix F-6). An unnamed

tributary to Little Barbour Creek (CH1U4-16) was assessed during ADEM's ALAMAP Program (Appendix F-5). Station descriptions are provided in Appendix E-1.

Sub-Watershed: Barbour Creek	**NRCS Sub-Watershed Number 180**

Station	Assessment Type	Date	Location	Area (mi^2)	Class
BRC-1	Chem.	1999	Barbour Creek at US Hwy 431	95	F&W
BRC-2	Chem., Hab., Macroinv.	1999	Barbour Creek at Barbour CR 79	20	F&W
CH01U3-33	Chem., Hab.	1999	Unnamed tributary to Leak Cr. approx. 0.75 mi. us of Barbour CR 79	3	F&W
BARB (AU009)	Chem.	1999	Barbour Creek at 1524 Barbour Lane in Eufaula	95	F&W
WFG (AU004)	Chem.	1999	Chattahoochee River at W.F. George Lock and Dam nr Abbeville	7460	F&W

Land use: Barbour Creek is the largest sub-watershed in the Middle Chattahoochee - W.F. George CU, draining 246 mi^2 of Barbour and Henry Counties. Land use within the sub-watershed is primarily forest (74%) mixed with some urban areas (11%), cropland (5%), and open water (4%) (Table 2a). Four current construction/stormwater authorizations and 5 NPDES permits have been issued in the sub-watershed (Table 9a). A 21.9-mi. section of Barbour Creek is listed as not supporting its "Fish and Wildlife" water-use classification due to siltation, organic enrichment, and dissolved oxygen violations from unknown sources (Table 11a). However, intensive monitoring data collected during 2000 suggest that Barbour Creek is meeting Fish and Wildlife Use Classification criteria. It has been recommended for removal from ADEM's draft 2000 §303(d) list (Appendix G).

NPS impairment potential: The potential for impairment from aquaculture and mining activities was estimated as *high* (Table 5a). The value for sediment contributions from mined land was the highest given in the CU (Table 4a). The overall potential for NPS impairment was estimated as *moderate* (Table 5a). Silviculture and agricultural land uses were observed within the sub-watershed during site reconnaissance of Barbour Creek at BRC-1 and BRC-2. The potential for impairment from urban runoff and development was *moderate* (Table 5a).

Assessments: Two stations were monitored on Barbour Creek during ADEM's 1999 CWA §303(d) stream monitoring program (Appendix F-2a). A 3rd station on Barbour Creek and a station on the Chattahoochee River were monitored during the University Tributary Nutrient Loading Study (Appendix F-4). An unnamed tributary to Leak Creek was evaluated during ADEM's ALAMAP Program (Appendix F-).

Barbour Creek: Barbour Creek at BRC-2 is a low-gradient, sandy-bottomed stream (Table 6a). Habitat quality was estimated as *good* (Table 6a). Seven EPT families were collected indicating the macroinvertebrate community to be in *fair* condition (Table 7a).

Thirty intensive water quality sampling events were conducted at Barbour Creek by ADEM (Appendix F-2) and Auburn University (Appendix F-4) in 1998 and 1999. The dissolved oxygen criteria of 5.0 mg/L was not violated on any occasion during the study period (Appendix G). Fecal coliform concentrations exceeded 700 colonies/100ml of sample at BRC-1 and BRC-2

during September of 1999 (Appendix F-2). Five-day biochemical oxygen demand (BOD-5) and total Kjeldahl nitrogen (TKN) were periodically elevated at BRC-1.

NPS priority status: Assessments conducted at BRC-2 indicated the macroinvertebrate community to be in *fair* condition (Table 12a). Intensive chemical sampling showed fecal coliform, TKN, and BOD concentrations to be periodically high and a potential source of biological impairment. SWCD estimates indicated aquaculture, mining, and sedimentation rates to be NPS concerns within the sub-watershed. Site reconnaissance confirmed silviculture and agricultural land uses to also be prevalent. Barbour Creek was recommended as a NPS priority sub-watershed (Table 13a).

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Lower Chattahoochee CU (0313-0004) Summary

Land use: Land cover within the Lower Chattahoochee CU was primarily forest, row crop, and pasture/hay. It contains 6 sub-watersheds in a 586 mi^2 area of Houston, Henry, and Barbour Counties (fig. 1). It is located in the Southern Hilly Gulf Coastal Plain (65d) and Dougherty Plains (65g) Subecoregions of the Southeastern Plains Ecoregion. Five stream segments are currently on ADEM's draft 2000 CWA §303(d) list of impaired waters for not meeting their water use classifications (Table 11a).

Percent land cover estimated by local SWCD (ASWCC 1998)

Forest	Row crop	Pasture	Mining	Urban	Open Water	Other
47%	33%	14%	1%	3%	1%	2%

NPS impairment potential: All 6 of the sub-watersheds within the Lower Chattahoochee CU were estimated to have a *moderate* or *high* potential for NPS impairment. Animal husbandry, row crops, pastures, and sediment were the main NPS concerns within the CU. Four sub-watersheds were estimated to have a *moderate* or *high* potential for impairment from urban sources (Table 5a).

Number of sub-watersheds with (M)oderate or (H)igh ratings for each NPS category (Table 5a).

Category	Overall Potential	Animal husbandry	Aqua-culture	Row crop	Pasture	Mining	Forestry	Sediment
Moderate	3	4	2	2	4	0	2	2
High	3	0	0	4	1	2	0	2

Number of sub-watersheds with (M)oderate or (H)igh ratings for each point source category (Table 5a).

Category	% Urban	Development	Septic tank failure
Moderate	3	2	0
High	0	1	0

Historical data/studies: Assessments have been conducted recently in 5 sub-watersheds (Table 8a). The majority of assessments conducted within the CU and presented in this report were from 5 major projects conducted by ADEM and Auburn University. Historical data included both monitored and evaluated assessments. Evaluated assessments are based on observed conditions, limited water quality data, water quality data older than 5 years, or estimated impacts from observed or suspected activities. Evaluated data has been collected in conjunction with ADEM's ALAMAP Program (Appendix 5) and 1996 Clean Water Strategy Project (Appendix F-6). Monitored assessments are based on chemical, physical, and/or biological data collected using commonly accepted and well-documented methods. Monitored assessment data was collected during 3 projects. Results of habitat and biological assessments conducted in conjunction with these projects are presented in Tables 6a and 7a, respectively. Chemical/physical data are provided in the Appendices listed below.

Project	Appendices and references
ADEM's 303(d) Monitoring Program	F-2
Southeast Alabama Poultry Industry Impact Study	F-3
Water Quality Study of the Lower Chattahoochee	F-8; AUCE 1999

Assessments conducted during the SE Alabama NPS Screening Assessment: Table 10a lists the stations assessed in conjunction with the southeast Alabama screening assessment. Three stations were assessed within the McRay Mill Creek (020) and Cedar Creek (080) sub-watersheds. Habitat and bioassessment results are presented in Tables 6a and 7a, respectively. Chemical/physical data are provided in Appendix D-1.

Sub-watershed summaries: Current and historical monitoring data were combined to provide a comprehensive assessment. A summary of the information available for both sub-watersheds is provided. Each summary discusses land use, NPS impairment potential, assessments conducted within the sub-watershed, and NPS priority rating based on available data. The summaries point out significant data and reference appropriate tables and appendices. Assessments of habitat, biological and chemical conditions are based on long-term data from ADEM's Ecoregional Reference Site Program (ADEM 2000a). Tables and Appendices referenced in the summaries are located at the end of this report.

Sub-watershed assessments: Habitat, chemical/physical, and biological indicators of water quality were monitored at 4 stations in 3 sub-watersheds (Table 12a). Habitat quality was generally assessed as *excellent* at all 4 stations (Table 6a). Results of macroinvertebrate assessments indicated the macroinvertebrate community to be in *fair* condition at 2 stations and *good* condition at 2 stations (Table 7a). Two fish IBI assessments were conducted. Results indicated the fish community to be in *fair* or *poor* condition at both sites (Table 7a).

Overall condition was rated as the lowest assessment result obtained (Table 12a). Three stations were assessed as *fair* or *poor*. One station was assessed as *good*.

NPS priority sub-watersheds: A sub-watershed was recommended for NPS priority status if the macroinvertebrate or fish communities were assessed as *fair* or *poor*. Bioassessments indicated biological impairment at two sub-watersheds (Table 12a). The McRay Mill Creek (020) sub-watershed was recommended for priority status (Table 13a). Omussee Creek (060) may be adversely impacted by runoff from non-rural sources. Intensive monitoring may be needed to identify the source of impairment.

Sub-Watershed: McRay Mill Creek	NRCS Sub-Watershed Number 020

Station	Assessment Type	Date	Location	Area (mi^2)	Class
BMCH-1	Hab., Macroinv., Fish	1999	Bennett Mill Creek at Henry CR 97	6	F & W
MMCH-1	Hab., Macroinv.	1999	McRay Mill Creek at AL Hwy 10	9	F & W
CH01U2-13	Chem., Hab.	1998	Tributary to Chattahoochee River approx. 0.1 mi. us of confluence with Chattahoochee River.	1	F & W

Land use: The McRay Mill Creek sub-watershed is small, draining only 45 mi^2 of Henry County. Forest (47%), row crops (40%), and pasture (10%) were estimated to be the main land uses within the sub-watershed (Table 2a). One current construction/stormwater authorization has been issued within the sub-watershed (Table 9a). Two unnamed tributaries to Jackson Lake are listed as not supporting their "Fish and Wildlife" water-use classifications due to organic enrichment, dissolved oxygen violations, and pathogens from animal feeding operations and pasture grazing (Table 11a).

NPS impairment potential: Potential for NPS impairment from cropland runoff was estimated as *high* (Table 5a). Potential for impairment from pasture runoff, forestry practices, and sedimentation was *moderate* (Table 5a). Excessive sediment deposition from cropland and roads and road banks were also listed as resource concerns by the SWCD (Table 4a). Overall potential for NPS impairment throughout the sub-watershed was estimated as *moderate* (Table 5a).

Assessments: Stream reaches located on Bennett Mill Creek and McRay Mill Creek were assessed as part of the southeast Alabama NPS Screening Assessment (Table 10a). One station (CH01U2-13) was evaluated on an unnamed tributary to the Chattahoochee River during ADEM's 1998 ALAMAP Project (Appendix F-5). Station descriptions are provided in Appendix E-1.

Bennett Mill Creek: The substrate composition at Bennett Mill Creek (BMCH-1) was dominated by sand (92%), but the overall habitat quality was assessed as *good* (Table 6a). Eight EPT families were collected, indicating the aquatic macroinvertebrate community to be in *fair* condition (Table 7a). The fish community was assessed as *poor* (Table 7a). Water samples collected at BMCH-1 for chemical analyses did not indicate impairment (Appendix D-1).

McRay Mill Creek: The bottom substrate at McRay Mill Creek (MMCH-1) was mostly sand (70%), with some clay (20%) (Table 6a). Habitat quality at the site was estimated as *excellent* for this subecoregion (Table 6a). Six EPT families were collected, indicating that the aquatic macroinvertebrate community was in *fair* condition (Table 7a).

NPS priority status: McRay Mill Creek is recommended as a NPS priority sub-watershed due to impaired biological conditions at Bennett Mill Creek and McRay Mill Creek (Tables 12a and 13a). Water quality samples did not suggest a cause of impairment. The main NPS concerns within the sub-watershed were runoff from cropland and pastures, forestry, and sedimentation.

Sub-Watershed: Abbie Creek	NRCS Sub-Watershed Number 040

Land use: The Abbie Creek sub-watershed is the largest in this CU, comprising 199 mi^2 of Barbour and Henry Counties. Forest (71%) is the dominant land use within the sub-watershed, followed by row crops (20%) and pasture (4%) (Table 2a). Two current construction/stormwater authorizations and 1 municipal NPDES permit have been issued within the sub-watershed (Table 9a).

NPS impairment potential: NPS impairment potential from mining activities and sedimentation was estimated as *high* (Table 5a). SWCD estimated a total sedimentation rate of 13.5 tons/acre/year for the sub-watershed, the highest in the CU. Sediment sources are listed in Table 4a. There was a *moderate* potential for impairment due to runoff from cropland and forestry areas (Table 5a).

Assessments: One station (CH03U1) was assessed on an unnamed tributary to Peterman Creek during ADEM's 1997 ALAMAP Project (Appendix E-1).

Sub-Watershed: Foster Creek	NRCS Sub-Watershed Number 050

Land use: The Foster Creek sub-watershed is the smallest in the Lower Chattahoochee CU, comprising 33 mi^2 of Henry and Houston Counties. According to SWCD estimates, the major land use categories in this sub-watershed were row crops (50%), forest (29%), and pasture (18%) (Table 2a). Three current construction/stormwater authorizations and 1 municipal NPDES permit have been issued in the sub-watershed (Table 9a).

NPS impairment potential: The overall potential for NPS impairment was estimated as *high* (Table 5a). The main NPS concerns were livestock production, sedimentation, and runoff from agricultural and croplands (Table 5a). There was a *moderate* potential for impairment from urban development (Table 5a).

Assessments: No assessments have been conducted in this sub-watershed.

Sub-Watershed: Omussee Creek	NRCS Sub-Watershed Number 060

Station	Assessment Type	Date	Location	Area (mi^2)	Class
PSB-1	Chem.	1999	Omussee Creek at Houston CR 41	46	F&W
PSB-2	Chem.	1999	Poplar Spring Branch at Ross Clark Circle in Dothan	1	F&W
SPMH-1	Chem., Hab., Macroinv., Fish	1999	Spivey Mill Creek between Henry CRs 49 & 87	18	F&W

Land use: The Omussee Creek sub-watershed is relatively large, draining a 177 mi^2 area of Henry and Houston Counties. SWCD estimates of land use were 42% row crops, 31% forest, 19% pasture, and 5% urban (Table 2a). Two municipal, 1 semi-public/private, and 3 industrial wastewater NPDES permits and 16 current construction/stormwater authorizations, have been issued within the sub-watershed (Table 9a).

NPS impairment potential: The impairment potential from animal sources, pasture runoff, and sedimentation was estimated as *moderate* (Table 5a). NPS impairment potential from row crops

was estimated as *high*. Overall potential for NPS impairment in the sub-watershed was estimated as *high* (Table 5a).

Assessments: Intensive monitoring data was collected at Spivey Mill Creek (SPMH-1) during the Southeast Alabama Poultry Industry Impact Study, which was conducted in August of 1998 through September 1999 (Appendix F-3, ADEM 1999g). Chemical sampling was conducted at Omussee Creek and Poplar Spring Branch during ADEM's 1999 CWA §303(d) Monitoring Program (Appendix F-2). Station descriptions are provided in Appendix E-1.

Spivey Mill Creek: Habitat and aquatic macroinvertebrate community assessments were conducted at SPMH-1 in 1998 and 1999. A fish community assessment was conducted in 1999. The habitat quality was evaluated as *good* and *excellent* in 1998 and 1999, respectively (Table 6a and 7a). The macroinvertebrate community was assessed as *good* in both 1998 and 1999. The fish sample collected in 1999 indicated a *fair* fish community.

Intensive water quality samples were collected at this station from August of 1998 through September of 1999 (Appendix F-3). Overall water quality data indicated nutrient enrichment. Fecal coliform concentrations were greater than 1,000-colonies/100 mL of sample during 1 sampling visit.

NPS priority status: The fish community at Spivey Mill Creek was assessed as *fair* (Table 12a). Water quality data indicated nutrient enrichment and pathogens to be potential problems at SPMH-1. However, the site may be adversely affected by runoff from a nearby golf course. Further study may be warranted to evaluate the source of these impairments.

Sub-Watershed: Cedar Creek	**NRCS Sub-Watershed Number 080**

Station	Assessment Type	Date	Location	Area (mi^2)	Class
CRCH-1	Chem., Hab., Macroinv.	1999	Cedar Creek at AL Hwy 95	31	F&W
CHA10	Chem.	1996	Cedar Creek at AL Hwy 95	31	F&W
CHA09	Chem.	1996	Cedar Creek at Houston CR 33	4	F&W
GWA (AU003)	Chem.	1999	Chattahoochee River at George W. Andrews Lock & Dam, Columbia, AL	8040	F&W

Land use: The Cedar Creek sub-watershed drains 66 mi^2 of Houston County. SWCD estimated land use to be 44% row crops, 30% forest, 17% pasture, and 6% urban (Table 2a). Three current construction/stormwater authorizations have been issued within the sub-watershed (Table 9a).

NPS impairment potential: The primary NPS concerns within the sub-watershed were animal husbandry, aquaculture, and runoff from crop and pasture lands (Table 5a). Cropland erosion was the primary source of sedimentation, contributing 1.1 tons/acre/year (Table 4a). The overall potential for NPS impairment was estimated as *moderate* (Table 5a). The potential for impairment from urban runoff and development was *moderate* (Table 5a).

Assessments: Cedar Creek at CRCH-1 was assessed during the southeast Alabama basins NPS Screening Assessments. Cedar Creek was previously evaluated at two locations in conjunction with ADEM's 1996 Clean Water Strategy Project (Appendix F-6). Water quality sampling was conducted at GWA during the AUCE Basin Study (AUCE 1999). Station descriptions are provided in Appendix E-1.

Cedar Creek: Cedar Creek (CRCH-1) is a low-gradient, sandy-bottomed stream (Table 6a). Habitat quality was estimated as *excellent* for this subecoregion (Table 6a). Nine EPT families were collected, indicating the macroinvertebrate community was in *good* condition at this site (Table 7a).

NPS priority status: Results of macroinvertebrate and habitat assessments conducted at CRCH-1 indicated Cedar Creek to be in *good* condition (Table 12a).

Sub-Watershed: Bryans Creek	**NRCS Sub-Watershed Number 100**

Station	Assessment Type	Date	Location	Area (mi^2)	Class
CHA07	Chem.	1996	Bryans Creek at Houston CR 85	15	F&W
CHA08	Chem.	1996	Bryans Creek at AL Hwy 95	35	F&W

Land use: The Bryans Creek sub-watershed drains a 66-mi^2 area of Houston County. SWCD estimated land use as 40% forest, 28% pasture, 26% row crops, and 5% urban (Table 2a). One current construction/stormwater authorization has been issued within the sub-watershed (Table 9a).

NPS impairment potential: Potential NPS impairment from cattle (Table 3a), aquaculture (Table 3a), and row crops (Table 1a) was *moderate*. There was a *high* potential for impairment from pasture runoff (Table 5a). Overall potential for NPS impairment was estimated as *moderate* for this sub-watershed (Table 5a). The potential for impairment from urban runoff was *moderate* (Table 5a).

Assessments: Two stations on Bryans Creek (CHA07 and CHA08) were evaluated during ADEM's 1996 Clean Water Strategy Project (Appendix F-6a). Station descriptions are listed in Appendix E-1.

Chipola River CU (0313-0012) Summary

Land use: The Chipola River CU contains only 2 sub-watersheds in a 258-mi^2 area of Houston and Geneva Counties (fig 1). It is located within the Dougherty Plain (65g) subecoregion (fig 2). Land cover within the Chipola River CU was primarily forest, row crops, pastures, and urban areas.

Percent land cover estimated by local SWCD (ASWCC 1998)

Forest	Row crop	Pasture	Mining	Urban	Open Water	Other
35%	35%	18%	0%	10%	1%	<1%

NPS impairment potential: The main NPS concerns within the Chipola River CU were animal husbandry and runoff from pasture and crop lands. The potential for impairment from aquaculture was *moderate* in the Cowarts Creek sub-watershed (Table 5a). Both sub-watersheds were estimated to have a moderate potential for impairment from nonpoint sources. Impairment from urban runoff and development was also a concern within the CU.

Number of sub-watersheds with (M)oderate or (H)igh ratings for each NPS category (Table 5a).

Category	Overall Potential	Animal husbandry	Aqua-culture	Row crop	Pasture	Mining	Forestry	Sediment
Moderate	2	2	1	2	2	0	0	0
High	0	0	0	0	0	0	0	0

Number of sub-watersheds with (M)oderate or (H)igh ratings for each point source category (Table 5a).

Category	% Urban	Development	Septic tank failure
Moderate	2	0	0
High	0	1	0

Historical data/studies: Table 8a lists the sub-watersheds and waterbodies in which data has been previously collected in conjunction with other monitoring programs. Appendices where the data are provided in this report are also listed. Recent assessment information has been collected in both the Cowarts Creek (010) and Big Creek (020) sub-watersheds. Two stations located within the Cowarts Creek sub-watershed were evaluated during ADEM's 1996 Clean Water Strategy Project (Appendix F-6). Ten stations located within the Big Creek sub-watershed were assessed during ADEM's 1999 CWA §303(d) stream monitoring program (Appendix F-2), ADEM's 1996 Clean Water Strategy Project (Appendix F-6), and ADEM's ALAMAP Project (Appendix F-5).

Assessments conducted during the SE Alabama NPS Screening Assessment: The Cowarts Creek and Big Creek sub-watersheds were not assessed during the southeast Alabama screening assessment due to prevalence of urban development and proximity to backwater areas.

Sub-watershed summaries: Historical monitoring data were used to provide a comprehensive assessment. A summary of the information available for both sub-watersheds is provided. Each summary discusses land use, NPS impairment potential, assessments conducted within the sub-watershed, and NPS priority rating based on available data. The summaries point out significant data and reference appropriate tables and appendices. Assessments of habitat, biological, and chemical conditions are based on long-term data from ADEM's Ecoregional Reference Site Program (ADEM 2000a). Tables and Appendices referenced in the summaries are located at the end of this report.

Sub-watershed assessments: Habitat, chemical/physical, and biological indicators of water quality were monitored at one station in the Big Creek sub-watershed (Table 12a). Habitat quality was

assessed as *excellent* (Table 6a). Results of the macroinvertebrate assessment indicated the macroinvertebrate community to be in *fair* condition (Table 7a).

NPS Priority Sub-watersheds: Overall condition of Cypress Creek at CYC-2 was rated as *fair* (the lowest assessment result obtained) (Table 12a). However, the site was located downstream of a wastewater treatment plant outfall. The Big Creek sub-watershed was therefore not recommended for NPS priority status.

Sub-Watershed: Cowarts Creek	**NRCS Sub-Watershed Number 010**

Station	Assessment Type	Date	Location	Area (mi^2)	Class
CHI04	Chem.	1996	Cowarts Cr at Houston CR 81	96	F&W
CHI05	Chem.	1996	Cowarts Cr at AL Hwy 53	103	F&W

Land use: Cowarts Creek drains a 114 mi^2 area of Houston Creek. According to SWCD estimates, row crops (35%), forest (35%), pasture (16%), and urban areas (9%) were the main land used within the sub-watershed (Table 2a). Two current construction/stormwater authorizations and 1 municipal NPDES permit have been issued in the sub-watershed (Table 9a).

NPS impairment potential: The SWCD-estimated impairment potential from livestock sources and aquaculture was *moderate* (Table 3a). Potential impairment from pasture runoff and cropland was *moderate* (Table 5a). Resource concerns listed by the local SWCD included excessive erosion, poor soil condition of cropland, and access of livestock to streams (Table 4a). The overall potential for NPS impairment was estimated as *moderate* (Table 5a). There was a *moderate* potential for impairment from urban runoff (Table 5a).

Assessments: An assessment was not conducted in the sub-watershed during the southeast Alabama basins NPS Screening Assessments. Two stations were evaluated on Cowarts Creek during ADEM's 1996 Clean Water Strategy Project (Appendix F-6a). Station descriptions are listed in Appendix E-1a.

Sub-Watershed: Big Creek	NRCS Sub-Watershed Number 030

Station	Assessment Type	Date	Location	Area (mi^2)	Class
CYC-1	Chem.	1999	Cypress Creek at Blackman Rd.	11	F&W
CYC-2	Chem., Hab., Macroinv.	1999	Cypress Creed at Hodgesville Rd.	8	F&W
CYC-3	Chem.	1999	Cypress Creek at Saunders Rd.	5	F&W
CYC-4	Chem.	1999	Cypress Creek at WWTP access road just before entering the gate.	8	F&W
CYWW-1	Chem.	1999	Cypress Creek at WWTP outfall	8	F&W
CHI01	Chem.	1996	Boggy Creek at AL Hwy 53	7	F&W
CHI02	Chem.	1996	Boggy Creek at unnamed Houston CR south of Cottomwood	10	F&W
CHI03	Chem.	1996	Buck Creek at Houston CR 55	10	F&W
CP01U1	Chem., Hab.	1997	Buck Creek nr. Cottonwood (1N/27E/15)	10	F&W
CHI06	Chem.	1996	Limestone Creek at AL Hwy 109	30	F&W

Land use: Big Creek drains a 144 mi^2 area of Geneva and Houston Counties. The local SWCD estimated land use as 35% row crops, 35% forest, 20% pasture, and 10% urban (Table 2a). Ten current construction/stormwater authorizations and 2 municipal NPDES permits have been issued in the sub-watershed (Table 9a).

NPS impairment potential: Potential for impairment from animal husbandry and runoff from crop and pasture lands was *moderate* (Table 5a). The overall potential for impairment from nonpoint sources was estimated as *moderate* (Table 5a).

Assessments: No sites were assessed within the sub-watershed during the southeast Alabama screening assessment. However, Cypress Creek was monitored at four stations to evaluate the impact of a wastewater treatment facility on water quality (Appendix F-2). Water quality data was collected from Boggy Creek, Buck Creek, and Limestone Creek during ADEM's 1996 Clean Water Strategy Project (Appendix F-6). Buck Creek was also evaluated during ADEM's 1997 ALAMAP Program (Appendix F-5). Station descriptions are provided in Appendix E-1.

Cypress Creek: Cypress Creek at CYC-2 is a low-gradient stream with sand and silt substrates (Table 6a). Habitat quality was estimated as *excellent* for this stream type and region (Table 6a). Four EPT families were collected, indicating the macroinvertebrate community was in *fair* condition (Table 7a). Results of water quality data are provided in Appendix F-2.

NPS priority status: Results of a macroinvertebrate community assessment indicated impaired biological condition at CYC-2 (Table 12a). However, this station is located downstream of a WWTP. Therefore, Big Creek was not recommended as a NPS priority sub-watershed.

Table 2a. Land use percentages for the Apalachicola Accounting Unit (0313-00) from EPA landuse categories (EPA 1997) and local SWCD Conservation Assessment Worksheet landuse estimates (ASWCC 1998).

Subwatershed	Percent Total Landuse													
	Open Water		Urban		Mines		Forest		Pasture		Row Crops		Other	
	SWCD	EPA	SWCD	EPA	SWCD	EPA	SWCD	EPA	SWCD	EPA	SWCD	EPA	SWCD	EPA
Middle Chattahoochee - Lake Harding (03130002)														
100	1	<1	0	0	<1	0	81	91	15	5	1	4	2	0
190	7	<1	3	0	0	0	73	81	15	9	<1	7	2	1
200	6	6	2	0	0	0	85	78	6	9	0	4		2
220	<1	<1	2	1	0	<1	91	81	6	7	1	2	<1	7
250	2	<1	30	14	0	0	59	64	9	6	<1	5	<1	10
260	---	1	---	12	---	0	---	76	---	2	---	2	---	6
290	1	<1	2	1	0	0	87	79	9	7	<1	5	<1	7
300	3	<1	9	2	0	<1	77	75	10	10	2	6	<1	5
310	12	12	1	0	0	0	83	83	2	2	1	2	<1	1
320	4	<1	5	1	0	<1	88	87	3	7	0	4	<1	1
360	15	2	10	1		0	74	88	1	2	0	3	<1	2
Middle Chattahoochee - Walter F. George Reservoir (03130003)														
020	1	2	33	16	2	<1	54	69	5	4	4	4	2	5
060	2	1	6	2	1	<1	74	82	11	3	5	8	<1	4
070	1	1	1	0	<1	<1	67	70	15	5	15	18	1	6
080	1	1	5	0	1	1	75	78	9	2	8	10	1	6
100	1	4	2	0	0	1	60	73	20	2	15	13	2	7
120	1	1	4	0	0	<1	70	91	18	2	5	4	2	2
130	1	<1	2	0	0	<1	68	86	19	3	9	8	1	2
140	1	1	1	0	<1	<1	86	88	5	2	1	4	6	5
150	<1	<1	<1	0	<1	<1	89	87	6	2	4	5	1	6
160	1	8	2	0	<1	<1	65	69	9	5	15	13	1	4
180	4	5	11	0	1	<1	74	84	3	1	5	6	2	2

Table 2a, cont. Land use percentages for the Apalachicola Accounting Unit (0313-00) from EPA landuse categories (EPA 1997) and local SWCD Conservation Assessment Worksheet landuse estimates (ASWCC 1998).

Subwatershed	Percent Total Landuse													
	Open Water		Urban		Mines		Forest		Pasture		Row Crops		Other	
	SWCD	EPA	SWCD	EPA	SWCD	EPA	SWCD	EPA	SWCD	EPA	SWCD	EPA	SWCD	EPA
Lower Chattahoochee (0313-0004)														
020	1	<1	0	0	0	0	47	67	10	7	40	24	3	2
040	1	<1	2	0	1	<1	71	68	4	8	20	19	2	4
050	1	1	<1	0	0	0	29	41	18	23	50	30	2	6
060	1	<1	5	2	1	0	31	40	19	23	42	31	2	2
080	1	1	6	0	0	<1	30	43	17	25	44	22	2	8
100	1	<1	5	0	0	<1	40	46	28	13	26	24	0	17
Chipola River (0313-0012)														
010	1	<1	9	0	0	<1	35	28	16	26	35	32	4	13
030	1	1	10	1	0	<1	35	30	20	20	35	33	1	14

Table 3a. Estimates of animal concentrations, animal units (AU), percent aquaculture, and percent of acres where pesticides/herbicides have been applied in the Appalachicola Accounting Unit (0313-00) .

		Middle Chattahoochee - Lake Harding Subwatersheds (CU 0313-0002)										
		100	190	200	220	250	260*	290	300	310	320	360
County (s)		Randolph	Chambers Randolph	Chambers	Chambers	Chambers Lee	Chambers Lee	Chambers Lee	Chambers Lee	Lee	Lee	Lee
Acres Reported (%)		100	80	104	100	100	0	100	100	99	100	100
Pesticides Applied	Est. % Total Acres	*	0.3	0.6	0.7	0.4	*	0.6	0.2	*	*	*
Cattle	# / Acre	0.09	0.11	0.03	0.02	0.04	*	0.04	0.05	0.01	0.02	0.01
	A.U./Acre	0.09	0.11	0.03	0.02	0.04	*	0.04	0.05	0.01	0.02	0.01
Dairy	# / Acre			<0.01			*					
	A.U./Acre			<0.01			*					
Swine	# / Acre						*					
	A.U./Acre						*					
Poultry - Broilers	# / Acre	82.52	4.65				*					
	A.U./Acre	0.66	0.04				*					
Poultry - Layers	# / Acre	2.88					*					
	A.U./Acre	0.02					*					
Total	A.U./Acre	**0.77**	**0.15**	**0.03**	**0.02**	**0.04**	*	**0.04**	**0.05**	**0.01**	**0.02**	**0.01**
Potential for NPS Impairment		High	Mod	Low	Low	Low	*	Low	Low	Low	Low	Low
Aquaculture	% Total Acres						*					

* No data reported for this portion of the subwatershed

Table 3a, cont. Estimates of animal concentrations, animal units (AU), percent aquaculture, and percent of acres where pesticides/herbicides have been applied in the Appalachicola Accounting Unit (0313-00) .

		Middle Chattahoochee - Walter F. George Reservoir Subwatersheds (CU 0313-0003)										
		020	060	070	080	100	120	130	140	150	160	180
County (s)		Lee Russell	Lee Russell	Lee Russell	Russell	Russell	Russell	Barbour Russell	Barbour Bullock Macon Russell	Barbour Bullock	Barbour Russell	Barbour Henry
Acres Reported		101	100	100	100	100	100	98	100	100	100	100
Pesticides Applied	Est. % Total Acres	*	0.4	1	3	3	1	1	0.3	0.3	8	2
Cattle	# / Acre	0.01	0.03	0.04	0.01	0.02	0.03	0.02	0.02	0.03	0.04	0.02
	A.U./Acre	0.01	0.03	0.04	0.01	0.02	0.03	0.02	0.02	0.03	0.04	0.02
Dairy	# / Acre		<0.01									
	A.U./Acre		<0.01									
Swine	# / Acre		<0.01	<0.01					<0.01	<0.01	<0.01	<0.01
	A.U./Acre		<0.01	<0.01					<0.01	<0.01	<0.01	<0.01
Poultry - Broilers	# / Acre											0.66
	A.U./Acre											0.01
Poultry - Layers	# / Acre	2.88									7.59	
	A.U./Acre	0.02									0.06	
Total	A.U./Acre	**0.01**	**0.03**	**0.04**	**0.01**	**0.02**	**0.03**	**0.02**	**0.02**	**0.03**	**0.10**	**0.02**
Potential for NPS Impairment		Low	Low	Low	Low	Low	Low	Low	Low	Low	Mod	Low
Aquaculture	% Total Acres											0.09

* No data reported for this portion of the subwatershed

Table 3a, cont. Estimates of animal concentrations, animal units (AU), percent aquaculture, and percent of acres where pesticides/herbicides have been applied in the Appalachicola Accounting Unit (0313-00) .

		Lower Chattahoochee River Subwatersheds (CU 0313-0004)						Chipola River (CU 0313-0012)	
		020	040	050	060	080	100	010	030
County (s)		Henry	Henry	Henry	Henry Houston	Houston	Houston	Houston	Houston
Acres Reported (%)		100	98	93	102	100	100	100	95
Pesticides Applied	Est. % Total Acres	50	24	68	46	26	25	32	17
Cattle	# / Acre	0.05	0.02	0.09	0.08	0.10	0.10	0.10	0.10
	A.U./Acre	0.05	0.02	0.09	0.08	0.10	0.10	0.10	0.10
Dairy	# / Acre				<0.01			<0.01	
	A.U./Acre				<0.01			<0.01	
Swine	# / Acre	0.01	0.01	0.05	0.02	0.02	0.02	0.02	0.02
	A.U./Acre	<0.01	<0.01	0.02	0.01	0.01	0.01	0.01	0.01
Poultry - Broilers	# / Acre								
	A.U./Acre								
Poultry - Layers	# / Acre							0.36	0.95
	A.U./Acre							<0.01	0.01
Total	A.U./Acre	**0.05**	**0.02**	**0.11**	**0.09**	**0.11**	**0.11**	**0.12**	**0.12**
Potential for NPS Impairment		Low	Low	Mod	Mod	Mod	Mod	Mod	Mod
Aquaculture	% Total Acres				<0.01	0.02	0.02	0.02	0.01

* No data reported for this portion of the subwatershed

Table 4a. Sedimentation estimates by source, forest condition, septic tank estimates, and resource concerns by sub-watershed in the Middle Chattahoochee - Lake Harding (0313-0002) and the Middle Chattahoochee - W.F. George (0313-0003) CUs as provided by the local SWCD on Conservation Assessment Worksheets (ASWCC 1998). (*not reported)

Basin Code- Cataloging Unit	0313-0002											0313-0003										
Subwatershed	**100**	**190**	**200**	**220**	**250**	**260***	**290**	**300**	**310**	**320**	**360**	**020**	**060**	**070**	**080**	**100**	**120**	**130**	**140**	**150**	**160**	**180**
Forest Condition																						
% of Subwatershed Needing Improvement	5	8	41	43	28	*	39	19	17	18	15	7	14	9	7	6	7	6	3	*	1	11
Sediment Contributions (Tons/Acre/Year)																						
Cropland	<0.1	<0.1		<0.1		*	<0.1	<0.1	<0.1			0.1	0.1	0.2	0.1	0.2	0.1	0.1	<0.1	0.1	0.2	0.1
Sand & Gravel Pits		4.3				*						4.2	1.0	0.3	3.5				1.1	<0.1	0.1	<0.1
Mined Land	<0.1					*							0.5	<0.1								0.7
Developing Urban Land		2.0	0.5	0.3	1.7	*	0.5	2.1	2.5	1.0	3.0	3.4	0.6	0.6	0.3				<0.1		0.2	0.2
Critical Areas	1.4	0.9	0.2	0.1	0.2	*	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.2	0.1	0.2	0.2	0.2	<0.1	<0.1	0.1	0.1
Gullies	12.6	8.5	0.2	0.1	0.2	*	0.3	0.1	1.8	0.1	0.0	0.1	0.1	0.2	0.1	0.3	0.3	0.3	0.1	0.2	0.2	0.8
Stream Banks	5.1	4.6	0.1	0.1	1.1	*	0.1	0.1	6.2	0.0	0.2	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	<0.1	0.2
Dirt Roads and Roadbanks	6.6	3.6	0.4	0.2	0.3	*	0.4	0.3	0.8	0.5	0.6	0.2	0.3	0.2	0.1	0.1	0.2	0.2	0.1	0.2	0.1	1.0
Woodlands	0.2	0.4	1.3	1.4	0.9	*	1.4	0.7	1.7	1.8	1.5	0.9	1.4	0.9	1.1	0.9	1.0	1.0	0.4	0.4	0.5	0.6
Total Sediment	25.9	24.3	2.6	2.3	4.3	*	2.8	3.5	13.1	3.5	5.5	9.1	4.3	2.6	5.4	1.7	1.9	1.9	1.8	1.0	1.4	3.7
Potential for Sediment NPS	High	High	Low	Low	Mod	*	Low	Low	High	Low	Mod	Mod	Mod	Low	Mod	Low	Low	Low	Low	Low	Low	Low
Septic Tanks																						
# Septic Tanks per acre*	0.02	0.01	0.01	0.01	0.01	*	0.01	0.02	0.13	0.02	0.18	0.14	0.08	0.03	0.08	0.00	0.01	0.01	0.01	0.01	0.01	0.02
# Septic Tanks Failing per acre*	0.00	0.00	0.00	0.00	0.00	*	0.00	0.00	0.01	0.00	0.01	0.03	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
# of Alternative Septic Systems	---	0	0	0	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Resource Concerns in the Subwatershed																						
Excessive Erosion on Cropland		X		X		*						X	X	X	X	X	X	X	X		X	X
Gully Erosion on Agricultural Land	X	X	X	X	X	*		X				X	X	X	X	X	X	X	X	X	X	X
Road and Roadbank Erosion	X	X	X	X	X	*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Poor Soil Condition (cropland)	X	X				*						X	X	X	X	X	X	X	X		X	
Excessive Animal Waste Applied to Land						*															X	
Excessive Pesticides Applied to Land						*						X		X	X		X	X			X	
Excessive Sediment (Sources):						*																
Cropland						*						X	X	X	X	X	X	X	X	X	X	X
Roads/Roadbanks	X	X	X	X	X	*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Urban Development	X	X	X	X	X	*	X	X	X		X	X	X									X
Inadequate Management of Animal Wastes						*							X									
Nutrients in Surface Waters	X	X				*						X	X	X	X	X	X	X	X	X	X	X
Pesticides in Surface Waters						*						X	X	X	X	X	X	X	X	X	X	X
Streams accessible to livestock	X	X	X	X	X	*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 4a, cont. Sedimentation estimates by subwatershed in the Lower Chattahoochee River (0313-0004) and Chipola River (0313-0012) cataloging units as provided by the local SWCD on Conservation Assessment Worksheets (1998).

Basin Code- Cataloging Unit	0313-0004						0313-0012	
Subwatershed	**020**	**040**	**050**	**060**	**080**	**100**	**010**	**030**
Forest Condition								
% of Subwatershed Needing Improvement	29	48	17	9	4	7	3	3
Sediment Contributions (Tons/Acre/Year)								
Cropland	0.9	0.4	1.1	1.0	1.1	0.4	0.8	0.8
Sand & Gravel Pits	<0.1	0.1	0.1	0.1	0.3	<0.1	<0.1	<0.1
Mined Land		2.3						
Developing Urban Land		0.2		0.2	0.2	0.1	0.1	0.1
Critical Areas	0.5	0.9	0.8	0.2	<0.1	<0.1	<0.1	<0.1
Gullies	3.4	5.9	5.0	1.2	0.1	0.1		
Stream Banks	1.1	1.2	1.5	0.5	0.5	0.3	0.4	0.4
Dirt Roads and Roadbanks	3.8	2.3	3.8	1.1	0.2	0.3	0.9	0.6
Woodlands	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Total Sediment	9.8	13.6	12.2	4.4	2.6	1.4	2.4	2.2
Potential for Sediment NPS	Mod	High	High	Mod	Low	Low	Low	Low
Septic Tanks								
# Septic Tanks per acre	0.01	0.01	0.01	0.03	0.04	0.02	0.04	0.04
# Septic Tanks Failing per acre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
# of Alternative Septic Systems	0	0	0	0	0	0	0	0
Resource Concerns in the Subwatershed								
Excessive Erosion on Cropland		X	X	X	X		X	X
Gully Erosion on Agricultural Land	X	X	X	X				
Road and Roadbank Erosion	X	X	X	X	X			
Poor Soil Condition (cropland)					X	X	X	X
Excessive Animal Waste Applied to Land								
Excessive Pesticides Applied to Land								
Excessive Sediment (Sources):								
Cropland	X	X	X	X				X
Roads/Roadbanks	X	X	X	X	X			
Urban Development				X				X
Inadequate Management of Animal Wastes								
Nutrients in Surface Waters								
Pesticides in Surface Waters	X		X	X				
Livestock Commonly have Access to Streams	X	X	X	X	X	X	X	X

Table 5a. Estimates of NPS impairment potentials for sub-watersheds in the Middle Chattahoochee-Lake Harding (0313-0002) and the Middle Chattahoochee-W. F. George Reservoir (0313-0003) CUs. Estimates are based on information provided by the local SWCD on Conservation Assessment Worksheets (1998). Estimates of impairment potential from development are from Current Construction/Stormwater Authorization information provided by the Mining and NPS Unit of ADEM. The range of values used to define *Low*, *Moderate*, and *High* impairment potentials for each category are listed in the Methods Tables 1b and 1c. Tables where raw data can be found are provided below.

Cataloging Unit	Sub-watershed	Potential NPS Impairment	Potential Sources of Impairment									
			Animal Husbandry	Aquaculture	Row Crops	Pasture Runoff	Mining	Forestry Practices	Sedimentation	Urban	Development	# Failing Septic Tanks
Raw Data Table			3a	3a	2a	2a	2a	4a	4a	2a	9a	4a
0313-0002	100	H	H	L	L	M	L	L	H	L	L	L
	190	M	M	L	L	M	L	L	H	L	L	L
	200	L	L	L	L	L	L	M	L	L	L	L
	220	L	L	L	L	L	L	M	L	L	L	L
	250	M	L	L	L	M	L	M	M	H	M	L
	260	---	---	---	---	---	---	---	---	---	L	---
	290	M	L	L	L	M	L	M	L	L	L	L
	300	L	L	L	L	M	L	L	L	M	H	L
	310	M	L	L	L	L	L	L	H	L	L	M
	320	L	L	L	L	L	L	L	L	M	L	L
	360	L	L	L	L	L	L	L	M	M	M	M
0313-0003	020	L	L	L	L	L	L	L	M	H	H	M
	060	M	L	L	L	M	H	L	M	M	H	M
	070	L	L	L	L	M	L	L	L	L	M	L
	080	M	L	L	L	M	H	L	M	M	M	M
	100	L	L	L	L	M	L	L	L	L	M	L
	120	L	L	L	L	M	L	L	L	M	M	L
	130	L	L	L	L	M	L	L	L	L	M	L
	140	L	L	L	L	L	M	L	L	L	L	L
	150	L	L	L	L	L	L	---	L	L	L	L
	160	M	M	L	L	M	L	L	L	L	M	L
	180	M	L	H	L	L	H	L	L	M	M	L

Table 5a. cont. Estimates of NPS impairment potentials for sub-watersheds in the Lower Chattahoochee River (0313-0004) and the Chipola River (0313-0012) CUs. Estimates are based on information provided by the local SWCD on Conservation Assessment Worksheets (1998). Estimates of impairment potential from development are from Current Construction/Stormwater Authorization information provided by the Mining and NPS Unit of ADEM. The range of values used to define Low, Moderate, and High impairment potentials for each category are listed in the Methods Tables 1b and 1c. Tables where raw data can be found are provided below.

Cataloging Unit	Sub-watershed	Potential NPS Impairment	Potential Sources of Impairment									
			Animal Husbandry	Aquaculture	Row Crops	Pasture Runoff	Mining	Forestry Practices	Sedimentation	Urban	Development	# Failing Septic Tanks
Raw Data Table			3a	3a	2a	2a	2a	4a	4a	2a	9a	4a
0313-0004	020	M	L	L	H	M	L	M	M	L	L	L
	040	H	L	L	M	L	H	M	H	L	L	L
	050	H	M	L	H	M	L	L	H	L	M	L
	060	H	M	L	H	M	H	L	M	M	H	L
	080	M	M	M	H	M	L	L	L	M	M	L
	100	M	M	M	M	H	L	L	L	M	L	L
0313-0012	010	M	M	M	M	M	L	L	L	M	L	L
	030	M	M	L	M	M	L	L	L	M	H	L

Table 6a. Physical characteristics and habitat quality of sites assessed in the Middle Chattahoochee - Lake Harding cataloging unit (0313-0002). (RR -Riffle/Run; GP Glide/Pool)

		Lake Harding					
		WECR-1	WECR-2	BWCC-1	WLCC-1	OSCC-1	HACL-1
Subwatershed #		190	190	220	220	290	300
Date (yymmdd)		990601	990601	990602	990602	990624	990624
Ecoregion/ Subregion		45a	45b	45b	45b	45b	45b
Drainage area (mi^2)		12	34	12	16	---	---
Width (ft)		20	35	10	18	50	50
Canopy Cover**		50/50	50/50	S	S	MO	MS
Depth (ft)	Riffle	0	1	---	---	1	0.3
	Run	0.5	1.0	---	---	1.5	1.5
	Pool	1.0	3.0	3.0	2.0	3.0	2.5
Substrate (%)	Bedrock	---	30	---	---	6	7
	Boulder	2	33	---	---	2	2
	Cobble	20	2	---	---	4	15
	Gravel	19	7	2	5	15	28
	Sand	40	2	74	65	55	28
	Silt	10	25	20	15	3	5
	Detritus	8	1	12	13	15	10
	Clay	1	---	2	2	---	5
	Org. Silt	---	---	---	---	---	---
Geomorphology		RR	RR	GP	GP	GP	RR
Habitat Survey (% maximum)							
Instream Habitat Quality		68	69	43	47	67	75
Sediment Deposition		45	45	70	73	78	75
Sinuosity		92	90	63	65	40	95
Bank and Vegetative Stability		69	76	51	55	45	50
Riparian Measurements		64	76	90	90	38	55
Habitat Assessment Score		158	173	132	143	130	169
% Maximum		66	72	60	65	59	70
Assessment		Excel	Excel	Good	Good	Good	Excel

**Canopy Cover: S = Shaded, MS = Mostly Shaded, 50/50 = Half Shaded / Half Open, MO = Mostly Open, O = Open

Table 6a, cont. Physical characteristics and habitat quality of sites assessed in the W.F. George (0313-0003), Lower Chattahoochee (0313-0004), and Chipola (0313-0012) cataloging units. (RR -Riffle/Run; GP Glide/Pool) *Data collected out of normal sampling window.

		W. F. George						Lower Chattahoochee				Chipola
		MICR-1*	LUC-3	UCCR-1	IHGR-1	HECR-2	BRC-2	BMCH-1	MMCH-1	SPMH-1*	CRCH-1	CYC-2
Subwatershed #		020	060	080	080	120	180	020	020	060	080	030
Date (yymmdd)		990422	990602	990624	990608	990609	990608	990520	990520	990920	990505	990505
Ecoregion/ Subregion		65i	45b	65d	65d	65d	65d	65d	65d	65g	65g	65g
Drainage area (mi^2)		---	---	---	---	51	---	7	9	---	31	---
Width (ft)		20	80	80	38	15	15	12	12	22	20	10
Canopy Cover**		50/50	50/50	MO	MO	MS	S	MS	50/50	MS	S	S
Depth (ft)	Riffle	0.3	0.4	0.5	0.5	---	---	---	---	---	---	---
	Run	1.5	1.0	2.0	1.0	---	0.5	0.3	0.3	---	---	---
	Pool	1.5	---	3.5	2.5	3.5	2.0	---	2.0	1.5	1.3	3.0
Substrate (%)	Bedrock	1	30	---	---	---	---	---	---	---	---	---
	Boulder	5	35	---	---	---	---	---	---	---	---	---
	Cobble	10	20	---	---	---	---	---	---	---	---	---
	Gravel	20	1	15	5	---	---	1	1	1	---	---
	Sand	59	2	20	40	85	93	92	70	80	91	60
	Silt	2	10	---	5	5	2	1	5	2	1	15
	Detritus	3	2	4	2	10	4	4	4	15	5	22
	Clay	---	---	60	44	---	1	2	20	2	3	1
	Org. Silt	---	---	---	---	---	---	---	---	---	---	2
Geomorphology		RR	RR	GP	RR	GP	GP	GP	GP	GP	GP	GP
Habitat Survey (% maximum)												
Instream Habitat Quality		58	76	57	68	37	23	23	35	58	38	58
Sediment Deposition		41	76	83	55	66	70	68	80	75	71	78
Sinuosity		70	95	45	95	50	45	35	30	50	78	58
Bank and Vegetative Stability		35	88	58	84	28	29	55	60	63	48	63
Riparian Measurements		50	90	75	90	85	85	90	90	90	90	90
Habitat Assessment Score		129	199	146	186	112	106	121	129	153	137	156
% Maximum		54	83	66	78	51	48	55	59	64	62	71
Assessment		Excel	Excel	Excel	Excel	Good	Good	Excel	Excel	Excel	Excel	Excel

**Canopy Cover: S = Shaded, MS = Mostly Shaded, 50/50 = Half Shaded / Half Open, MO = Mostly Open, O = Open

Table 7a. Bioassessment results conducted in the Lake Harding (0313-0002) and the Walter F. George (0313-0003) cataloging units of the Middle Chattahoochee River by ADEM during 1999.

	Lake Harding (0002)						W.F. George (0003)					
Sub-watershed	190	190	220	220	290	300	020	060	080	100	120	180
Station	WECR-1	WECR-2	BWCC-1	WLCC-1	OSCC-1	HACL-1	MICR-1	LUC-3	UCCR-1	IHGR-1	HECR-2	BRC-2
Macroinvertebrate community												
Date (yymmdd)	990601	990601	990602	990602	990624	990624	990422	990602	990624	990608	990609	990608
# EPT families	9	8	6	6	12	9	3	8	10	11	7	7
Assessment	Good	Good	Fair	Fair	Good	Good	Poor	Fair	Good	Good	Fair	Fair
Fish community												
Date (yymmdd)	990708	990708			990915	990915	990915		990915	990729		
Time (min)	30	30			30	30	30		30	30		
Richness measures												
# species	15	19			17	18	17		16	18		
# darter species	1	1			1	1	1		1	1		
# minnow species	6	8			4	8	6		5	4		
# sunfish species	2	3			3	3	4		3	6		
# sucker species	2	1			1	2	1		2	1		
# intolerant species	0	0			0	0	0		0	0		
Composition measures												
% sunfish	4	36			23	23	8		41	18		
% omnivores and herbivores	18	11			6	7	20		2	23		
% insectivourous cyprinids	69	43			25	54	69		28	44		
% top carnivores	1	1			3	1	0		1	1		
Population measures												
Individuals							529		268	152		
# collected per hour	396	84			236	424	1058		536	304		
% disease and anomalies	33	0			1	0	9		2	3		
IBI Score	46	42			36	44	40		36	36		
Assessment	Fair	Fair			Poor	Fair	Poor		Poor	Poor		

Table 7a, cont. Bioassessment results conducted in the Lower Chattahoochee (0313-0004) and the Chipola River (0313-0012) cataloging units by ADEM during 1999.

	L. Chattahoochee				Chipola
Sub-watershed	020	020	060	080	030
Station	BMCH-1	MMCH-1	SPMH-1	CRCH-1	CYC-2
Macroinvertebrate community					
Date (yymmdd)	990520	990520	990920	990505	990505
# EPT families	8	6	8	9	4
Assessment	Fair	Fair	Good	Good	Fair
Fish community					
Date (yymmdd)	990706		990920		
Time (min)	30		30		
Richness measures					
# species	7		16		
# darter species	2		1		
# minnow species	3		9		
# sunfish species	1		3		
# sucker species	0		1		
# intolerant species	0		0		
Composition measures					
% sunfish	1		20		
% omnivores and herbivores	46		6		
% insectivourous cyprinids	51		67		
% top carnivores	0		0		
Population measures					
Individuals	128		103		
# collected per hour	256		206		
% disease and anomalies	2		0		
IBI Score	30		40		
Assessment	Poor		Fair		

Table 8a. List of previous water quality assessments (by cataloging unit) conducted on streams within the Chattahoochee and Chipola River basins from 1993-1999.

	Waterbody	*Date(s)*	*Assessment type**	*Appendices or reference*
Middle Chattahoochee River - Lake Harding (03130002)				
220	Hardley Cr	1999	H, C	F-5a, F-5b
220	Unnamed tributary to Wells Cr	2000	H, C	F-5a, F-5b
220	Chattahoochee R.	1999	C	F-4a
290	Osanippa Cr	1999	M, F, H, C	T-6a, T-7a, F-4a, MC
290	tributary of Snapper Cr	1997	H, C	F-5a, F-5b
300	Halawakee Cr	1999	M, F, H, C	T-6a, T-7a, F-4a, MC
Middle Chattahoochee River - W.F. George (03130003)				
020	Mill Cr	1996, 1999	M, F, H, C	F-6a, MC
020	Chattahoochee R.	1999	C	F-4a
060	Unnamed tributary to Hospilika Cr	1999	H, C	F-5a, F-5b
060	Unnamed tributary to Sturkie Cr	2000	H, C	F-5a, F-5b
060	Little Uchee Cr	1999	M, H, C	T-6a, T-7a, F-2a
060	Phelps Cr	1999	C	AUCE
070	Brush Cr	1992-1995	M, H, C	T-6a, T-7a, F-1a
070	Unnamed tributary to Snake Cr	1997	H, C	F-5a, F-5b
080	Uchee Cr	1999	M, F, H, C	T-6a, T-7a, F-4a, F-5a, F-5b, MC, AUCE
100	Ihagee Cr	1995, 1999	M, F, H, C	T-6a, T-7a, F-1a
130	North Fork Cowikee Cr	1996, 1999	C	F-4a, F-6a
140	Middle Fork Cowikee Cr	1996, 1999	C	F-4a, F-6a
150	East Fork Cowikee Cr	1999	C	AUCE
150	South Fork Cowikee Cr	1996	C	F-4a
160	South Fork Cowikee Cr	1996	C	F-6a
160	Unnamed tributary to Little Barbour Cr	2000	H, C	F-5a, F-5b
160	W.F. George Reservoir	1999	C	AUCE
180	Barbour Cr	1999	M, H, C	T-6a, T-7a, AUCE, F-2a
180	Unnamed tributary to Leak Cr	1999	H, C	F-5a, F-5b
180	Chattahoochee R.	1999	C	AUCE
Lower Chattahoochee River (03130004)				
020	Unnamed tributary to Chattahoochee R.	1998	H, C	F-5a, F-5b
040	Unnamed tributary to Peterman Cr	1997	H, C	F-5a, F-5b
060	Spivey Mill Cr	1998, 1999	M, F, H, C	T-6a, T-7a, F-3a
060	Poplar Springs Br.	1999	C	F-2a
060	Omussee Cr	1999	C	F-2a
080	Cedar Cr	1996	C	F-6a
080	Chattahoochee R.	1999	C	AUCE
100	Bryans Cr	1996	C	F-6a
Chipola River (03130012)				
010	Cowarts Cr	1996	C	F-6a
030	Boggy Cr	1996	C	F-6a
030	Buck Cr	1996, 1997	H, C	F-5a, F-5b, F-6a
030	Cypress Cr	1999	M, H, C	T-6a, T-7a, F-2a
030	Limestone Cr	1996	C	F-6a

* C=Chemical; H=Habitat; M=Macroinvertebrate; F=Fish

\+ T=tables; F=appendices

Table 9a. Summary of the number of current construction/stormwater authorizations and NPDES permits issued within the Chattahoochee and Chipola River basins. Those subwatersheds with more than five authorizations or permits in a category are in bold.

Cataloging Unit and Subwatershed	# of Authorizations / #NPDES permits					
	Total Number of Permits and Authorizations	Construction/ Stormwater Authorizations[c]	Mining NPDES[a]	Municipal NPDES[b]	Semi Public/ Private NPDES[b]	Industrial Process Wastewater - NPDES Majors[b]
Middle Chattahoochee - Lake Harding (0313-0002)						
100	*0*					
190	*2*	2				
200	*1*	1				
220	*6*	2		1	1	2
250	*4*	4				
260	*3*	1		1	1	
290	*2*	2				
300	***12***	**11**			**1**	
310	*1*	1				
320	*0*					
360	*5*	5				
Middle Chattahoochee - Walter F. George Reservoir (0313-0003)						
020	***19***	**17**		**1**	**1**	
060	***13***	**13**				
070	*4*	4				
080	*3*	3				
100	*4*	3			1	
120	*5*	3			1	1
130	*6*	5		1		
140	*1*	1				
150	*2*	2				
160	*6*	5			1	
180	*9*	4		1	1	3
Lower Chattahoochee (0313-0004)						
020	*1*	1				
040	*3*	2		1		
050	*4*	3		1		
060	***22***	**16**		**2**	**1**	**3**
080	*3*	3				
100	*1*	1				
Chipola River (0313-0012)						
010	*3*	2		1		
030	***12***	**10**		**2**		

Table 10a. List of stations assessed within the Chattahoochee and Chipola River basins as part of the Southeast Alabama NPS screening study.

Stream	Station	Sub-watershed	County	T	R	S	Sub-Ecoregion **	Area (mi^2)	Assessment Type*
Lake Harding (0313-0002)									
Wehadkee Creek	WECR-1	190	Randolph	21S	13E	5	45a	12	C, H, M, F
Wehadkee Creek	WECR-2	190	Randolph	21S	13E	27	45b	34	C, H, M, F
Barrow Creek	BWCC-1	220	Chambers	22N	28E	17	45b	12	H, M
Well Creek	WLCC-1	220	Chambers	23N	27E	27	45b	16	H, M
W.F. George Reservoir (0313-0003)									
Hatchechubbee Creek	HECR-2	120	Russell	14N	28E	14	65d	51	H, M
Lower Chattahoochee (0313-0004)									
Bennett Mill Creek	BMCH-1	020	Henry	6N	30E	6	65d	7	C, H, M, F
McRae Mill Creek	MMCH-1	020	Henry	7N	29E	12	65d	9	H, M
Cedar Creek	CRCH-1	080	Houston	3N	29E	34	65g	31	H, M

* Assessment Type: C=Chemical Assessment; H= Habitat Assessment; M=Aquatic Macroinvertebrate; F=Fish Assessment
** Level IV Ecoregions of Alabama (Griffith et.al. 2001)

Table 11a. List of the three waterbodies within the Chattahoochee and Chipola Basins on ADEM's draft 2000 CWA §303(d) list. Sources and causes of impairment are listed (ADEM 1999c). **Two waterbodies and one cause are recommended for removal from the 2000 list (See Appendix G).

Waterbody	Sub-watershed	Miles impaired	Use	Support Status	Sources	Causes of Impairment
Middle Chattahoochee - Lake Harding (0313-0002)						
West Point Lake**	200	2304*	S/ F&W	Non	Contaminated sediments	Pesticides
Lake Harding**	310	2176*	PWS/ S/ F&W	Non	Contaminated sediments	Pesticides
Middle Chattahoochee - Lake Harding (0313-0003)						
Barbour Cr.	180	21.9	F&W	Non	Agriculture	Siltation; OE/DO**
Lower Chattahoochee (0313-0004)						
Poplar Spring Br.	060	2.0	F&W	Non	Industrial	pH
Cypress Cr.	100	3.0	F&W	Non	Municipal Urban/Storm Sewers	OE/DO; Nutrients

*Measured in acres.

Table 12a. Summary of bioassessments conducted within the Chattahoochee and Chipola River basins. Overall assessment was estimated as the lowest station assessment obtained.

Cataloging Unit and Subwatershed	Station	*Assessment*				Overall Assessment
		Habitat	*Macroinv.*	*Fish*	*Chemical* [a]	
Lake Harding (0313-0002)						
190	WECR-1	E	G	F	D	F
190	WECR-2	E	G	F	D	F
220	BWCC-1	G	F	---	---	F
220	WLCC-1	G	F	---	---	F
290	OSCC-1[b]	G	G	P	---	P
300	HACL-1[b]	E	G	F	---	F
W.F. George Reservoir (0313-0003)						
020	MICR-1[b]	E	P	P	---	P
060	LUC-3	E	F	---	U	F
080	UCCR-1[b]	E	F	P	---	P
100	IHGR-1	E	G	P	U	P
120	HECR-2	G	F	---	---	F
180	BRC-2	G	F	---	D	F
Lower Chattahoochee (0313-0004)						
020	BMCH-1	E	F	P	D	P
020	MMCH-1	E	F	---	U	F
060	SPMH-1[b]	G	G	F	D	F
080	CRCH-1	E	G	---	U	G
Chipola (0313-0012)						
030	CYC-2[b]	E	F	---	D	F

a. U = Potential water quality problems undetected; D = potential water quality problems detected

b. Impairment from urban sources

E= Excellent; G=Good; F=Fair; P=Poor

Table 13a. Priority listing of subwatersheds assessed *fair* or *poor* within the Chattahoochee or Chipola River basins.

Subwatershed Number	Subwatershed Name	Lowest Station Assessment (Fair/Poor)	Suspected Cause(s)	Suspected Nonpoint Sources
Lake Harding (0313-0002)				
190	Wehadkee Creek	Fair	Sedimentation	Animal husbandry, pasture runoff
220	Oseligee Creek	Fair	Sedimentation, nutrients	Unknown
W. F. George Reservoir (0313-0003)				
060	Little Uchee Creek	Fair	Sedimentation	Cropland runoff, agriculture
100	Ihagee Creek	Poor	Sedimentation	Pasture runoff
120	Hatchechubbee Creek	Fair	Sedimentation	Pasture runoff
180	Barbour Creek	Fair	Sedimentation, nutrients	Silviculture, agriculture
Lower Chattahoochee (0313-0004)				
020	Mill Creek	Fair	Sedimentation	Cropland runoff, pasture runoff, silviculture

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APPENDICES

Appendix A-1. Land use percentages for the Appalachicola Accounting Unit from EPA landuse subcategory data (EPA 1997).

	Percent Total Landuse (Category and Subcategory)													
	Open Water	Urban			Mining	Forest				Pasture/ Hay	Row Crops	Other		
Sub-watershed	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial/ Industrial/ Transportation	Quarries/ Strip Mines/ Gravel Pits	Transitional Forest	Deciduous Forest	Evergreen Forest	Mixed Forest	Pasture/ Hay	Row Crops	Other Grasses	Woody Wetlands	Herbaceous Wetlands
Middle Chattahoochee - Lake Harding (0313 - 0002)														
100	<1	<1		<1		3	45	23	20	5	4	<1		
190	<1	<1	<1	<1		2	35	19	24	9	7	<1	1	<1
200	6	<1		<1		2	25	26	24	9	4	<1	2	<1
220	<1	1	<1	<1	<1	2	28	26	25	7	2	1	6	<1
250	<1	9	2	3		1	23	18	23	6	5	4	5	<1
260	1	9	1	2		<1	20	26	29	2	2	4	2	<1
290	<1	1	<1	<1		2	28	24	24	7	5	1	6	<1
300	<1	1	<1	1	<1	2	27	22	25	10	6	<1	5	<1
310	12	<1	<1	<1		2	24	30	27	2	2	<1	1	<1
320	<1	<1	<1	1	<1	3	28	29	27	7	4	<1	1	<1
360	2	<1	<1	1		2	43	16	27	2	3	<1	2	<1
Middle Chattahoochee - Walter F. George Reservoir (0313 - 0003)														
020	2	8	2	5	<1	1	38	9	21	4	4	1	3	1
060	1	1	<1	1	<1	1	38	15	27	3	8	<1	4	<1

Appendix A-1, cont. Land use percentages for the Appalachicola Accounting Unit from EPA landuse subcategory data (EPA 1997).

	Percent Total Landuse (Category and Subcategory)													
	Open Water	Urban			Mining	Forest				Pasture/ Hay	Row Crops	Other		
Sub-watershed	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial/ Industrial/ Transportation	Quarries/ Strip Mines/ Gravel Pits	Transitional Forest	Deciduous Forest	Evergreen Forest	Mixed Forest	Pasture/ Hay	Row Crops	Other Grasses	Woody Wetlands	Herbaceous Wetlands
Middle Chattahoochee - Walter F. George Reservoir, continued (0313 - 0003)														
070	1	<1		<1		1	35	12	22	5	18	<1	6	<1
080	1	<1	<1	<1	1	2	40	13	23	2	10	<1	6	<1
100	4	<1		<1	1	1	43	11	19	2	13	<1	6	1
120	1	<1		<1		5	37	21	28	2	4	<1	2	<1
130	<1	<1	<1	<1		5	39	16	26	3	8	<1	2	<1
140	1	<1		<1		2	48	15	24	2	4	<1	5	<1
150	<1	<1		<1		3	27	29	28	2	5		6	<1
160	8	<1	<1	<1	<1	1	23	19	26	5	13	<1	3	1
180	5	<1	<1	<1	<1	4	23	28	30	1	6	<1	2	<1
Lower Chattahoochee (0313 - 0004)														
020	<1	<1		<1		1	25	16	25	7	24	<1	2	<1
040	<1	<1	<1	<1	<1	1	22	18	27	8	19	<1	4	<1
050	1	<1	<1	<1		<1	16	9	16	23	30	<1	6	<1
060	<1	1	<1	1		<1	14	11	15	23	31	<1	2	<1

Appendix A-1, cont. Land use percentages for the Middle (0313-0002) and Lower Chattahoochee River (0313-0004) and Chipola River (0313-0012) from EPA land use subcategory data (EPA 1997).

	Percent Total Landuse (Category and Subcategory)														
	Open Water	Urban			Mining	Forest				Pasture/ Hay	Row Crops	Other		
Sub-watershed	Open Water	Low Intensity Residential	High Intensity Residential	High Intensity Commercial/ Industrial/ Transportation	Quarries/ Strip Mines/ Gravel Pits	Transitional Forest	Deciduous Forest	Evergreen Forest	Mixed Forest	Pasture/ Hay	Row Crops	Other Grasses	Woody Wetlands	Herbaceous Wetlands
Lower Chattahoochee, continued (0313 - 0004)														
080	1	<1	<1	<1	<1	<1	16	11	16	25	22	<1	8	<1
100	<1	<1	<1	<1	<1	<1	15	15	15	13	24	<1	16	1
Chipola (0313 - 0012)														
010	<1	<1	<1	<1	<1	<1	13	5	9	26	32	<1	13	<1
030	1	1	<1	<1	<1	<1	14	5	11	20	33	<1	14	<1

APPENDIX A-2

EPA Region IV Land Cover Data Set

South-Central Portion

VERSION 1

INTRODUCTION

The main objective of this project was to generate a generalized and consistent (i.e. seamless) land cover data layer for the South-central portion of EPA Region IV, which includes most of Alabama, Western Georgia, Eastern Mississippi, and the Florida Panhandle. This data set was developed by personnel at the EROS Data Center (EDC), Sioux Falls, SD. The project was initiated during the summer of 1997, and a first draft product was completed in November, 1997 (Version 1). The write-up that follows pertains to Version 1. Questions about the data set can be directed to Terry Sohl (EDC; email sohl@edcmail.cr.usgs.gov; telephone 605-594-6537).

GENERAL PROCEDURES

Data sources: The primary source of data for this project was leaves-off (primarily spring) Landsat TM data, acquired in 1988, 1990, 1991, 1992 and 1993. While most of the leaves-off data sets were acquired in spring, a few were from late autumn due to the difficulties in acquiring cloud-free TM data. These data sets were referenced to Albers Conical Equal Area coordinates (see table 1). Additionally, leaves-on (summer) TM data sets were acquired and referenced. The south-central and north-central portions of Region IV were processed as one unit and later split for distribution purposes; in total, 40 TM scenes were analyzed. Data sets used are provided in Table 2. In addition, other intermediate scale spatial data were acquired and utilized. These included 3-arc second Digital Terrain Elevation Dataset (DTED) and derivative DTED products (slope, shaded relief, and relative elevation), population density and housing units density data at the census block level, USGS land use and land cover data (LUDA), National Wetlands Inventory (NWI) data, and STATSGO soils information (available water and organic carbon).

Methods: The general procedure of this project was to (1) mosaic multiple spring TM scenes and classify them using an unsupervised classification algorithm, (2) interpret and label classes into sixteen land cover categories using aerial photographs as reference data, (3) resolve

confused classes using the appropriate ancillary data source(s), and (4) incorporate land cover information from leaves-on TM data, NWI data, and other data sources to refine and augment the "basic" classification developed above. The entire area (north-central and south-central portions of Region IV) was analyzed as one large mosaic consisting of 20 leaves-off scenes. For mosaicing purposes, a base scene was selected, and other scenes were normalized to mimic spectral properties of the base scene following histogram equalization using pixels in regions of spatial overlap.

Following mosaicing, mosaiced scenes were clustered into 100 spectrally distinct classes using the Cluster algorithm developed by Los Alamos [1]. Clusters were assigned into Anderson level 1 and 2 land cover classes using National High Altitude Photography program (NHAP) aerial photographs as reference information. Almost invariably, individual spectral classes were confused between/among two or more "targeted" land cover classes. Separation of spectral classes into meaningful land cover units was accomplished using ancillary data. Briefly, for a given confused spectral class, digital values of the various ancillary data layers were compared to determine: (1) which data layers were the most effective for splitting the confused class into the appropriate land cover units, and (2) the appropriate thresholds for splitting the classes. Models were then developed using one to several data sets to split each confused class into the desired land cover categories. As an example, a spectral class might be confused between row crop and high-intensity residential areas. In order to split this particular class into more meaningful land cover units, population density and housing units density data were assessed to determine if they could be used to split the class into the respective categories, and if so, to define the appropriate thresholds to be used in the class splitting model.

Following the above class splitting steps, a "first order" classification product was constructed from the clustered leaves-off data. Leaves-on data were then clustered with the goal of refining certain land cover features not easily discriminated using leaves-off TM data. Land cover classes that were spatially but not spectrally distinct in the leaves-off data (barren areas, clearcuts) were digitized off the screen from the leaves-on data. These digitized data layers were used in conjunction with clustered leaves-on data to define barren and cleared areas that were then incorporated into the classification product. A digitized layer outlining wetland areas was also used to refine the wetlands information. "Other grasses", consisting largely of parks, urban lawns, and golf courses, were defined at this point by using hand-digitized information and

LUDA urban information to separate "other grasses" from "hay/pasture". Similarly, high-intensity residential and high-intensity commercial/industrial areas were separated by using a threshold in the population density data.

The resulting classification (Version 1) includes the following. Please note that not all classes were used for this region:

Water

- 11 Open Water
- 12 Perennial Ice/Snow

Developed

- 21 Low Intensity Residential
- 22 High Intensity Residential
- 23 High Intensity Commercial/Industrial/Transportation

Barren

- 31 Bare Rock/Sand
- 32 Quarries/Strip Mines/Gravel Pits
- 33 Transitional

Natural Forested Upland (non-wet)

- 41 Deciduous Forest
- 42 Evergreen Forest
- 43 Mixed Forest

Natural Shrubland

- 51 Deciduous Shrubland
- 52 Evergreen Shrubland
- 53 Mixed Shrubland

Non-Natural Woody

- 61 Planted/Cultivated (orchards, vineyards, groves)

Herbaceous Upland Natural/Semi-Natural Vegetation

- 71 Grassland/Herbaceous

Herbaceous Planted/Cultivated

- 81 Pasture/Hay
- 82 Row Crops

83 Small Grains

84 Bare Soil

85 Other Grasses (Urban/recreational; e.g. parks, lawns, golf courses)

Wetlands

91 Woody Wetlands

92 Herbaceous Wetlands

Current definitions of the classes are as follows; percentages given must be viewed as guidelines.

Water - All areas of open water or permanent ice/snow cover

Water - all areas of open water, generally with less than 25% cover of vegetation/land cover.

Perennial Ice/Snow - all areas characterized by yearlong surface cover of ice and/or snow.

Developed - areas characterized by high percentage (approximately 30% or greater) of construction materials (e.g. asphalt, concrete, buildings, etc).

Low Intensity Residential - Land includes areas with a mixture of constructed materials and vegetation or other cover. Constructed materials account for 30-80 percent of the total area. These areas most commonly include single-family housing areas, especially suburban neighborhoods. Generally, population density values in this class will be lower than in high intensity residential areas.

High Intensity Residential - Includes heavily built-up urban centers where people reside. Examples include apartment complexes and row houses. Vegetation occupies less than 20 percent of the landscape. Constructed materials account for 80-100 percent of the total area. Typically, population densities will be quite high in these areas.

High-Intensity Commercial/Industrial/Transportation - Includes all highly developed lands not classified as High Intensity Residential, most of which is Commercial/Industrial/Transportation.

Barren - Bare rock, sand, silt, gravel, or other earthen material with little or no vegetation regardless of its inherent ability to support life. Vegetation, if present, is more widely spaced and scrubby than that in the vegetated categories.

Bare Rock / Sand - Includes areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, and other accumulations of rock without vegetative cover.

Quarries / Strip Mines / Gravel Pits - Areas of extractive mining activities with significant surface expression.

Transitional - Areas dynamically changing from one land cover to another, often because of land use activities. Examples include forestlands cleared for timber, and may include both freshly cleared areas as well as areas in the earliest stages of forest regrowth.

Natural Forested Upland (non-wet) - A class of vegetation dominated by trees generally forming > 25 percent canopy cover.

Deciduous Forest - Areas dominated by trees where 75 percent or more of the tree species shed foliage simultaneously in response to an unfavorable season.

Evergreen Forest - Areas dominated by trees where 75 percent or more of the tree species maintain their leaves all year. Canopy is never without green foliage.

Mixed Forest - Areas dominated by trees where neither deciduous nor evergreen species represent more than 75 percent of the cover present. Natural Shrubland - A class of vegetation defined by areas dominated by shrubs generally less than 6 meters tall with individuals or clumps not touching to interlocking. The species may include true shrubs or trees and shrubs that are small or stunted because of environmental conditions. Shrub canopy cover is generally greater than 25 percent when tree canopy is less than 25 percent. Shrub cover may be less than 25 percent if cases when the cover of each other life form (herbaceous, tree) is less than 25 percent and shrubs exceed the cover of the other life forms. Not currently represented in the central portion of the EPA Region IV data set.

Deciduous Shrubland - Areas dominated by shrubs where 75 percent or more of the shrub species shed foliage simultaneously in response to an unfavorable season.

Evergreen Shrubland - Areas dominated by shrubs where 75 percent or more of the shrub species maintain their leaves all year. Canopy is never without green foliage.

Mixed Shrubland - Areas dominated by shrubs where neither deciduous nor evergreen species represent more than 75 percent of the cover present. Non-Natural Woody - Areas dominated by non-natural woody plant species such as orchards, vineyards, and groves. The classification of

Non-Natural Woody is subject to availability of sufficient ancillary data to differentiate from natural woody vegetation. Not currently represented in the central portion of the EPA Region IV data set.

Planted / Cultivated - Orchards, Vineyards, and tree plantations planted for the production of fruit, nuts, fiber (wood), or ornamental. Herbaceous Upland Natural/Semi-Natural Vegetation - Areas comprised of natural or semi-natural upland herbaceous vegetation.

Grassland/Herbaceous - A class of vegetation dominated by natural upland grasslands, i.e. neither planted nor cultivated by humans, as well as other non-woody plants known as herbs (graminoids, Forbes, and ferns). The grasses/herbs generally form at least 25 percent cover. Trees and shrubs generally have less than 25 percent cover. In rare cases, herbaceous cover is less than 25 percent but exceeds the combined cover of other life forms present.

Herbaceous Planted / Cultivated - Areas dominated with vegetation which has been planted in its current location by humans, and/or is treated with annual tillage, a modified conservation tillage, or other intensive management or manipulation. The majority of vegetation in these areas is planted and/or maintained for the production of food, feed, fiber, or seed.

Pasture / Hay - Grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops.

Row Crops - All areas used for the production of crops, such as corn, soybeans, vegetables, tobacco, and cotton.

Small Grains - All areas used for the production of graminoid crops such as wheat and rice. Not represented in the central portion of the EPA Region IV data set.

Bare Soil - Areas within planted or cultivated regions that have been tilled or plowed and do not exhibit any visible cover of vegetation. Not represented in the central portion of the EPA Region IV data set.

Other Grasses - Vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. Examples include parks, lawns, and golf courses.

Wetlands - Non-woody or woody vegetation where the substrate is periodically saturated with or covered with water as defined by Cowardin et al. [2].

Woody Wetlands - Areas of forested or shrubland vegetation where the soil or substrate is periodically saturated with or covered with water as defined by Cowardin et al. [2].

Emergent Woodlands - Non-woody vascular perennial vegetation where the soil or substrate is periodically saturated with or covered with water as defined by Cowardin et al. [2].

CAVEATS AND CONCERNS

While we believe that the approach taken has yielded a very good general land cover classification product for a very large region, it is important to indicate to the user where there might be some potential problems. The biggest concerns are listed below:

1) Quantitative accuracy checks have yet to be conducted. We plan to make comparisons with existing data sets in order to develop a general overview regarding the quality of the land cover data set developed. Feedback from users of the data will be greatly appreciated.

2) Some of the leaves-off data sets were not temporally ideal. In this project, leaves-off data sets are heavily relied upon for discriminating between hay/pasture and row crop, and also for discriminating between forest classes. The success of discriminating between these classes using leaves-off data sets hinges on the time of data acquisition. When hay/pasture areas are non-green, they are not easily distinguishable from other agricultural areas using remotely sensed data. However, there is a temporal window during which hay and pasture areas green up before most other vegetation (excluding evergreens, which have different spectral properties); during this window these areas are easily distinguishable from other crop areas. The discrimination between evergreen and deciduous forest is likewise optimized by selecting data in a temporal window where deciduous vegetation has yet to leaf out. Due to double-cropping practices and the long-growing season in this portion of the country, it's difficult to acquire a single-date of imagery that adequately differentiates between both deciduous/conifer and hay-pasture/row crop.

3) The data sets used cover a range of years, and changes that have taken place across the landscape over the time period may not have been captured. While this is not viewed as a major problem for most classes, it is possible that some land cover features change more rapidly than might be expected (e.g. hay one year, row crop the next).

4) Wetlands classes are extremely difficult to extract from Landsat TM spectral information alone. The use of ancillary information such as National Wetlands Inventory (NWI) data is highly desirable. NWI data were not available in digital format for much of this area. Manual digitizing was used in combination with spectral information to derive much of the wetlands information, a procedure that isn't able to provide the level of detail of NWI data. It is suspected that forested wetlands are underestimated in areas where NWI wasn't available.

5) Accurate definition of the transitional barren class was extremely difficult. The majority of pixels in this class correspond to clear-cut forests in various stages of regrowth. Spectrally, fresh clear-cuts are very similar to row-crops in the leaves-off data. Manual correction of coding errors was performed to improve differentiation between row-crops and clear-cuts, but some errors may still be found. As regrowth occurs in a clear-cut region, the definition of transitional barren verses a forested class becomes problematic. An attempt was made to classify only fresh clear-cuts or those in the earliest stages of regrowth, but there are likely forested regions classed as transitional barren and vice versa.

6) Due to the confusion between clear-cuts, regrowth in clear-cuts, forested areas, and shrublands, no attempts were made to populate the shrubland classes. Any shrubland areas that exist in this area are classed in their like forest class, i.e. deciduous shrubland is classed as deciduous forest, etc.

ACKNOWLEDGMENTS

This work was performed by the Hughes STX Corporation under U.S. Geological Survey Contract 1434-92-C-40004.

REFERENCE

[1] Kelly, P.M., and White, J.M., 1993. Preprocessing remotely sensed data for efficient analysis and classification, Applications of Artificial Intelligence 1993: Knowledge-Based Systems in Aerospace and Industry, Proceedings of SPIE, 1993, 24-30.

[2] Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe, 1979. Classification of Wetlands and Deepwater Habitats of the United States, Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C.

Table C-1. Projection Information

The initial Landsat TM mosaics, all ancillary data sets, and the final classification product are all map-registered to an Albers Conical Equal Area projection. The following represents projection information for the final classification product:

Projection: Albers Conical Equal Area
Datum: NAD83
Spheroid: GRS80
Standard Parallels: 29.5 degrees North Latitude 45.5 degrees North Latitude
Central Meridian: 96 degrees West Longitude
Origin of the Projection: 23 degrees North Latitude
False Easting: 0 meters
False Northing: 0 meters
Number of Lines: 17220
Number of Samples: 21773
Number of Bands: 1
Pixel size: 30 X 30 meters
Upper Left Corner: 591953 meters (X), 1301000 meters (Y)
Upper Right Corner: 1245113 meters (X), 1301000 meters (Y)
Lower Left Corner: 591953 meters (X), 784430 meters (Y)
Lower Right Corner: 1245113 meters (X), 784430 meters (Y)

APPENDIX A-2

Table C-2. MRLC Landsat thematic mapper (TM) data sets used to develop north-central and south-central portions of the EPA Region IV data set.

No asterisk represents scenes used in south-central portion only
* Represents scenes used in north-central portion only.
** Represents scenes used in both the north-central and south-central portion

Path/Row	Date	EOSAT-ID
19/33	12/14/90	5019033009034810*
19/33	09/20/94	5019033009426310*
19/34	10/03/93	5019034009327610*
19/34	11/20/93	5019034009332410*
19/35	11/12/90	5019035009031610*
19/35	09/30/92	5019035009227410*
19/36	09/28/91	5019036009127110**
19/36	11/17/92	5019036009232210**
19/37	03/09/93	5019037009306810
19/37	10/03/93	5019037009327610
19/38	02/16/91	5019038009104710
19/38	10/03/93	5019038009327610
19/39	02/16/91	5019039009104710
19/39	10/03/93	5019039009327610
20/33	08/02/91	5020033009121410*
20/33	11/22/91	5020033009132610*
20/34	11/29/88	5020034008833410*
20/34	08/02/91	5020034009121410*
20/35	11/29/88	5020035008833410*
20/35	10/07/92	5020035009228110*
20/36	03/11/91	5020036009107010**
20/36	07/22/93	5020036009320310**
20/37	11/29/88	5020037008833410
20/37	10/23/92	5020037009229710
20/38	02/10/92	5020038009204110
20/38	10/23/92	5020038009229710
20/39	01/22/91	5020039009102210
20/39	11/06/91	5020039009131010
21/34	04/05/92	5021034009209610*
21/34	10/14/92	5021034009228810*
21/35	04/05/92	5021035009209610*
21/35	08/30/93	5021035009324210*
21/36	09/10/91	5021036009125310**
21/36	12/15/91	5021036009134910**
21/37	02/03/93	5021037009303410
21/37	10/01/93	5021037009327410
21/38	02/14/91	5021038009104510
21/38	10/12/91	5021038009128510
21/39	09/26/91	5021039009126910
21/39	02/01/92	5021039009203210

Appendix B-1. Riffle/run habitat assessment form used by ADEM.

ADEM-FIELD OPERATIONS-ECOLOGICAL STUDIES
RIFFLE/RUN HABITAT ASSESSMENT FIELD DATA SHEET

Name of Waterbody _____ Date: _____
Station Number _____ Investigators _____

Habitat Parameter	Category			
	Optimal	Suboptimal	Marginal	Poor
1 **Instream Cover**	>50% mix of boulder, cobble, submerged logs, undercut banks, or other stable habitat.	50-30% mix of boulder, cobble, or other stable habitat; adequate habitat.	30-10% mix of boulder, cobble, or other stable habitat; habitat availability less than desirable.	<10% mix of boulder, cobble, or other stable habitat; lack of habitat is obvious.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2 **Epifaunal surface**	Well developed riffle and run; riffles as wide as stream and length extends 2x the width of stream; abundance of cobble.	Riffle is as wide as stream but length is <2 times width; abundance of cobble; boulders and gravel common.	Run area may be lacking; riffle not as wide as stream and its length is <2 times the stream width; gravel or large boulders and bedrock prevalent; some cobble present.	Riffles or run virtually non existent; large boulders and bedrock prevalent; cobble lacking.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3 **Embeddedness**	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble and boulder particles are >75% surrounded by fine sediment.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4 **Velocity/Depth Regimes**	All 4 velocity/depth regimes present (slow-deep, slow-shallow, fast-shallow, fast-deep).	Only 3 of 4 regimes present. (if fast-shallow is missing, score lower.)	Only 2 of 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5 **Channel Alteration**	No Channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (>20 years) may be present, but not recent.	New embankments present on both banks; and 40 - 80% of stream reach is channelized and disrupted.	Banks shored with gabion or cement; >80% of the stream reach channelized and disrupted.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6 **Sediment Deposition**	Little or no enlargement of islands or point bars and less than 5 % of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at obstruction, constriction,, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; > 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7 **Frequency of Riffles**	Occurrence of riffles relatively frequent; distance between riffles divided by stream width equals 5-7; variety of habitat.	Occurrence of riffles relatively infrequent; distance between riffles divided by the stream width equals 7-15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided stream width is 15-25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by stream width >25.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8 **Channel flow Status**	Water reaches base of both lower banks and minimal amount t of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
9 **Condition of Banks**	Banks stable; no evidence of erosion or bank failure.	Moderately stable; infrequent, small areas of erosion mostly healed over.	Moderately unstable; up to 60% of banks in reach have areas of erosion.	Unstable; many eroded areas; "raw" areas frequent Along straight section and bends; on side slopes, 60-100% of bank has erosional scars.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
10 **Bank Vegetative Protection**	>90% of the stream bank surfaces covered by vegetation.	90-70% of the streambank surfaces covered by vegetation.	70-50% of the stream bank surfaces covered by vegetation.	<50% of the streambank surfaces covered by vegetation.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0
11 **Grazing or other disruptive pressure**	Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally.	Disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	Disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Disruption of stream bank vegetation is very high; vegetation has been removed to 2 inches or less in average stubble height.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0
12 **Riparian vegetative zone (each bank)**	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone.	Width of riparian zone 18-12 meters; human activities have impacted zone only minimally.	Width of riparian zone 12-6 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters;: little or no riparian vegetation due to human activities.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0

Appendix B-2. Glide-pool habitat assessment form used by ADEM.

ADEM-FIELD OPERATIONS-ECOLOGICAL STUDIES
GLIDE/POOL HABITAT ASSESSMENT FIELD DATA SHEET

Name of Waterbody _____ Date: _____
Station Number _____ Investigators _____

Habitat Parameter	Category			
	Optimal	Suboptimal	Marginal	Poor
1 **Instream Cover**	> 50% mix of snags, submerged logs, undercut banks, or other stable habitat; rubble, gravel may be present.	50-30% mix of stable habitat; adequate habitat for maintenance of populations.	30-10% mix of stable habitat; habitat availability less than desirable.	<10% stable habitat; lack of habitat is obvious.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2 **Pool Substrate Characterization**	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant ; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3 **Pool Variability**	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4 **Channel Alteration**	No Channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (>20 years) may be present, but not recent.	New embankments present on both banks; channelization may be extensive, usually in urban or agriculture lands; and > 80% of stream reach is channelized and disrupted.	Extensive channelization; banks shored with gabion or cement; heavily urbanized areas; instream habitat greatly altered or removed entirely.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5 **Sediment Deposition**	<20% of bottom affected; minor accumulation of fine and coarse material at snags and submerged vegetation; little or no enlargement of islands or point bars.	20-50% affected; moderate accumulation; substantial sediment movement only during major storm event; some new increase in bar formation.	50-80% affected; major deposition; pools shallow, heavily silted; embankments may be present on both banks; frequent and substantial sediment movement during storm events.	Channelized; mud, silt, and/or sand in braided or non-braided channels; pools almost absent due to deposition.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6 **Channel Sinuosity**	Bends in stream increase stream length 3 to 4 times longer than if it was in a straight line.	Bends in stream increase stream length 2 to 3 times longer than if it was in a straight line.	Bends in stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7 **Channel flow Status**	Water reaches base of both lower banks and minimal amount t of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8 **Condition of Banks**	Banks stable; no evidence of erosion or bank failure; <5% affected.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% affected.	Moderately unstable; 30-60% of banks in reach have areas of erosion.	Unstable; many eroded areas; "raw" areas frequent Along straight section and bends; on side slopes, 60-100% of bank has erosional scars.
Score _____	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
9 **Bank Vegetative Protection (each bank)**	> 90% of the stream bank surfaces covered by vegetation.	90-70% of the streambank surfaces covered by vegetation.	70-50% of the stream bank surfaces covered by vegetation.	<50% of the streambank surfaces covered by vegetation.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0
10 **Grazing or other disruptive pressure (each bank)**	Vegetative disruption, through grazing or mowing, minimal or not evident; almost all plants allowed to grow naturally.	Disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	Disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Disruption of stream bank vegetation is very high; vegetation has been removed to 2 inches or less in average stubble height.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0
11 **Riparian vegetative zone Width (each bank)**	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone.	Width of riparian zone 18-12 meters; human activities have impacted zone only minimally.	Width of riparian zone 12-6 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
Score (LB) _____	10 9 8	7 6	5 4 3	2 1 0
Score (RB) _____	10 9 8	7 6	5 4 3	2 1 0

Appendix C-1. Physical-characterization sheet used by ADEM.

ADEM-FIELD OPERATIONS-ECOLOGICAL STUDIES
PHYSICAL CHARACTERIZATION / WATER QUALITY FIELD DATA SHEET-Wadeable Streams

Station # _____ Date: _____ Collector Names _____

Reach Description: _____

WATERSHED CHARACTERISTICS

Watershed Land Use: Forest Pasture Ag. Residential Commercial Ind. Other: _____

Local Watershed Erosion: None Slight Moderate Heavy

Local Watershed NPS Pollution: No Evidence Potential sources Obvious Sources

REACH CHARACTERISTICS

Land Use at Reach: Pasture Crops Residential Forest Commercial Ind. Other: _____

Est. Stream Width: _____ ft *Depth:* Mid Channel _____ ft Riffle: _____ ft Run: _____ ft Pool: _____ ft

Length of Reach: _____ ft *Stream Gradient:* _____ ft drop in 25 feet (representative seg.) *Channelized:* Y N

Rosgen Stream Type: _____ *Bank Height:* _____ ft *High Water Mark:* _____ ft *Dam Present:* Y N

Prev. 7 day precip: Fl. Flood Heavy Mod. light none *Macrophytes:* None Rare Common Abundant

Canopy Cover: Open 0-20% Mostly Open 20-40% Est. 50/50 40-60% Mostly Shaded 60-80% Shaded 80-100% *Canopy Type:* _____

SEDIMENT / SUBSTRATE CHARACTERISTICS

Odors: Normal Sewage Petroleum Chemical Anaerobic Other: _____

Oils: Absent Slight Moderate Profuse

Deposits: Sludge Sawdust Paper-Fiber Sand Relict Shells Other: _____

Are the undersides of stones not deeply embedded, black? Y N N/A

WATER QUALITY CHARACTERISTICS

Water Odors: Normal Sewage Petroleum Chemical Other: _____

Water Surface Oils: None Slick Sheen Globs Flecks

Water Color: Clear Sl. Tannic Mod. Tannic Dk Tannic Green Gray Other: _____

Weather Conditions: Clear P/C Mostly Cloudy Cloudy Raining

Biological Indicators: Periphyton Macrophytes Fish Filamentous Slimes Others

PHOTOS Roll # _____

Picture # _____ Description _____ Picture # _____ Description _____

EST. % COMP. IN SAMPLING AREA

Inorganic + Organic = 100%

Type	Diameter	Percent
Bedrock		%
Boulder	>10 in.	%
Cobble	2.5 - 10 inches	%
Gravel	0.1 - 2.5 inches	%
Sand	gritty	%
Silt		%
Clay	slick	%
Detritus	Stick, Wood	%
	CPOM	%
Mud-Muck	fine organic	%
Marl	Gray Shell Frag.	%

FIELD NOTES

WATER QUALITY

Time _____ hrs (24hrs)

Mid Channel Depth _____ ft

Sample Depth _____ ft

T-Air _____ C

T-H2O _____ C

pH _____ s.u.

Cond. _____ umhos @ 25c

D.O. _____ mg/l

Turb. _____ ntu

Appendix D-1. Results of physical/chemical measurements and water quality samples collected from NPS screening assessment stations within the Chattahoochee River basin.

Sub-Watershed Number	Station Number	Date (yymmdd)	Time (24hr)	Water Temp. (°C)	Dissolved Oxygen (mg/L)	pH (s.u.)	Conductivity (umhos)	Turbidity (ntu)	Flow (cfs)	Fecal Coliform (col/100mL)	BOD-5 mg/L	TSS (mg/L)	TDS (mg/L)	Alkalinity (mg/L)	Hardness (mg/L)	NH3-N (mg/L)	NO_2/ NO_3-N (mg/L)	Total-P (mg/L)	TKN (mg/L)	TON (mg/L)	TOC (mg/L)
Middle Chattahoochee - Lake Harding (0313-0002)																					
190	WECR-1	990601	1342	22	7.8	7.18	16.7	3.86	6.1												
190	WECR-1	990720	0910	25	8.2	6.7	36	45.8	10		0.6	8	61	12	7.72	<0.015	0.24	0.07	<0.15	<0.2	3.21
190	WECR-2	990601	1535	23	8.1	7.46	44.4	10.4	8.9												
190	WECR-2	990720	0950	25	8.2	7.3	53	29.7	22		1.6	12	60	20	9.98	<0.015	0.17	0.06	<0.15	<0.2	3.37
220	BWCC-1	990602	1203	21	6.6	7.21	39.3	15	1.4												
220	WLCC-1	990602	0815	20	6.8	7.11	72.5	15.9	2.8												
Middle Chattahoochee -W. F. George (0313-0003)																					
120	HECR-2	990609	1020	26	6.4	5.97	24.5	16.2	1.8												
Lower Chattahoochee (0313-0004)																					
020	BMCH-1	990520	0920	17.87	10.76	6.26	40	6.53	4.8												
020	BMCH-1	990715	1145	23	7.5	6.2	36	12.3	10	193	0.9	22	90	1	13.4	<MDL	0.36	0.06	<MDL	<MDL	2.79
080	CRCH-1	990505	1130	20	8.53	6.54	140	6.59	12.4												

** - High Flow

Appendix D-2. Results of water quality samples collected for metals, chloride and sulfate analyses from NPS screening assessment stations located within the Chattahoochee River basin.

Sub-watershed	Station	Date (yymmdd)	Time (24hr)	Al (mg/L)	Ca (mg/L)	Cu (mg/L)	Fe (mg/L)	Mg (mg/L)	Mn (mg/L)	Zn (mg/L)	As (ug/L)	Cl (mg/L)	SO_4 (mg/L)
Middle Chattahoochee - Lake Harding (0313-0002)													
190	WECR-1	990720	0910	0.345	1.56	<0.02	0.602	0.928	0.023	<0.03	<10	4.46	3.14
190	WECR-2	990720	0950	<0.2	2.3	<0.02	1.27	1.030	0.146	<0.03	<10	4.59	2.63
Lower Chattahoochee (0313-0004)													
20	BMCH-1	990715	1145	<0.2	3.94	<0.02	0.515	0.872	<0.02	<0.03	<10	5.21	3.54

Appendix E-1. Descriptions of stations located within the Chattahoochee and Chipola River basins and assessed since 1994.

Basin	CU	Sub-watershed	County	Station Number	Project	Waterbody Name	Station Description	T / R / S	Latitude	Longitude	Sub-ecoregion
0313	0002	190	Randolph	WECR-1	NPS Screening Station	Wehodkee Creek	Wehodkee Creek @ Randolph CR 87	21S/13E/5	33.22279	-85.31333	45a
0313	0002	190	Randolph	WECR-2	NPS Screening Station	Wehodkee Creek	Wehodkee Creek @ AL Hwy 22	21S/13E/27	33.15877	-85.29002	45b
0313	0002	220	Chambers	BWCC-1	NPS Screening Station	Barrow Creek	Barrow Creek @ unnamed Chambers CR, NW of Lanett	22N/28E/17	32.89908	-85.25116	45b
0313	0002	220	Chambers	CH02U3-14	ALAMAP 1999	Hardley Creek	Hardley Creek approx. 1/4 mile west of Chambers CR 212.	22N/28E/2	32.91680	-85.19860	45b
0313	0002	220	Chambers	CH3U4-58	ALAMAP 2000	Tributary to Wells Creek	Tributary to Wells Creek	23N/ 27E/16	32.97970	-85.33510	45b
0313	0002	220	Chambers	CHTAU02	Tributary Sampling FY99	Chattahoochee River	Chattahoochee River @ U.S. Highway 29	22N/28E/24	32.88611	-85.18222	45b
0313	0002	220	Chambers	WLCC-1	NPS Screening Station	Well Creek	Well Creek @ unnamed CR	23N/27E/27	32.95096	-85.32492	45b
0313	0002	290	Chambers	CH01U1	ALAMAP 1997	Tributary to Snapper Cr	Tributary to Snapper Creek approx. 9.1 miles us of confluence of Snapper Creek with Osanippa Creek.	21N/26E/26	32.77710	-85.41190	45b
0313	0002	290	Chambers	OSAAU01	Tributary Sampling FY99	Osanippa Creek	Osanippa Creek @ Chambers CR 195	20N/29E/5	32.75778	-85.16167	45b
0313	0002	290	Chambers	OSCC-1	Middle Chattahoochee WQ Study	Osanippa Creek	Osanippa Creek @ Chambers CR 195	20N/29E/5	32.75756	-85.16152	45b
0313	0002	300	Lee	HACL-1	Middle Chattahoochee WQ Study	Halawakee Creek	Halawakee Creek @ Lee CR 390	20N/28E/29	32.69603	-85.25588	45b
0313	0002	300	Lee	HALAU01	Tributary Sampling FY99	Halawakee Creek	Halawakee Creek @ Lee CR 390	20N/28E/29	32.69639	-85.25583	45b
0313	0003	020	Russell	CHA01	CWS-1996	Mill Creek	Mill Creek @ Poyner Dr.	17N/30E/5	32.48806	-85.05917	65i
0313	0003	020	Russell	CHA02	CWS-1996	Mill Creek	Mill Creek @ U.S. Hwy 280	17N/30E/5	32.48897	-85.03400	65i
0313	0003	020	Russell	CHA03	CWS-1996	Mill Creek	Mill Creek @ AL Hwy 1 near mouth	17N/30E/14	32.46580	-85.00082	65i
0313	0003	020	Russell	CHTAU01	Tributary Sampling FY99	Chattahoochee River	Chattahoochee River @ bridge 0.5 mi. ds of Georgia RR	17N/30E/14	32.46250	-84.99778	65i
0313	0003	020	Russell	MICR-1	Middle Chattahoochee WQ Study	Mill Creek	Mill Creek @ Broad St in Phenix City	17N/30E/14	32.46580	-85.00082	65i
0313	0003	060	Lee	CH03U3-44	ALAMAP 1999	Tributary to Hospilika Creek	Tributary to Hospilika Creek approx. 1/4 mile us of Lee CR 240	17N/29E/3	32.49780	-85.12710	65i
0313	0003	060	Lee	CH2U4-35	ALAMAP 2000	Tributary to Sturkie Creek	Tributary to Sturkie Creek	19N/ 28E/33	32.59070	-85.24790	45b
0313	0003	060	Russell	LUC-1	1999 303(d)	Little Uchee Creek	Little Uchee Creek @ US Hwy 431.	16N/29E/13	32.38070	-85.08410	65d
0313	0003	060	Russell	LUC-2	1999 303(d)	Little Uchee Creek	Little Uchee Creek @ US Hwy 80.	17N/29E/16	32.46200	-85.13080	65i
0313	0003	060	Lee	LUC-3	1999 303(d)	Little Uchee Creek	Little Uchee Creek @ Meadows Mill.	18N/28E/20	32.52800	-85.25410	45b
0313	0003	060	Lee	PHE (AU012)	AUCE Basin Study (AUCE 1999)	Phelps Creek	Phelps Creek @ Lee CR 145, E of Al Hwy 169 nr Salem, AL	18N/28E/7	32.57250	-85.28250	45b
0313	0003	070	Russell	BCR-1	Reference Sites	Brush Creek	Brush Creek upstream of Russell Co. Rd. 33.	17N/28E/32	32.42470	-85.26070	65i

Appendix E-1. cont., Descriptions of stations located within the Chattahoochee and Chipola River basins and assessed since 1994.

Basin	CU	Sub-watershed	County	Station Number	Project	Waterbody Name	Station Description	T / R / S	Latitude	Longitude	Sub-ecoregion
0313	0003	070	Russell	CH02U1	ALAMAP 1997	Tributary to Snake Cr	Tributary to Snake Creek approx. 2.7 mi. us of confluence with Snake Creek.	17N/27E/26	32.43900	-85.30140	65i
0313	0003	080	Russell	CH04U3-13	ALAMAP 1999	Uchee Creek	Uchee Creek @ AL Hwy 165	15N/30E/3	32.31610	-85.01420	65d
0313	0003	080	Russell	UCCAU01	Tributary Sampling FY99	Uchee Creek	Uchee Creek @ AL Hwy 165	15N/30E/3	32.31667	-85.01500	65d
0313	0003	080	Russell	UCCR--1	Middle Chattahoochee WQ Study	Uchee Creek	Uchee Creek @ AL Hwy 165	15N/30E/3	32.31667	-85.01500	65d
0313	0003	080	Russell	UCH (AU011)	AUCE Basin Study (AUCE 1999)	Uchee Creek	Uchee Creek @ AL Hwy 165	15N/30E/4	32.32694	-85.02500	65d
0313	0003	100	Russell	IHGR-1	Reference Sites	Ihagee Creek	Ihagee Creek @ Russell CR 18.	14N/30E/1	32.23850	-84.98070	65d
0313	0003	120	Russell	HECR-2	NPS Screening Station	Hatchechubbee Creek	Hatchechubbee Creek @ AL Hwy 26	14N/28E/14	32.27393	-85.26847	65d
0313	0003	130	Barbour	CHA04	CWS-1996	North Fork Cowikee Creek	North Fork Cowikee Creek @ Barbour Creek Rd.	13N/28E/27	32.09000	-85.20917	65d
0313	0003	130	Russell	NFCAU01	Tributary Sampling FY99	North Fk Cowikee Creek	North Fork Cowikee Creek @ Russell CR 42	13N/28E/27	32.09000	-85.20944	65d
0313	0003	140	Barbour	CHA05	CWS-1996	Middle Fork Cowikee Creek	Middle Fork Cowikee Creek @ Barbour CR	12N/28E/4	32.05444	-85.22750	65d
0313	0003	140	Barbour	MFCAU01	Tributary Sampling FY99	Middle Fk Cowikeee Creek	Middle Fork Cowikee Creek @ Barbour CR North of Hawkinsville	12N/28E/4	32.05439	-85.22802	65d
0313	0003	150	Barbour	COW (AU008)	AUCE Basin Study (AUCE 1999)	E Fk Cowikee Creek	East Fork Cowikee Creek @ US Hwy 82 nr Midway AL (mile 226)	12N/27E/15	32.02694	-85.32194	65d
0313	0003	150	Barbour	SFCAU01	Tributary Sampling FY99	South Fk Cowikee Creek	South Fork Cowikee Creek @ Barbour CR 79	12N/27E/14	32.01750	-85.29583	65d
0313	0003	160	Barbour	CHA06	CWS-1996	South Fork Cowikee Creek	South Fork Cowikee Creek @ Barbour CR 89	12N/28E/22	32.01667	-85.21361	65d
0313	0003	160	Russell	CH1U4-16	ALAMAP 2000	Tributary to Little Barbour Creek	Tributary to Little Barbour Creek	13N/ 29E/29	32.08350	-85.13960	65d
0313	0003	160	Barbour	USCG (AU010)	AUCE Basin Study (AUCE 1999)	W. F George Reservoir	Us Coast Gard Docks - 180 Chewala Rd in Eufala	11N/29E/29	31.91417	-85.15194	65d
0313	0003	180	Barbour	BARB (AU009	AUCE Basin Study (AUCE 1999)	Barbour Creek	1524 Barbour Lane - Eufala, AL	10N/28E/1	31.88417	-85.19833	65d
0313	0003	180	Barbour	BRC-1	1999 303(d)	Barbour Creek	Barbour Creek @US Hwy 431	10N/29E/7	31.86420	-85.16160	65d
0313	0003	180	Barbour	BRC-2	1999 303(d)	Barbour Creek	Barbour Creek @ Barbour CR 79.	11N/27E/33	31.89740	-85.34020	65d
0313	0003	180	Barbour	CH01U3-33	ALAMAP 1999	Tributary to Leak Creek	Tributary to Leak Creek approx. 3/4 mi. us of Barbour CR 79	11N/ 27E/17	31.94720	-85.36270	65d
0313	0003	180	Henry	WFG (AU004)	AUCE Basin Study (AUCE 1999)	Chattahoochee River	Chattahoochee River @ W.F. George Lock & Dam Nr Abbeville	8N/30E/31	31.62556	-85.06972	65p
0313	0004	020	Henry	BMCH-1	NPS Screening Station	Bennett Mill Creek	Bennett Mill Creek @ CR 97	6N/30E/6	31.52586	-85.07152	65d
0313	0004	020	Henry	CH01U2-13	ALAMAP 1998	Tributary to the Chattahoochee River	Tributary to Chattahoochee River approx. 0.1 mi. us of confluence with Chattahoochee River.	5N/30E/7	31.41460	-85.07860	65p
0313	0004	020	Henry	MMCH-1	NPS Screening Station	McRay Mill Creek	McRay Mill Creek @ AL Hwy 10	7N/29E/12	31.59619	-85.08345	65d

Appendix E-1. cont., Descriptions of stations located within the Chattahoochee and Chipola River basins and assessed since 1994.

Basin	CU	Sub-watershed	County	Station Number	Project	Waterbody Name	Station Description	T / R / S	Latitude	Longitude	Sub-ecoregion
0313	0004	040	Henry	CH03U1	ALAMAP 1997	Tributary to Peterman Creek	Tributary to Peterman Creek approx. 3.7 mi. us of confluence of Peterman Creek and Abbie Creek.	6N/29E/6	31.49930	-85.15210	65d
0313	0004	060	Houston	PSB-1	1999 303(d)	Omussee Creek	Omussee Creek @ Houston CR 41.	3N/27E/4	31.25900	-85.33240	65g
0313	0004	060	Houston	PSB-2	1999 303(d)	Poplar Spring Branch	Poplar Spring Branch @ Ross Clark Circle in Dothan.	3N/27E/17	31.23480	-85.36230	65g
0313	0004	060	Henry	SPMH--1	Poultry Project	Spivey Mill Creek	Spivey Mill Creek between Henry CR 49 & 87	4N/28E/8	31.33812	-85.24979	65g
0313	0004	080	Houston	CHA09	CWS-1996	Cedar Creek	Cedar Creek @ Houston CR 33	3N/28E/26	31.20694	-85.21361	65g
0313	0004	080	Houston	CHA10	CWS-1996	Cedar Creek	Cedar Creek @ AL Hwy 95	3N/29E/34	31.18972	-85.11889	65g
0313	0004	080	Houston	CRCH-1	NPS Screening Station	Cedar Creeke	Cedar Creek @ CR 95	3N/29E/34	31.18966	-85.11882	65g
0313	0004	080	Houston	GWA (AU003)	AUCE Basin Study (AUCE 1999)	Chattahoochee River	Chattahoochee River @ G.W. Andrews Lock & Dam, Columbia, AL	3N/29E/2	31.26472	-85.12028	65p
0313	0004	100	Houston	CHA07	CWS-1996	Bryans Creek	Bryans Creek @ Houston CR 85	1N/29E/13	31.05083	-85.09250	65g
0313	0004	100	Houston	CHA08	CWS-1996	Bryans Creek	Bryans Creek @ AL Hwy 95	1N/30E/9	31.06889	-85.04556	65g
0313	0012	010	Houston	CHI04	CWS-1996	Cowarts Creek	Cowarts Creek @ CR 81	1N/28E/14	31.07444	-85.21889	65g
0313	0012	010	Houston	CHI05	CWS-1996	Cowarts Creek	Cowarts Creek @ AL Hwy 53	7N/10W/10	31.01694	-85.22250	65g
0313	0012	030	Houston	CHI01	CWS-1996	Boggy Creek	Boggy Creek @ AL Hwy 53	1N/27E/24	31.04500	-85.29528	65g
0313	0012	030	Houston	CHI02	CWS-1996	Boggy Creek	Boggy Creek @ unnamed CR	1N/27E/35	31.02000	-85.30889	65g
0313	0012	030	Houston	CHI03	CWS-1996	Buck Creek	Buck Creek @ Houston CR 55	1N/27E/23	31.04916	-85.31361	65g
0313	0012	030	Houston	CHI06	CWS-1996	Limestone Creek	Limestone Creek @ AL Hwy 109 south of Dothan	2N/26E/34	31.09916	-85.42083	65g
0313	0012	030	Houston	CYC-1	1999 303(d)	Cypress Creek	Cypress Creek @ Blackman Rd.	2N/26E/24	31.13020	-85.40030	65g
0313	0012	030	Houston	CYC-2	1999 303(d)	Cypress Creek	Cypress Creek @ Hodgesville Rd.	2N/26E/13	31.14860	-85.39110	65g
0313	0012	030	Houston	CYC-3	1999 303(d)	Cypress Creek	Cypress Creek @ Saunders Rd.	2N/27E/7	31.16740	-85.37950	65g
0313	0012	030	Houston	CYC-4	1999 303(d)	Cypress Creek	Cypress Creek @ WWTP access road just before entering the gate.	2N/27E/7	31.15870	-85.37730	65g
0313	0012	030	Houston	CYWW001	1999 303(d)	Cypress Creek WWTP outfall	Cypress Creek WWTP outfall	2N/27E/7	31.15750	-85.37950	65g
0313	0012	030	Houston	CP01U1	ALAMAP 1997	Buck Creek	Buck Creek near Cottonwood.	1N/27E/15	31.05630	-85.31780	65g

Appendix F-1. Ecoregional Reference Site Program

Lead agency: ADEM

Purpose: Ecoregions are relatively homogeneous ecological areas defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables. Since 1991, ADEM has maintained a network of least-impaired ecoregional reference sites. Intensive monitoring assessments, including chemical, physical, habitat, and biological data, are collected to develop baseline reference conditions for each of Alabama's 29 Level IV subecoregions (Griffith et al. 2001). The reference condition establishes the basis for making comparisons and detecting use impairment.

Table 6a. Habitat assessment data

Table 7a. Biological assessment data

Appendix F-1. Physical/ chemical data

References:

ADEM. 2000a. Ecoregional reference site data collected by ADEM 1992 to 2000 (unpublished). Field Operations Division, Alabama Department of Environmental Management. Montgomery, Alabama.

Appendix F-1. Physical/chemical data collected at Ecoregional Reference Sites located within the Chattahoochee River basin.

Sub-Watershed	Station	Date	Time	Air Temp.	Water Temp.	Dissolved Oxygen	pH	Conductivity	Turbidity	Stream Flow	Fecal Coliform	BOD-5	TSS	TOC	Total-P	NO_3+ NO_2-N	NH_3-N	TKN
		yymmdd	*24hr*	*^oC*	*^oC*	*mg/L*	*s.u.*	*umhos @ 25 ^oC*	*NTU*	*cfs*	*col/100mL*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/l*	*mg/l*	*mg/l*
Middle Chattahoochee - Walter F. George (0313-0003)																		
070	BCR -1	990518	1150	33	22	7.2	6.4	40	4.42	3.3	55	1.5	10	3.22	<0.004	0.17	<0.015	0.42
070	BCR -1	990616	1035	35	24	8.0	6.3	30	3.81	6.0	77	2.1	4	3.16	0.01	0.14	<0.015	<0.15
070	BCR -1	990707	1020	25	24	7.5	7.1	20	2.6	3.7	est 63	0.1	3	3.91	0.03	0.19	<0.015	0.15
070	BCR -1	990928								*								
100	IHGR-1	990518	1540	32	26	9.3	7.0	60		9.8	27	1	6	5.26	0.04	0.2	<0.015	<0.15
100	IHGR-1	990608	1430	36.5	30	8.3	6.6	42.6	18.1	4.1								
100	IHGR-1	990616	1415	30	27	8.1	6.6	40	15.7	10.5	>700	1.1	18	4.87	0.06	0.17	<0.015	0.25
100	IHGR-1	990707	1450	30	26	7.2	7.4	30	9.5	8.0	est 57	0.8	6	4.65	0.08	0.49	<0.015	0.25
100	IHGR-1	990928	1540	32	26	8.3	7.5	90	5.35	10.0	174	1.4	10	4.08	0.05	0.15	<0.015	<0.15

* - No Flow ; ** - High Flow; ***Not Wadeable

Appendix F-2. §303(d) Waterbody Monitoring Project

***Lead agency*:** ADEM

***Purpose*:** In accordance with Section 303(d) of the Federal Clean Water Act, each state must identify its polluted waterbodies that do not meet surface water quality standards and submit this list to the EPA. In an effort to address water quality problems within Alabama, some waterbodies included on ADEM's §303(d) list are only suspected to have water quality problems based on evaluated assessment data. ADEM conducts monitored assessments of impaired waterbodies to support §303(d) listing and de-listing decisions. The program includes intensive chemical, habitat, and biological data collected using ADEM's SOPs and QA/QC manuals.

Table 6a. Habitat assessment data

Table 7a. Biological assessment data

Appendix F-2. Physical/ chemical data

References:

ADEM. 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. Montgomery, Alabama.

Appendix F-2. Physical/chemical data collected at CWA §303(d) monitoring stations located within the Appalachicola Accounting Unit. (ADEM 1999c)

Sub-Watershed	Station	Date	Time	Air Temp.	Water Temp.	Dissolved Oxygen	pH	Conductivity	Turbidity	Stream Flow	Fecal Coliform	BOD-5	TSS	TDS	TOC	Total-P	NO_3+ NO_2-N	NH_3-N	TKN	Hardness
	#	*yymmdd*	*24hr*	*^oC*	*^oC*	*mg/L*	*s.u.*	*umhos @ 25^oC*	*NTU*	*cfs*	*col/100mL*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*
Middle Chattahoochee - Walter F. George (0313-0003)																				
060	LUC -1	990518	1415	28	28.2	9.3	7.7	80	10.8	20.0	26		10			<0.004	0.15		<0.15	
060	LUC -1	990616	1315	28	26	8.5	7.7	90	11.7	22.5	83		3			0.03	0.04		0.19	
060	LUC -1	990707	1315	32	24.3	8.0	7.9	80	9.9	28.7	28		7			0.04	0.11		<0.15	
060	LUC -1	990928								*										
060	LUC -2	990518	1219	28	24.9	8.0	7.3	70	26.4		est 12		21			0.008	0.1		<0.15	
060	LUC -2	990616	1130	32	26.8	5.8	7.1	80	51.4		est 47		36			0.05	0.14		0.29	
060	LUC -2	990707	1145	32	26.9	6.0	7.4	70	13.0		77		14			0.06	0.1		0.33	
060	LUC -2	990928	1418	28	26.6	6.1	7.9	90	10.9		46		8			0.03	0.05		<0.15	
060	LUC -3	990518	1010	27	22	7.8	7.2	90	12.5		35		7			<0.004	0.07		<0.15	
060	LUC -3	990602	1400	29	24	7.9	7.7	86.5		9.3										
060	LUC -3	990616	1010	26	25.5	7.1	7.1	100	8.0		49		3			0.02	0.1		0.17	
060	LUC -3	990707	0940	27	26.7	6.9	7.4	80	8.6		23		4			0.05	0.13		<0.15	
060	LUC -3	990928	1325	28	25.6	7.1	7.5	145	3.6		240		3			0.04	0.07		0.17	
180	BRC -1	990427	1744		24.7	9.9	8.9	100.7	4.7		<1	2.6	9		3.65	<0.004	<0.003	0.015	0.4	20.7
180	BRC -1	990519	0930	28	25.3	9.0	8.2	105	7.1		est 3	2.5	6		3.95	0.01	0.14	<0.015	0.17	
180	BRC -1	990525	1610		26.4	10.0	8.6	106	4.6		<3	2.6	11		3.79	0.02	0.17	<0.015	0.43	23.6
180	BRC -1	990617	1030	27	27.5	7.3	7.7	110	7.5		est 15	2.2	10		4.14	0.02	0.04	<0.015	0.54	
180	BRC -1	990622	1610		29.9	8.9	8.6	106.3	5.3		<2	2.2	7		3.76	0.02	0.17	<0.015	<0.15	21.5
180	BRC -1	990708	0900	30	29.8	8.2	8.7	120	3.0		est 23	1.5	5		3.86	0.04	0.11	<0.015	0.81	
180	BRC -1	990727	1601		31.1	9.3	8.6	116.4	4.6		est 1	1.2	9		3.84	0.006	0.1	<0.015	<0.15	22.7
180	BRC -1	990824	1441		31.9	7.9	8.0	111.3	5.7		est 12	2.5	9		4.46	0.006	0.01	<0.015	0.29	25.2
180	BRC -1	990928	1519		26.3	10.1	8.5	122.5	2.8		est 1	3.3	12		3.43	0.07	0.08	<0.015	0.68	21.5
180	BRC -1	990929	0900	27.5	27.3	9.5	8.5	120	2.8		>720	2.1	4		3.93	0.03	0.08	<0.015	<0.15	
180	BRC -1	991026	1457		19.6	7.4	7.4	126	8.5		est 4	1.1	10		4.01	0.02	0.243	<0.015	0.84	21.4
180	BRC -2	990519	1101	23	22.2	8.4	7.3	85	21.6	15.1	320	0.7	7		3.4	0.01	0.1	<0.015	<0.15	
180	BRC -2	990608	1100	27	24	7.5	7.0	100.3	18.2	5.8										
180	BRC -2	990617	1130	32	24.8	8.3	7.2	60	24.8	22.2	230	0.5	32		4.51	0.04	0.1	<0.015	0.28	
180	BRC -2	990708	1020	24.9	30	7.8	7.5	70	15.2	14.9	167	0.5	22		3.81	0.03	0.16	<0.015	<0.15	
180	BRC -2	990929	1015	28	24.4	7.9	8.0	70	10.6	9.8	>840	0.7	10		3.23	0.04	0.1	<0.015	<0.15	
Lower Chattahoochee (0313-0004)																				
060	PSB -1	990511	1645	25	22	7.4	7.5	75	14.0	***	90		5		3.15	0.04	0.82	<0.015	0.53	
060	PSB -1	990608	0730	26	24	6.9	7.5	75	15.1	14.1	100		21			0.05	0.77		0.44	
060	PSB -1	990722	0845	31	27	6.8	7.0	90	12.8		184		9			0.03	1.06	<0.015	0.39	

Appendix F-2. Physical/chemical data collected at CWA §303(d) monitoring stations located within the Appalachicola Accounting Unit. (ADEM 1999c)

Sub-Watershed	Station	Date	Time	Air Temp.	Water Temp.	Dissolved Oxygen	pH	Conductivity	Turbidity	Stream Flow	Fecal Coliform	BOD-5	TSS	TDS	TOC	Total-P	NO_3+ NO_2-N	NH_3-N	TKN	Hardness
	#	*yymmdd*	*24hr*	*^oC*	*^oC*	*mg/L*	*s.u.*	*umhos @ 25^oC*	*NTU*	*cfs*	*col/100mL*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*
Lower Chattahoochee (0313-0004)																				
060	PSB -1	990805	0725	29	27	5.7	6.8	120	29.8	35.0	>600		3			0.14	1	<0.015	<0.15	
060	PSB -2	990511	1610	27	24	7.2	7.3	360	5.1	0.8	450		1		3.18	0.06	3.44	1.39	4.83	
060	PSB -2	990608	0815	29	25	7.9	7.5	260	5.0		est 160		8			0.07	1.85		0.4	
060	PSB -2	990722	0830	33	26	6.0	7.1	330	9.4		41		15			0.13	3.98	0.87	1.57	
060	PSB -2	990805	0850	33	27	4.8	6.9	240	24.6	2.1	>600		14			0.39	1.87	1.03	2.01	

* No Flow; ** High flow; ***Not Wadeable; +Bridge Closed

Appendix F-3. Southeast Alabama Poultry Industry Impact Study

Lead agency: Cooperative effort by ADEM and Rivers and the Reservoirs Laboratory. Department of Fisheries. Auburn University.

Purpose: The objectives of Poultry Industry Impact Study were to collect a baseline of surface water quality data from selected watersheds expected to receive point and/or non-point sources of pollution associated with the increased poultry production in Southeast Alabama. The increase of poultry production activity is associated with the opening of the Charoen Pokphand plant near Eufaula, Alabama. In the spring of 1998 Chareon Pokphand provided ADEM with a map of broiler farms. The information was reviewed and eight monitoring locations were selected. The eight streams were sampled from August 1998 through September 1999. Data collected included water chemistry, stream flow, habitat assessments and aquatic macroinvertebrate and fish community surveys.

Table 6a. Habitat assessment data

Table 7a. Bioassessment data

Appendix: F-3. Chemical/physical data

References: ADEM. 1999g. FY99 Southeast Alabama Poultry Industry Impact Study. Unpublished data. Alabama Department of Environmental Management. Montgomery, AL

Appendix F-3. Physical/chemical data collected within the Lower Chattahoochee Basin (0313-0004) as part of the Southeast Alabama Poultry Industry Impact Study, 1998 and 1999.

Sub-watershed	Station	Date (yymmdd)	Water Temp (^{o}C)	D.O. (mg/L)	Flow (cfs)	Fecal coliform (col/100 mL)	TSS (mg/L)	TDS (mg/L)	BOD-5 (mg/L)	TOC (mg/L)	Alk (mg/L)	Hard (mg/L)	NO_3-NO_2-N (mg/L)	Total-P (mg/L)	NH_3-N (mg/L)	TKN (mg/L)	TON (mg/L)	As (ug/L)	Cu (mg/L)	Mg mg/mL	Zn mg/L
060	SPMH-1	980804	23	7.7	37	210	18	102	0.2	4.7	20	27.4	1.63	0.05	<0.015	1.02	1.02	<10	<0.02	1.9	<0.03
060	SPMH-1	981014			34	210	8	71	0.1	1.43	14	23	1.94	0.004	<0.015	0.16	0.16	<10	<0.02	1.66	<0.03
060	SPMH-1	990128	18	8.9	30	370	11	62	0.4	1.47	89	24.3	2.16	0.05	0.02	0.2	0.2	<10	<0.02	1.61	<0.03
060	SPMH-1	990420	15	9.1	19	310	19	75	0.5	1.52	53	26.3	0.41	0.13	<0.015	0.69	0.69	<10	<0.02	1.77	<0.03
060	SPMH-1	990517	16	9.2	23	330	16	63	0.8	1.4	29	27.7	1.83	0.03	<0.015	0.46	0.46	<10	<0.02	1.96	0.073
060	SPMH-1	990614	19	9.3	21	258	17	88	0.6	1.56	23	26	1.67	0.03	<0.015	0.24	0.24	<10	<0.02	1.76	<0.03
060	SPMH-1	990719	25	7.5	24	190	14	103	0.9	1.99	25	26.9	1.74	0.06	<0.015	0.25	0.25	<10	<0.02	1.86	<0.03
060	SPMH-1	990816	34	7.3	16	1200	11	81	0.7	1.38	22	27.3	1.64	0.004	<0.015	0.23		<10	<0.02	1.88	<0.03
060	SPMH-1	990920	25	7.8	18	470	14	85	0.8	1.59	26	25.7	1.58	0.1	<0.015	0.34	0.34	<10	<0.02	1.76	<0.03

Appendix F-4. University reservoir tributary nutrient study

Lead Agencies*:* Cooperative effort by the University of Alabama, Auburn University, Tennessee Valley Authority and Auburn University at Montgomery funded by ADEM

Purpose: Intensive chemical sampling was conducted October 1998-March 2000 to study nutrient loading from tributaries to 26 reservoirs in Alabama. These data were used to quantify tributary nutrient loads to reservoirs and to provide estimates of nonpoint source nutrient contributions. These loading estimates will be essential to the Department's effort to address lake eutrophication concerns across the state. Samples were collected monthly, June-November and biweekly, December-May. All samples and in-situ measures were collected in accordance with ADEM Standard Operating Procedures manual. Duplicate samples were collected at 10% of the stations.

Appendix F-4. Physical/chemical data

References:

ADEM. 2000i. Water quality monitoring data from tributaries of the Alabama River basin reservoirs collected by Auburn University Montgomery (unpublished). Field Operations Division, Alabama Department of Environmental Management. Montgomery, Alabama.

Appendix F-4. Physical/chemical data collected by Auburn University from tributaries to reservoirs in the Chattahoochee River basin from October 1998 through September 1999.

Sub-watershed	Stream	Station	Date *dd/mm/yy*	Time *24hr*	Water Temp. *^{o}C*	Dissolved Oxygen *mg/L*	pH *s.u.*	Conductivity *umhos @ 25^{o}C*	Turbidity *NTU*	Stream Flow *cfs*	Total Alkalinity *mg/L*	TDS *mg/L*	TSS *mg/L*	Total Settlable Solids *ml/L*	NH_3-N *mg/L*	NO_2+ NO_3-N *mg/L*	TKN *mg/L*	Total-P *mg/L*
Middle Chattahoochee - Lake Harding (0313-0002)																		
220	Chattahoochee R	CHTAU02	1/12/99	1200	10	11.1	6.6	116	5.3		22.50	110.15	3.82	0.0	0.072	1.463	0.671	0.019
220	Chattahoochee R	CHTAU02	1/25/99	1230	12	11.2	6.6	107	5.2		22.25	53.80	3.12	0.0	0.058	1.539	0.470	0.021
220	Chattahoochee R	CHTAU02	2/2/99	1310	12	11.2	6.6	99	6.7		20.25	77.83	3.04	0.0	0.069	1.171	0.265	0.020
220	Chattahoochee R	CHTAU02	2/15/99	1143	13	12.5	6.5	97	7.5		18.75	56.13	4.10	0.0	0.113	1.398	0.338	0.022
220	Chattahoochee R	CHTAU02	2/23/99	1200	11	9.8	6.6	113	6.2		19.50	84.80	3.73	0.0	0.060	1.277	0.405	0.020
220	Chattahoochee R	CHTAU02	3/9/99	1200	13	10.8	6.5	88	5.7		19.00	57.17	2.48	0.0	0.051	1.186	0.356	0.019
220	Chattahoochee R	CHTAU02	3/16/99	1345	15	12.1	6.9	86	5.6		19.50	106.45	2.51	0.0	0.039	1.206	0.139	0.021
220	Chattahoochee R	CHTAU02	4/12/99	1151	20	10.1	5.9	97	3.0		19.00	141.03	1.07	0.0	0.030	1.218	0.226	0.013
220	Chattahoochee R	CHTAU02	4/26/99	1200	18	9.5	7.1	85	2.3		19.50	126.55	0.80	0.0	0.056	1.164	0.234	0.011
220	Chattahoochee R	CHTAU02	5/10/99	1145	21	9.0	7.2	91	1.5		21.75	144.70	0.47	0.0	0.033	1.074	0.176	0.011
220	Chattahoochee R	CHTAU02	5/24/99	1240	22	7.2	7.0	97	2.1		21.50	121.25	1.17	0.0	0.059	0.994	0.185	0.011
220	Chattahoochee R	CHTAU02	6/14/99	1230	24	4.4	7.0	108	7.3		26.50	150.40	9.02	0.0	0.124	1.057	0.283	0.027
220	Chattahoochee R	CHTAU02	6/29/99	1340	27	6.4	7.0	109	3.4		25.25	146.35	1.83	0.0	0.089	0.729	0.376	0.017
220	Chattahoochee R	CHTAU02	7/20/99	1250	28	6.3	7.2	111	1.4		24.00	142.20	1.16	0.0	0.081	0.819	0.492	0.023
220	Chattahoochee R	CHTAU02	8/10/99	1300	31	5.2	7.1	103	1.4		22.50	156.95	1.00	0.0	0.105	0.607	0.440	0.017
220	Chattahoochee R	CHTAU02	9/28/99	1330	25	6.0	7.2	116	5.6		27.50	65.40	9.22	0.0	0.063	0.828	0.243	0.034
220	Chattahoochee R	CHTAU02	10/13/98	1640	23	7.8	7.0	85	1.2			59.35	0.21	0.0	0.039	0.636	0.243	0.010
220	Chattahoochee R	CHTAU02	11/16/98	1455	19	7.1	6.8	102	12.2			75.47	8.38	0.0	0.065	1.193	0.386	0.034
220	Chattahoochee R	CHTAU02	12/1/98	1235	20	9.0	7.0	105	3.9			77.47	0.89	0.0	0.057	1.163	0.257	0.018
220	Chattahoochee R	CHTAU02	12/8/98	1220	19	7.9	6.7	118	2.6			69.60	1.27	0.0	0.04	1.418	0.329	0.022
290	Osanippa Cr	OSAAU01	1/12/99	1130	6	12.8	6.5	58	9.3	56.0	21.25	77.50	1.61	0.0	0.030	0.198	0.243	0.012
290	Osanippa Cr	OSAAU01	1/25/99	1140	13	10.4	6.5	44	81.0	457.7	11.50	66.80	44.64	0.3	0.055	0.552	0.651	0.091
290	Osanippa Cr	OSAAU01	2/2/99	1205	10	11.1	6.4	37	49.0	768.2	9.50	71.70	27.40	0.1	0.056	0.258	0.410	0.050
290	Osanippa Cr	OSAAU01	2/15/99	1110	9	11.9	6.5	56	10.2	78.6	21.25	71.17	2.36	0.0	0.058	0.133	0.148	0.014
290	Osanippa Cr	OSAAU01	2/23/99	1130	9	11.1	6.4	56	11.0	85.1	22.25	68.65	1.69	0.0	0.035	0.139	0.153	0.011
290	Osanippa Cr	OSAAU01	3/9/99	1115	12	10.8	6.9	53	14.5	104.7	21.00	47.90	3.80	0.0	0.051	0.146	0.240	0.023

Appendix F-4, cont. Physical/chemical data collected by Auburn University from tributaries to reservoirs in the Chattahoochee River basin from October 1998 through September 1999.

Sub-watershed	Stream	Station	Date *dd/mm/yy*	Time *24hr*	Water Temp. *°C*	Dissolved Oxygen *mg/L*	pH *s.u.*	Conductivity *umhos @ 25°C*	Turbidity *NTU*	Stream Flow *cfs*	Total Alkalinity *mg/L*	TDS *mg/L*	TSS *mg/L*	Total Settlable Solids *ml/L*	NH_3-N *mg/L*	NO_2+ NO_3-N *mg/L*	TKN *mg/L*	Total-P *mg/L*
Middle Chattahoochee - Lake Harding (0313-0002), cont.																		
290	Osanippa Cr	OSAAU01	3/16/99	1315	15	10.7	6.4	46	30.0	217.6	16.00	108.65	14.24	0.1	0.050	0.234	0.208	0.035
290	Osanippa Cr	OSAAU01	4/12/99	1120	23	8.1	7.2	68	9.7	64.6	31.00	121.57	4.50	0.0	0.021	0.134	0.182	0.018
290	Osanippa Cr	OSAAU01	4/26/99	1120	20	8.5	7.2	69	10.4	38.8	31.00	115.95	4.38	0.0	0.036	0.178	0.228	0.019
290	Osanippa Cr	OSAAU01	5/10/99	1110	21	8.2	7.3	64	18.4	58.3	28.75	133.00	15.58	0.0	0.035	0.197	0.289	0.029
290	Osanippa Cr	OSAAU01	5/24/99	1130	23	7.3	7.3	69	10.8	25.7	29.75	129.20	8.46	0.0	0.045	0.169	0.315	0.021
290	Osanippa Cr	OSAAU01	6/14/99	1130	25	7.1	7.4	69	7.5	40.0	31.25	133.65	3.62	0.0	0.003	0.201	0.211	0.019
290	Osanippa Cr	OSAAU01	6/29/99	1210	25	7.7	6.9	37	62.0	408.3	18.00	148.10	59.30	0.3	0.054	0.182	0.469	0.071
290	Osanippa Cr	OSAAU01	7/20/99	1120	26	7.7	7.4	69	11.2	42.3	30.25	142.05	3.44	0.0	0.018	0.166	0.165	0.015
290	Osanippa Cr	OSAAU01	8/10/99	1145	29	7.0	7.4	86	5.4	9.7	35.00	154.85	1.89	0.0	0.016	0.042	0.165	0.014
290	Osanippa Cr	OSAAU01	9/28/99	1225	23	7.8	7.2	59	11.6	17.9	25.75	40.25	3.22	0.0	0.024	0.059	0.174	0.022
290	Osanippa Cr	OSAAU01	10/13/98	1515	19	13.2	7.1	62	9.8	23.8		71.10	2.20	0.0	0.015	0.076	0.129	0.015
290	Osanippa Cr	OSAAU01	11/16/98	1410	16	9.1	7.0	70	8.9	42.9		67.55	2.08	0.0	0.018	0.014	0.271	0.015
290	Osanippa Cr	OSAAU01	12/1/98	1130	14	11.0	6.8	68	9.0	29.9		60.90	1.04	0.0	0.024	0.037	0.071	0.011
290	Osanippa Cr	OSAAU01	12/8/98	1120	18	9.0	7.2	71	8.6	38.4		51.37	2.29	0.0	0.011	0.049	0.129	0.015
290	Osanippa Cr	SFCAU01	1/12/99	0845	4	13.2	6.7	86	11.8		22.25	90.30	2.93	0.0	0.015	0.131	0.529	0.030
290	Osanippa Cr	SFCAU01	1/25/99	0900	10	10.6	6.8	84	52.0		20.50	119.20	157.08	0.5	0.068	0.153	0.832	0.128
300	Halawakee Cr	HALAU01	1/12/99	1100	6	12.0	6.5	46	10.6	23.0	15.00	75.75	1.54	0.0	0.019	0.170	0.457	0.015
300	Halawakee Cr	HALAU01	1/25/99	1110	12	11.0	6.4	46	35.0	62.7	12.75	51.40	9.46	0.0	0.044	0.345	0.542	0.051
300	Halawakee Cr	HALAU01	2/2/99	1130	10	11.4	6.4	38	39.0	211.4	10.25	43.90	13.88	0.0	0.069	0.277	0.289	0.050
300	Halawakee Cr	HALAU01	2/15/99	1020	9	11.8	6.5	45	11.3	30.7	16.25	33.33	2.00	0.0	0.036	0.153	0.240	0.016
300	Halawakee Cr	HALAU01	2/23/99	1100	8	11.2	6.4	41	13.3	32.9	16.25	61.55	4.47	0.0	0.037	0.156	0.188	0.019
300	Halawakee Cr	HALAU01	3/9/99	1050	11	11.1	6.5	44	14.4	56.7	16.00	41.10	4.66	0.0	0.044	0.131	0.312	0.020
300	Halawakee Cr	HALAU01	3/16/99	1230	13	10.9	6.4	39	24.0	77.6	12.25	94.50	7.48	0.0	0.045	0.206	0.020	0.032
300	Halawakee Cr	HALAU01	4/12/99	1100	23	8.2	6.6	52	9.5	25.8	20.75	113.73	2.42	0.0	0.046	0.173	0.286	0.018
300	Halawakee Cr	HALAU01	4/26/99	1100	19	8.8	6.9	50	10.1	20.6	18.50	114.45	3.70	0.0	0.058	0.201	0.174	0.019
300	Halawakee Cr	HALAU01	5/10/99	1050	21	8.7	7.0	51	17.1	23.6	20.00	127.20	4.82	0.0	0.056	0.189	0.289	0.025

Appendix F-4, cont. Physical/chemical data collected by Auburn University from tributaries to reservoirs in the Chattahoochee River basin from October 1998 through September 1999.

Sub-watershed	Stream	Station	Date *dd/mm/yy*	Time *24hr*	Water Temp. *°C*	Dissolved Oxygen *mg/L*	pH *s.u.*	Conductivity *umhos @ 25°C*	Turbidity *NTU*	Stream Flow *cfs*	Total Alkalinity *mg/L*	TDS *mg/L*	TSS *mg/L*	Total Settlable Solids *ml/L*	NH_3-N *mg/L*	NO_2+ NO_3-N *mg/L*	TKN *mg/L*	Total-P *mg/L*
Middle Chattahoochee - Lake Harding (0313-0002), cont.																		
300	Halawakee Cr	HALAU01	5/24/99	1100	23	8.1	7.1	50	10.7	19.9	20.25	115.80	5.34	0.0	0.040	0.195	0.188	0.021
300	Halawakee Cr	HALAU01	6/14/99	1110	24	7.4	7.4	50	8.3	12.0	19.75	112.05	2.27	0.0	0.000	0.217	0.124	0.015
300	Halawakee Cr	HALAU01	6/29/99	1115	23	8.4	6.8	47	66.0	184.5	11.00	156.45	27.76	0.0	0.081	0.146	0.564	0.081
300	Halawakee Cr	HALAU01	7/20/99	1100	25	7.5	7.0	52	23.0	25.5	21.50	130.65	9.16	0.0	0.028	0.186	0.246	0.031
300	Halawakee Cr	HALAU01	8/10/99	1120	27	7.2	7.0	48	6.2	11.1	17.00	115.90	4.03	0.0	0.011	0.117	0.182	0.016
300	Halawakee Cr	HALAU01	9/28/99	1210	22	7.8	7.2	45	27.0	15.9	18.50	37.55	18.18	0.0	0.074	0.065	0.246	0.041
300	Halawakee Cr	HALAU01	10/13/98	1400	18	12.2	7.1	49	12.2	13.6		54.45	2.72	0.0	0.012	0.141	0.186	0.021
300	Halawakee Cr	HALAU01	11/18/98	1145	15	8.9	6.9	53	10.9	16.9		65.60	3.92	0.0	0.035	0.028	0.157	0.019
300	Halawakee Cr	HALAU01	12/1/98	1100	13	9.8	6.8	53	8.8	10.4		50.70	1.75	0.0	0.005	0.047	0.086	0.012
300	Halawakee Cr	HALAU01	12/8/98	1100	18	8.8	6.8	51	21.0	18.9		48.20	7.16	0.0	0.022	0.073	0.243	0.027
Middle Chattahoochee - Walter F. George (0313-0003)																		
020	Chattahoochee R	CHTAU01	1/25/99	1015	12	10.3	6.6	101	10.3		22.00	68.17	4.12	0.0	0.026	1.241	0.542	0.022
020	Chattahoochee R	CHTAU01	2/2/99	1040	11	10.8	6.6	92	21.0		20.25	62.00	6.22	0.0	0.068	0.854	0.434	0.031
020	Chattahoochee R	CHTAU01	2/15/99	0948	12	11.1	6.5	94	7.4		19.25	53.37	2.21	0.0	0.065	1.165	0.347	0.018
020	Chattahoochee R	CHTAU01	2/23/99	1005	12	10.6	6.7	113	6.1		20.75	86.10	2.22	0.0	0.049	1.142	0.269	0.020
020	Chattahoochee R	CHTAU01	3/9/99	1000	13	11.5	6.7	85	5.8		20.00	59.80	3.13	0.0	0.034	1.035	0.255	0.019
020	Chattahoochee R	CHTAU01	3/16/99	1045	13	11.0	6.5	82	14.7		20.50	127.20	3.45	0.0	0.084	0.897	0.116	0.023
020	Chattahoochee R	CHTAU01	4/12/99	1000	23	8.4	6.0	85	3.2		18.75	149.93	1.58	0.0	0.064	0.821	0.246	0.016
020	Chattahoochee R	CHTAU01	4/26/99	1010	21	8.6	7.1	97	3.1		20.75	134.00	1.66	0.0	0.153	0.797	0.243	0.016
020	Chattahoochee R	CHTAU01	5/10/99	1000	23	8.6	7.1	86	3.0		22.00	136.75	1.73	0.0	0.046	0.794	0.356	0.013
020	Chattahoochee R	CHTAU01	5/24/99	1015	25	8.2	7.1	88	3.5		20.00	126.70	4.26	0.0	0.074	0.690	0.275	0.018
020	Chattahoochee R	CHTAU01	6/14/99	1015	26	8.3	7.1	96	6.2		21.50	134.60	5.43	0.0	0.029	1.005	0.252	0.023
020	Chattahoochee R	CHTAU01	6/29/99	1020	26	8.3	7.0	86	19.3		21.00	142.35	8.64	0.0	0.064	0.635	0.379	0.030
020	Chattahoochee R	CHTAU01	7/20/99	1015	29	7.2	7.3	89	2.6		22.25	136.60	2.21	0.0	0.067	0.515	0.362	0.014
020	Chattahoochee R	CHTAU01	8/10/99	1025	30	6.8	7.1	93	1.4		21.25	142.25	1.55	0.0	0.047	0.535	0.249	0.012
020	Chattahoochee R	CHTAU01	9/28/99	1110	25	8.0	7.4	101	1.9		22.50	57.80	0.95	0.0	0.058	0.529	0.188	0.012

Appendix F-4, cont. Physical/chemical data collected by Auburn University from tributaries to reservoirs in the Chattahoochee River basin from October 1998 through September 1999.

Sub-watershed	Stream	Station	Date *dd/mm/yy*	Time *24hr*	Water Temp. *°C*	Dissolved Oxygen *mg/L*	pH *s.u.*	Conductivity *umhos @ 25°C*	Turbidity *NTU*	Stream Flow *cfs*	Total Alkalinity *mg/L*	TDS *mg/L*	TSS *mg/L*	Total Settlable Solids *ml/L*	NH_3-N *mg/L*	NO_2+ NO_3-N *mg/L*	TKN *mg/L*	Total-P *mg/L*
Middle Chattahoochee - Walter F. George (0313-0003), cont.																		
020	Chattahoochee R	CHTAU01	10/13/98	1240	24	10.8	7.3	77	7.8			62.40	1.37	0.0	0.068	0.490	0.286	0.023
020	Chattahoochee R	CHTAU01	11/16/98	1300	19	9.6	7.0	94	7.2			60.70	4.48	0.0	0.057	0.663	0.271	0.027
020	Chattahoochee R	CHTAU01	12/1/98	1000	18	9.3	6.8	57	3.3			69.13	1.31	0.0	0.036	0.835	0.186	0.020
020	Chattahoochee R	CHTAU01	12/8/98	1000	19	9.6	6.9	102	2.6			64.57	1.20	0.0	0.028	0.929	0.229	0.014
080	Uchee Cr	UCCAU01	1/12/99	0935	5	13.3	6.3	45	8.2		11.00	81.35	2.30	0.0	0.014	0.110	0.386	0.018
080	Uchee Cr	UCCAU01	1/25/99	0945	12	9.8	6.3	45	50.0		9.00	60.90	46.00	0.2	0.029	0.164	0.506	0.088
080	Uchee Cr	UCCAU01	2/2/99	1015	11	10.2	6.2	41	81.0		7.25	68.20	124.60	0.2	0.100	0.135	0.530	0.096
080	Uchee Cr	UCCAU01	2/15/99	0926	8	11.8	6.5	46	9.4		11.25	63.30	6.92	0.0	0.031	0.094	0.220	0.023
080	Uchee Cr	UCCAU01	2/23/99	0940	9	11.6	6.3	46	9.7		12.25	61.20	4.97	0.0	0.014	0.089	0.231	0.019
080	Uchee Cr	UCCAU01	3/9/99	0930	13	10.7	6.5	48	10.1		12.25	35.95	6.08	0.0	0.016	0.063	0.318	0.026
080	Uchee Cr	UCCAU01	3/16/99	1021	12	10.9	6.6	40	44.0		9.00	107.70	61.36	0.2	0.051	0.104	0.330	0.073
080	Uchee Cr	UCCAU01	4/12/99	0930	23	8.0	6.2	53	8.4		16.75	133.43	2.68	0.0	0.036	0.099	0.486	0.028
080	Uchee Cr	UCCAU01	4/26/99	0935	20	6.5	7.0	57	7.2		16.50	113.70	3.12	0.0	0.041	0.141	0.309	0.027
080	Uchee Cr	UCCAU01	5/10/99	0930	22	8.4	7.1	48	11.2		16.25	71.75	5.24	0.0	0.022	0.131	0.318	0.030
080	Uchee Cr	UCCAU01	5/24/99	0940	25	7.8	7.0	58	6.5		19.25	61.30	3.48	0.0	0.026	0.043	0.252	0.024
080	Uchee Cr	UCCAU01	6/14/99	0950	27	7.3	7.2	58	5.4		18.75	126.45	2.19	0.0	0.000	0.029	0.399	0.023
080	Uchee Cr	UCCAU01	6/29/99	0950	24	7.5	6.7	40	250.0		11.25	156.65	623.70	1.6	0.125	0.218	1.064	0.265
080	Uchee Cr	UCCAU01	7/20/99	0945	27	7.5	7.1	47	12.8		14.00	131.20	6.76	0.0	0.019	0.060	0.275	0.034
080	Uchee Cr	UCCAU01	8/10/99	1000	27	6.7	7.0	59	3.5		16.25	130.55	1.60	0.0	0.017	0.027	0.150	0.021
080	Uchee Cr	UCCAU01	9/28/99	1045	25	7.3	6.9	50	6.2		8.25	35.40	3.24	0.0	0.022	0.036	0.197	0.024
080	Uchee Cr	UCCAU01	10/13/98	1100	18	9.5	7.1	43	13.7			58.15	6.98	0.0	0.024	0.086	0.329	0.031
080	Uchee Cr	UCCAU01	11/16/98	1225	19	9.2	6.9	50	4.6			47.70	2.93	0.0	0.005	0.038	0.171	0.023
080	Uchee Cr	UCCAU01	12/1/98	0930	14	10.3	6.7	49	4.2			47.00	2.15	0.0	0.001	0.037	0.200	0.018
080	Uchee Cr	UCCAU01	12/8/98	0935	19	8.4	6.7	49	5.2			46.40	2.95	0.0	0.005	0.050	0.171	0.022
130	N Fk Cowikee Cr	NFCAU01	1/12/99	0735	5	11.8	6.6	101	29.0	19.3	16.00	128.97	5.68	0.0	0.042	0.188	0.600	0.058
130	N Fk Cowikee Cr	NFCAU01	1/25/99	0745	12	10.2	6.5	64	94.0	161.7	10.75	93.55	73.67	0.3	0.067	0.115	1.121	0.155

Appendix F-4, cont. Physical/chemical data collected by Auburn University from tributaries to reservoirs in the Chattahoochee River basin from October 1998 through September 1999.

Sub-watershed	Stream	Station	Date *dd/mm/yy*	Time *24hr*	Water Temp. *°C*	Dissolved Oxygen *mg/L*	pH *s.u.*	Conductivity *umhos @ 25°C*	Turbidity *NTU*	Stream Flow *cfs*	Total Alkalinity *mg/L*	TDS *mg/L*	TSS *mg/L*	Total Settlable Solids *ml/L*	NH_3-N *mg/L*	NO_2+ NO_3-N *mg/L*	TKN *mg/L*	Total-P *mg/L*
Middle Chattahoochee - Walter F. George (0313-0003), cont.																		
130	N Fk Cowikee Cr	NFCAU01	2/2/99	0720	9	12.9	6.4	51	109.0	976.3	9.00	116.63	177.33	0.4	0.148	0.069	1.109	0.181
130	N Fk Cowikee Cr	NFCAU01	2/15/99	0733	6	11.4	6.7	109	18.4	26.8	22.75	137.03	3.82	0.0	0.048	0.187	0.246	0.038
130	N Fk Cowikee Cr	NFCAU01	2/23/99	0800	8	11.2	6.5	102	18.6	28.2	20.00	118.45	4.80	0.0	0.033	0.127	0.457	0.037
130	N Fk Cowikee Cr	NFCAU01	3/9/99	0745	12	9.9	6.5	93	37.0	58.8	14.75	103.30	17.14	0.0	0.060	0.086	0.497	0.054
130	N Fk Cowikee Cr	NFCAU01	3/16/99	0800	11	10.2	6.3	58	81.0	399.2	9.75	169.10	104.60	0.2	0.088	0.138	0.795	0.120
130	N Fk Cowikee Cr	NFCAU01	4/12/99	0800	22	6.8	6.7	122	12.5	17.6	33.50	172.13	8.90	0.0	0.054	0.124	0.376	0.043
130	N Fk Cowikee Cr	NFCAU01	4/26/99	0800	20	5.5	7.2	124	14.7	5.0	37.50	190.35	4.40	0.0	0.091	0.236	0.434	0.048
130	N Fk Cowikee Cr	NFCAU01	5/10/99	0753	20	7.6	7.0	116	26.0	8.6	31.75	192.50	8.24	0.0	0.052	0.275	0.497	0.058
130	N Fk Cowikee Cr	NFCAU01	5/24/99	0800	23	6.4	7.2	146	12.2	4.8	41.75	200.35	4.42	0.0	0.044	0.087	0.402	0.041
130	N Fk Cowikee Cr	NFCAU01	6/14/99	0800	24	6.6	7.1	136	20.0	9.0	34.50	183.65	5.67	0.0	0.056	0.285	0.422	0.055
130	N Fk Cowikee Cr	NFCAU01	6/29/99	0720	24	6.8	6.9	66	104.0	191.4	19.00	185.35	111.10	0.4	0.112	0.226	1.223	0.169
130	N Fk Cowikee Cr	NFCAU01	7/20/99	0800	25	6.9	7.0	81	31.0	23.2	20.50	170.55	14.08	0.0	0.064	0.220	0.657	0.067
130	N Fk Cowikee Cr	NFCAU01	8/10/99	0810	26	5.4	7.1	126	25.0	9.2	31.00	199.37	16.14	0.0	0.120	1.243	0.761	0.097
130	N Fk Cowikee Cr	NFCAU01	9/28/99	0840	24	5.4	7.4	143	4.1	3.4	51.25	113.50	1.26	0.0	0.013	0.031	0.434	0.028
130	N Fk Cowikee Cr	NFCAU01	10/13/98	0745	17	10.1	6.9	96	15.4	7.1		95.50	3.30	0.0	0.023	0.198	0.414	0.044
130	N Fk Cowikee Cr	NFCAU01	11/16/98	1015	18	8.2	7.1	137	5.1	3.3		99.15	1.25	0.0	0.014	0.147	0.500	0.031
130	N Fk Cowikee Cr	NFCAU01	12/1/98	0740	13	8.0	7.0	103	5.7	0.8		97.13	1.52	0.0	0.012	0.101	0.343	0.034
130	N Fk Cowikee Cr	NFCAU01	12/8/98	0745	19	7.0	6.8	108	7.0	3.3		92.00	1.33	0.0	0.016	0.258	0.243	0.031
140	N Fk Cowikee Cr	MFCAU01	1/12/99	0810	4	12.6	6.5	71	21.0	37.8	16.25	87.80	7.22	0.0	0.019	0.085	0.600	0.046
140	M Fk Cowikee Cr	MFCAU01	1/25/99	0830	11	9.4	6.4	55	103.0	396.7	9.00	103.80	113.93	0.4	0.079	0.040	0.976	0.184
140	M Fk Cowikee Cr	MFCAU01	2/2/99	0820	10	13.0	6.2	56	89.0	733.9	8.00	92.77	144.07	0.3	0.124	0.037	0.930	0.144
140	M Fk Cowikee Cr	MFCAU01	2/15/99	0805	7	11.9	7.1	83	14.1	57.3	19.00	85.40	6.40	0.0	0.022	0.110	0.347	0.040
140	M Fk Cowikee Cr	MFCAU01	2/23/99	0830	8	11.6	6.9	87	17.2	64.0	16.75	99.95	7.43	0.0	0.021	0.090	0.379	0.041
140	M Fk Cowikee Cr	MFCAU01	3/9/99	0815	12	10.9	6.5	92	32.0	128.3	13.50	91.65	28.62	0.1	0.091	0.054	0.526	0.075
140	M Fk Cowikee Cr	MFCAU01	3/16/99	0830	10	10.0	6.3	42	66.0	1898.4	8.50	124.75	186.80	0.3	0.139	0.034	0.642	0.133
140	M Fk Cowikee Cr	MFCAU01	4/12/99	0820	22	7.8	6.6	92	10.9	43.6	27.00	149.37	7.08	0.0	0.041	0.124	0.333	0.049

Appendix F-4, cont. Physical/chemical data collected by Auburn University from tributaries to reservoirs in the Chattahoochee River basin from October 1998 through September 1999.

Sub-watershed	Stream	Station	Date *dd/mm/yy*	Time *24hr*	Water Temp. *°C*	Dissolved Oxygen *mg/L*	pH *s.u.*	Conductivity *umhos @ 25°C*	Turbidity *NTU*	Stream Flow *cfs*	Total Alkalinity *mg/L*	TDS *mg/L*	TSS *mg/L*	Total Settlable Solids *ml/L*	NH_3-N *mg/L*	NO_2+ NO_3-N *mg/L*	TKN *mg/L*	Total-P *mg/L*
Middle Chattahoochee - Walter F. George (0313-0003), cont.																		
140	M Fk Cowikee Cr	MFCAU01	4/26/99	0820	20	6.2	7.1	83	11.7	34.4	26.50	143.20	6.80	0.0	0.045	0.162	0.281	0.049
140	M Fk Cowikee Cr	MFCAU01	5/10/99	0820	20	8.3	7.2	85	21.0	38.9	24.75	160.10	15.50	0.0	0.056	0.117	0.373	0.062
140	M Fk Cowikee Cr	MFCAU01	5/24/99	0830	23	7.6	7.3	96	11.8	15.0	32.00	145.15	5.61	0.0	0.033	0.105	0.327	0.045
140	M Fk Cowikee Cr	MFCAU01	6/14/99	0830	24	7.1	6.9	74	35.0	24.7	20.50	185.00	27.84	0.1	0.042	0.244	0.526	0.074
140	M Fk Cowikee Cr	MFCAU01	6/29/99	0810	24	7.2	6.8	54	85.0	250.5	14.25	187.90	140.80	0.5	0.070	0.080	0.781	0.165
140	M Fk Cowikee Cr	MFCAU01	7/20/99	0820	26	7.0	7.1	62	29.0	49.4	19.50	149.60	17.40	0.0	0.046	0.150	0.573	0.071
140	M Fk Cowikee Cr	MFCAU01	8/10/99	0830	26	6.4	7.4	110	5.2	6.4	40.00	167.75	3.44	0.0	0.015	0.063	0.289	0.034
140	M Fk Cowikee Cr	MFCAU01	9/28/99	0910	23	5.6	7.5	144	3.7	2.3	47.25	87.95	2.70	0.0	0.027	0.047	0.231	0.037
140	M Fk Cowikee Cr	MFCAU01	10/13/98	0845	16	9.6	7.0	80	10.9	21.1		78.55	5.88	0.0	0.010	0.113	0.343	0.042
140	M Fk Cowikee Cr	MFCAU01	11/16/98	1100	18	8.2	6.8	81	5.4	21.9		79.25	3.71	0.0	0.005	0.019	0.329	0.037
140	M Fk Cowikee Cr	MFCAU01	12/1/98	0810	12	9.6	6.8	80	5.3	9.0		67.75	2.40	0.0	0.003	0.021	0.129	0.039
140	M Fk Cowikee Cr	MFCAU01	12/8/98	0810	19	7.8	6.9	87	8.7	15.9		70.70	4.96	0.0	0.006	0.037	0.329	0.045
150	S Fk Cowikee Cr	SFCAU01	2/2/99	0915	11	10.3	6.7	82	49.0		21.25	108.03	62.00	0.1	0.072	0.119	0.458	0.106
150	S Fk Cowikee Cr	SFCAU01	2/15/99	0832	6	12.9	7.1	89	11.6		25.00	86.30	3.56	0.0	0.019	0.125	0.119	0.033
150	S Fk Cowikee Cr	SFCAU01	2/23/99	0900	6	12.7	6.8	82	9.5		26.00	131.33	3.81	0.0	0.020	0.089	0.211	0.029
150	S Fk Cowikee Cr	SFCAU01	3/9/99	0845	12	11.4	6.7	97	14.2		23.75	77.40	7.24	0.0	0.059	0.085	0.469	0.042
150	S Fk Cowikee Cr	SFCAU01	3/16/99	0910	11	10.9	6.6	77	54.0		21.25	152.90	112.64	0.2	0.070	0.132	0.561	0.097
150	S Fk Cowikee Cr	SFCAU01	4/12/99	0845	21	8.5	6.7	100	8.3		39.00	168.23	3.86	0.0	0.047	0.106	0.318	0.039
150	S Fk Cowikee Cr	SFCAU01	4/26/99	0840	20	6.6	7.4	99	9.9		34.75	146.10	7.22	0.0	0.032	0.108	0.084	0.039
150	S Fk Cowikee Cr	SFCAU01	5/10/99	0845	18	9.4	7.5	94	16.7		31.50	159.45	13.20	0.0	0.025	0.168	0.518	0.059
150	S Fk Cowikee Cr	SFCAU01	5/24/99	0900	23	7.8	7.5	111	6.9		40.75	157.85	5.00	0.0	0.034	0.082	0.336	0.036
150	S Fk Cowikee Cr	SFCAU01	6/14/99	0900	25	8.0	7.4	76	13.0		30.75	156.90	91.68	0.0	0.000	0.075	0.428	0.049
150	S Fk Cowikee Cr	SFCAU01	6/29/99	0850	24	8.1	7.4	76	69.0		25.25	202.80	257.64	1.4	0.057	0.141	0.775	0.123
150	S Fk Cowikee Cr	SFCAU01	7/20/99	0850	26	7.4	7.6	84	11.5		35.00	165.95	6.76	0.0	0.028	0.069	0.382	0.037
150	S Fk Cowikee Cr	SFCAU01	8/10/99	0905	26	7.4	7.7	119	6.9		45.00	194.67	5.59	0.0	0.019	0.105	0.298	0.037
150	S Fk Cowikee Cr	SFCAU01	9/28/99	0950	25	8.0	7.6	118	3.6		40.75	82.15	13.46	0.0	0.017	0.177	0.231	0.038

Appendix F-4, cont. Physical/chemical data collected by Auburn University from tributaries to reservoirs in the Chattahoochee River basin from October 1998 through September 1999.

Sub-watershed	Stream	Station	Date *dd/mm/yy*	Time *24hr*	Water Temp. *^{o}C*	Dissolved Oxygen *mg/L*	pH *s.u.*	Conductivity *umhos @ 25^{o}C*	Turbidity *NTU*	Stream Flow *cfs*	Total Alkalinity *mg/L*	TDS *mg/L*	TSS *mg/L*	Total Settlable Solids *ml/L*	NH_3-N *mg/L*	NO_2+ NO_3-N *mg/L*	TKN *mg/L*	Total-P *mg/L*
Middle Chattahoochee - Walter F. George (0313-0003), cont.																		
150	S Fk Cowikee Cr	SFCAU01	10/13/98	0945	16	10.0	7.1	88	7.8			86.70	3.20	0.0	0.000	0.083	0.271	0.038
150	S Fk Cowikee Cr	SFCAU01	11/16/98	1125	20	8.6	6.9	85	6.4			68.65	41.16	0.0	0.006	0.025	0.243	0.048
150	S Fk Cowikee Cr	SFCAU01	12/1/98	0830	13	10.5	6.9	87	5.2			69.60	0.88	0.0	0.000	0.067	0.129	0.032
150	S Fk Cowikee Cr	SFCAU01	12/8/98	0835	19	8.6	6.9	102	12.4			82.20	8.09	0.0	0.013	0.064	0.386	0.063

Appendix F-5. ALAMAP (Alabama Monitoring and Assessment Program)

***Lead agencies*:** ADEM and USEPA

***Purpose*:** ADEM's ALAMAP Program is a statewide monitoring effort to provide data that can be used to estimate the current status of all streams within Alabama. Evaluated assessment data, including chemical, physical, and habitat parameters are collected once at 250 stations, randomly selected by USEPA-Gulf Breeze over a 5-year period using ADEM's SOPs and QA/QC manuals.

Appendix F-5a. Physical/ chemical data

Appendix F-5b. Habitat assessment data

References:

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

Appendix F-5a. Physical/chemical data collected during August 1997-1999 as part of the Alabama Monitoring and Assessment Program (ALAMAP) from locations within the Chattahoochee and Chipola River basins (ADEM 1997c, 1998).

Sub-Watershed	Stream	Station	Date	Time	Air Temp.	Water Temp.	Dissolved Oxygen	pH	Conductivity	Turbidity	Stream Flow	Depth	Fecal Coliform	BOD-5	TDS	TSS	NO_2/ NO_3-N	Total-P	Cl^-
			yymmdd	*24hr*	*^oC*	*^oC*	*mg/L*	*s.u.*	*umhos @ 25^oC*	*NTU*	*cfs*	*m*	*col/100mL*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*
Middle Chattachoochee River - Lake Harding (0313-0002)																			
220	Hardley Creek[1]	CH02U3-14	990805	1145	---	---	---	---	---	---	0.0	---	---	---	---	---	---	---	---
290	Snapper Creek, UT to	CH01U1	970805	1551	32	31	4	6.3	70	10.1	*	0	47	2	62	3	0.1	0.15	4.98
Middle Chattachoochee River - Walter F. George (0313-0003)																			
060	Hospilika Creek, UT to[1]	CH03U3-44	990804	1320	---	---	---	---	---	---	0.0	---	---	---	---	---	---	---	---
070	Snake Creek, UT to	CH02U1	970805	1741	30	23	7	5.5	74	6.58	0.2	0	33	0.3	63	5	5.24	0.15	9.84
080	Uchee Creek	CH04U3-13	990915	1320	35	27	9	6.8	45	3.78	14.4		est. 5	0.7	67	9	0.02	0.05	5.5
180	Leak Creek, UT to	CH01U3-33	990805	1630	34	28	8	7.7	59	27.3	0.1		55	2.2	115	16	0.02	<0.004	6.63
Lower Chattachoochee River (0313-0004)																			
020	Chattahoochee River, UT to[2]	CH01U2-13	980805	1000	---	---	---	---	---	---	0.0	---	---	---	---	---	---	---	---
040	Peterman Creek, UT to	CH03U1	970806	1803	30	25	8	6.3	45	12.3	1.6	0	170J	0.3	48	9	0.53	0.15	5.12
Chipola (0313-0012)																			
030	Buck Creek	CP01U1	970807	0739	26	25	6	6.4	54	11.5	21.1	1	200	<0.1	189	6	0.14	0.1	6.44

1. No stream flow; standing pools only. Samples not collected.

2. Station inaccessible; no samples collected.

Appendix F-5b. Physical characteristics and habitat quality of sites assessed in the Appalachicola Accounting Unit as part of the Alabama Montoring and Assessment Program (ALAMAP).

Cataloging Unit		0002	0003	0003	0003	0004	0012
Station		CH3U4-58	CH01U3-33	CH02U1	CH04U3-13	65d	CP01U1
Sub-watershed-		220	180	070	080	040	030
Ecoregion/Subregion		45b	65d	65i	65d	65e	65g
Date (YYMMDD)		000802	990805	970805	990915	970806	970807
Width (ft)		4	5	2	40	10	25
Canopy Cover[a]		S	MS	MS	O	S	S
Depth (ft)	Riffle	0.1		0.1	0.3	1.0	
	Run	0.2	0.2	0.4	0.5	1.0	2.5
	Pool	0.2			2.0	2.0	3.5
Substrate (%)	Bedrock					15	
	Boulder					20	
	Cobble	15			12	15	
	Gravel	25		45	35	5	
	Sand	30		13	16	16	
	Silt	25	95	50	10	40	85
	Detritus		2	3	8	2	5
	Clay	5	2	1	32	2	8
	Organic silt		2	1	3	1	2
Habitat assessment form[b]		RR	GP	RR	RR	RR	GP
Habitat survey (% maximum)							
Instream habitat quality		59	25	30	45	45	60
Sediment deposition		46	68	65	75	40	78
Sinuosity		88	35	85	80	50	85
Bank and vegetative stability		51	55	65	70	63	58
Riparian measurements		93	90	35	50	58	73
Habitat assessment score		152	117	128	143	118	153
% Maximum		63	53	53	60	49	70
Assessment		Good	Good	Good	Excellent	Good	Excellent

a. Canopy cover: S=shaded, MS=mostly shaded, 50/50=50% shaded, MO=mostly open, O=open
b. Habitat assessment form: GP=glide/pool, RR=riffle/run

Appendix F-6. Clean Water Strategy Project

Lead Agency: ADEM

Purpose: ADEM conducted intensive water quality monitoring during the 1996 Clean Water Strategy Project to evaluate the condition of the state's surface waters, identify or confirm problem areas, and to serve as a guide from which to direct future sampling efforts. Sampling stations were chosen where problems were known or suspected to exist, or where there was a lack of existing data. Data was collected monthly, June through October of 1996. All samples and in-situ measures were collected in accordance with ADEM SOP and QA/QC manuals.

Appendix F-6. Physical/chemical data

References:

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

Appendix F-6. Water quality data from the Chattahoochee and Chipola River basins collected during ADEM's 1996 Clean Water Strategy Project.

Sub-watershed	Stream	Station	Date *yymmdd*	Time *24hr*	Stream Depth *ft*	Sampling Depth *ft*	Water Temp. *°C*	Dissolved Oxygen *mg/L*	pH *s.u.*	Conductivity *umhos @ 25°C*	Turbidity *NTU*	Stream Flow *cfs*	Fecal Coliform *col/100mL*	BOD-5 *mg/L*	TSS *mg/L*	NO_2+ NO_3-N *mg/L*	NH_3-N *mg/L*	TKN *mg/L*	Total-P *mg/L*
Middle Chattahoochee (0313-0003)																			
020	Mill Cr	CHA01	960611	1000	0.5	0.0	22	6.9	6.6	64	14			0.9		0.03	0.015	0.34	0.09
020	Mill Cr	CHA01	960709	0945	0.5	0.3	25	6.0	6.7	60	33								
020	Mill Cr	CHA01	960806	1030	0.3	0.0	25	5.9	6.2	72	26								
020	Mill Cr	CHA01	960919	1150	1.0	0.5	23	5.9	6.7	84	32			1.2		0.03	<0.015	0.85	0.02
020	Mill Cr	CHA01	961003	1145	1.0	0.5	21	6.6	6.6	56	23			1.1	7	0.07	<0.015	0.27	0.04
020	Mill Cr	CHA02	960611	1045	0.3	0.0	24	7.1	7.0	66	16			0.8		0.07	0.015	0.8	0.07
020	Mill Cr	CHA02	960709	1015	0.5	0.3	26	7.1	7.1	59	38								
020	Mill Cr	CHA02	960806	1100	0.3	0.0	27	7.6	6.5		11	92							
020	Mill Cr	CHA02	960919	1125	1.0	0.5	23	8.0	7.3	87	16			2.5		0.19	0.11	0.64	0.04
020	Mill Cr	CHA02	961003	1045	1.0	0.5	21	8.1	7.1	60	27	30		1	14	0.09	0.015	0.34	0.05
020	Mill Cr	CHA03	960611	1130	0.5	0.0	25	7.0	7.3	80	19			1		0.22	0.015	0.15	0.1
020	Mill Cr	CHA03	960709	1045	0.5	0.3	27	7.1	7.4	75	54								
020	Mill Cr	CHA03	960806	1120	0.5	0.0	28	6.6	6.4	103	>81								
020	Mill Cr	CHA03	960919	1050	1.5	0.7	23	8.5	7.4	99	10			0.9		0.21	<0.015	<0.15	0.04
020	Mill Cr	CHA03	961003	1245	2.0	1.0	22	8.3	7.4	72	32			0.9	26	0.23	<0.015	0.16	0.06
130	N. Fk. Cowikee Cr	CHA04	960611	1510	5.0	2.5	27	6.9	6.9	69	37			1.6		0.14	0.015	0.18	0.35
130	N. Fk. Cowikee Cr	CHA04	960709	1255	4.0	2.0	31	8.1	8.1	161	16								
130	N. Fk. Cowikee Cr	CHA04	960919	1000	2.0	1.0	21	7.3	7.3	114	20			1		0.18	0.02	0.75	0.05
130	N. Fk. Cowikee Cr	CHA04	961017	1000	2.5	1.0	17	8.3	7.2	133	13			1.2		0.12	<0.015	0.41	0.04
140	M. Fk. Cowikee Cr	CHA05	960611	1430	4.0	2.0	28	7.0	7.1	84	19			0.9		0.1	0.015	0.15	0.06
140	M. Fk. Cowikee Cr	CHA05	960709	1225	4.0	2.0	30	8.2	8.0	100	10								
140	M. Fk. Cowikee Cr	CHA05	960919	0915	3.0	1.5	21	7.6	7.2	81	16			1		0.08	<0.015	<0.15	0.05
140	M. Fk. Cowikee Cr	CHA05	961017	0930	2.5	1.2	17	9.0	7.3	97	7			1.1		0.13	<0.015	0.32	0.03
160	S. Fk. Cowikee Cr	CHA06	960611		15.0	5.0	30	5.7	7.2	117	42			1.2		0.1	0.015	0.15	0.06
160	S. Fk. Cowikee Cr	CHA06	960709	1200	20.0	5.0	30	3.1	7.2	120	91								
160	S. Fk. Cowikee Cr	CHA06	960806	1245								0							
160	S. Fk. Cowikee Cr	CHA06	960919	0900	13.5	5.0	24	6.5	7.3	109	39	0		1.8		0.08	<0.015	<0.15	0.05
160	S. Fk. Cowikee Cr	CHA06	961017	0905	14.0	5.0		8.9	7.6		8			1.1		0.4	0.45	0.51	0.04

Appendix F-6, cont. Water quality data from the Chattahoochee and Chipola River basins collected during ADEM's 1996 Clean Water Strategy Project.

Sub-watershed	Stream	Station	Date *yymmdd*	Time *24hr*	Stream Depth *ft*	Sampling Depth *ft*	Water Temp. *°C*	Dissolved Oxygen *mg/L*	pH *s.u.*	Conductivity *umhos @ 25°C*	Turbidity *NTU*	Stream Flow *cfs*	Fecal Coliform *col/100mL*	BOD-5 *mg/L*	TSS *mg/L*	NO_2+ NO_3-N *mg/L*	NH_3-N *mg/L*	TKN *mg/L*	Total-P *mg/L*
Lower Chattahoochee (0313-0004)																			
080	Cedar Cr	CHA09	960612	0800	5.0	2.5	25	1.3	6.7	252	0			8		0.19	0.015	0.15	0.07
080	Cedar Cr	CHA09	960709	1540	4.0	2.0	31	4.9	7.7	223	3								
080	Cedar Cr	CHA09	960807	0820	4.0	2.0	26	0.9	6.6	243	5								
080	Cedar Cr	CHA09	960918	1910	1.5	0.7	26	5.4	7.2	166	9					0.33	<0.015	0.67	0.02
080	Cedar Cr	CHA09	961023	1045	3.5	1.8	16	5.0	7.5	262	4			0.8		0.82	<0.015	<0.15	0.056
080	Cedar Cr	CHA10	960612	0915	4.0	2.0	22	8.6	7.2	148	7			0.4		0.54	0.015	0.15	0.08
080	Cedar Cr	CHA10	960709	1540	1.0	0.5	27	7.3	7.6	140	5								
080	Cedar Cr	CHA10	960807	0900	1.0	0.5	24	7.5	6.6	154	32								
080	Cedar Cr	CHA10	960918	1850	1.5	0.7	25	7.4	7.2	112	25					0.46	<0.015	0.86	0.02
080	Cedar Cr	CHA10	961023	1025	2.0	1.0	16	8.6	7.7	140	8			0.3		0.77	<0.015	<0.15	0.089
100	Bryans Cr	CHA07	960612	1100								0							
100	Bryans Cr	CHA07	960709	1700								0							
100	Bryans Cr	CHA07	960807	0955								0							
100	Bryans Cr	CHA07	960918	1805	1.0	0.5	28	2.6	5.2	38	7					0.01	<0.015	0.91	0.05
100	Bryans Cr	CHA07	961023	0940	1.0	0.5	15	5.1	5.2	42	4			1.3		1.55	<0.015	<0.15	0.083
100	Bryans Cr	CHA08	960612	1030	0.5	0.0	23	6.0	7.1	156	0			0.8		0.1	0.015	0.15	0.07
100	Bryans Cr	CHA08	960709	1635	0.3	0.0	26	5.5	7.3	159	1								
100	Bryans Cr	CHA08	960807	0930	0.3	0.0	25	4.1	6.5	209	2								
100	Bryans Cr	CHA08	960918	1825	1.0	0.5	24	5.4	6.6	75	7					0.09	<0.015	1.2	0.03
100	Bryans Cr	CHA08	961023	1000	1.5	0.8	16	6.6	7.2	102	2			1		0.13	<0.015	<0.15	0.038
Chipola (0313-0012)																			
010	Cowarts Cr	CHI04	960613	1205	4.0	2.0	26	7.3	7.6	186									
010	Cowarts Cr	CHI04	960710	1110	2.0	1.0	27	7.1	7.8	212	4			0.9		0.29	0.015	0.15	0.04
010	Cowarts Cr	CHI04	960807	1020	3.0	1.5	25	6.9	6.8	211	6			1		0.25	<0.015	<0.15	0.04
010	Cowarts Cr	CHI04	960918	1745	6.0	3.0		6.0	6.9		16			1.3					
010	Cowarts Cr	CHI04	961023	0915	5.0	2.5	15	7.9	7.6	168	5			0.7		0.57	<0.015	0.39	0.077
010	Cowarts Cr	CHI05	960613	1140	5.0	2.2	26	6.5	7.7	197	3								
010	Cowarts Cr	CHI05	960710	1040	2.0	1.0	26	6.6	7.6	211	4			0.7		1.65	0.015	0.15	0.03
010	Cowarts Cr	CHI05	960807	1050	2.0	1.0	26	6.5	6.9	198	4			0.7		1.1	<0.015	0.21	0.03

Appendix F-6, cont. Water quality data from the Chattahoochee and Chipola River basins collected during ADEM's 1996 Clean Water Strategy Project.

Sub-watershed	Stream	Station	Date *yymmdd*	Time *24hr*	Stream Depth *ft*	Sampling Depth *ft*	Water Temp. *°C*	Dissolved Oxygen *mg/L*	pH *s.u.*	Conductivity *umhos @ 25°C*	Turbidity *NTU*	Stream Flow *cfs*	Fecal Coliform *col/100mL*	BOD-5 *mg/L*	TSS *mg/L*	NO_2+ NO_3-N *mg/L*	NH_3-N *mg/L*	TKN *mg/L*	Total-P *mg/L*
Chipola (0313-0012), cont.																			
010	Cowarts Cr	CHI05	960918	1720	7.0	3.5	25	5.2	7.0	145	14			1.2					
010	Cowarts Cr	CHI05	961023	0845	4.5	2.3	16	6.9	7.5	208	5			1		1.3	<0.015	<0.15	0.107
030	Boggy Cr	CHI01	960613	1115	2.0	1.0	24	8.9	7.9	223	0								
030	Boggy Cr	CHI01	960710	1020	1.0	0.5	24	7.7	8.0	234	4			0.9		1.75	0.015	0.15	
030	Boggy Cr	CHI01	960807	1115	0.5	0.0	25	8.7	7.3	254	4			0.8		1.73	0.015	0.17	0.02
030	Boggy Cr	CHI01	960918	1645	1.0	0.5	25	7.3	7.7	204	6								
030	Boggy Cr	CHI01	961023	0825	2.5	1.3	16	7.9	7.8	184	8			0.6		0.01	<0.015	0.56	0.065
030	Boggy Cr	CHI02	960613	1035	4.0	2.0	27	3.2	6.9	970	6								
030	Boggy Cr	CHI02	960710	0955	0.5	0.0	28	4.2	7.1	251	9			1.3		0.19	0.028	6.18	0.05
030	Boggy Cr	CHI02	960807	1145	1.0	0.5	29	6.9	7.0	2499	4			0.8		0.26	0.11	0.7	0.04
030	Boggy Cr	CHI02	960918	1705	0.0	0.0	29	7.6	7.7	475	4								
030	Boggy Cr	CHI02	961023	0800	2.0	1.0	15	5.7	7.2	905	13			1.3		0.73	<0.015	0.59	0.08
030	Buck Cr	CHI03	960613	1000	0.5	0.0	26	6.6	6.7	104									
030	Buck Cr	CHI03	960710	0930	0.5	0.0	27	4.7	6.8	105	6			1.7		0.01	0.015	0.15	0.02
030	Buck Cr	CHI03	960807	1130								0							
030	Buck Cr	CHI03	960918	1625	4.5	2.0	26	5.9	6.6	85	16			1.9					
030	Buck Cr	CHI03	961023	0735	2.0	1.0	16	7.8	7.3	100	5			0.8		0.04	<0.015	<0.15	0.067
030	Limestone Cr	CHI06	960613	0915	5.0	2.5	24	6.5	6.9	114	5								
030	Limestone Cr	CHI06	960710	0830	0.5	0.0	25	6.6	6.9	129	5			0.6		0.9	0.015	0.15	0.12
030	Limestone Cr	CHI06	960807	1225	1.0	0.0	26	7.9	6.8	127	13			1.2		0.53	<0.015	0.64	0.07
030	Limestone Cr	CHI06	960918	1600	2.0	1.0	26	6.7	6.9	97	9								
030	Limestone Cr	CHI06	961023	0710	2.0	1.0	16	7.8	7.5	109	5			1		0.62	<0.015	0.32	0.072

Appendix F-7. Middle Chattahoochee River Water Quality Study

Lead agency: Cooperative effort by ADEM, Auburn University Civil Engineering Department, Columbus State University Department of Biology for Columbus Water Works

Purpose: The objectives of this project were to collect surface water quality data for source water characterization and modeling by the Columbus Water Works. To assist, ADEM provided support to Auburn Universities Department of Civil Engineering to collect water chemistry samples and the Environmental Indicators Section conducted biological (aquatic macroinvertebrates and fish surveys) monitoring in four stream locations in Alabama. Aquatic macroinvertebrate data is collected quarterly. In 1999, aquatic macroinvertebrates were collected in April, June and September. Fish community surveys were conducted in March and September, during high and low-flow periods. Data collected by AAU was provided to Columbus State University to be incorporated with other biological data collected.

Table 6a. Habitat assessment data

Table 7a. Bioassessment data

References: ADEM. 1999f. FY99 Middle Chattahoochee River Water Quality Study. Unpublished data. Alabama Department of Environmental Management. Montgomery, Alabama.

F-8. Temporal and Spatial Variations in Water Quality of the Lower Chattahoochee and Choctawhatchee River Basins

Lead agency: Funded by ADEM, Data collection conducted by: Auburn University Civil Engineering Department

Purpose: With the announcement of a major poultry processing facility near Eufaula, Alabama the ADEM funded a study conducted by the Auburn University Civil Engineering Department to monitoring waterbodies suspected of receiving poultry industry influenced drainage. Sampling sites were selected on the basis that they were likely to receive processing plant and growing house drainage. The objectives of this project were to collect a baseline of Water Quality data within a fifty-mile radius of Eufaula, Alabama. Twelve stream segments were monitored from April 1998 through May 1999.

References: AUCE. 1999. Temporal and Spatial Variations in Water Quality of the Lower Chattahoochee and Choctawhatchee River Basins. A baseline study of water quality within a fifty mile radius of Eufaula, Alabama.

Appendix G. Alabama's 2000 Section 303(d) List Fact Sheet

Background

Section 303(d) of the Clean Water Act requires that each state identify those waters that do not currently support designated uses, and establish a priority ranking of the waters taking into account the severity of the pollution and the uses to be made of the waters. For each water on the list, the state is required to establish the total maximum daily load (TMDL) for the pollutant or pollutants of concern at a level necessary to implement the applicable water quality standards. Guidance issued in August 1997 by the Environmental Protection Agency (EPA) suggests that states also include a schedule for TMDL development. The schedule is included as part of Alabama's 2000 list and provides expected completion dates for waterbodies on the list. Expected completion dates range from one to ten years following EPA approval of the 2000 list and were established to be consistent with the TMDL completion schedule outlined in EPA's settlement agreement with plaintiffs in the 1998 TMDL lawsuit. As a result, TMDL completion dates for many of the segments shown on the 2000 Section 303(d) list may be different than those shown on the 1998 list.

2000 Section 303(d) List

Alabama's 2000 Section 303(d) list includes segments of rivers, streams, lakes, reservoirs, and estuaries that either do not support or partially support their currently designated use or uses. Most of the waterbodies on the 2000 Section 303(d) list also appeared on Alabama's 1998 Section 303(d) list, which was developed using the 1996 Water Quality Report to Congress (305(b) Report). The Department has attempted to obtain and evaluate all existing and readily available water quality related data and information. The 2000 §303(d) list was developed using the 1998 §303(d) list as the starting point. Data in EPA's STOrage and RETrieval (STORET) database, information from §319 nonpoint assessments, other federal and state agencies, industries, and watershed initiatives were evaluated as the 2000 §303(d) list was compiled. Any individual or organization could submit additional data or information during the advertised comment period relative to water quality impairment in stream segments not included on the draft list. Chemical, physical, and biological data collected primarily during the previous five years were considered when adding new waterbodies to the 2000 Section 303(d) list. Data older than five years was generally not considered, except when the data may be used to demonstrate water quality trends. Data sources include the Alabama Department of Environmental Management, the Alabama Department of Public Health, the Geological Survey of Alabama, the United States Geological Survey, the Tennessee Valley Authority, other public agencies, universities, and industries.

The list contains information such as the waterbody name, county(s) in which the listed segment is located, dates when the data on which the listing is based were collected, cause(s) for the use impairment, the source(s) of the pollutant(s) causing the impairment, the size of the impaired segment, and the location of the listed waterbody. Also included on the list is the segment's priority ranking (high, low, medium), which was developed using the attached prioritization strategy.

Use-support status for waterbodies was determined in several ways. In cases where the monitored data was primarily chemical data from the water column, use-support status was based on the percentage of measurements not meeting the applicable water quality standard. When 10 percent or fewer measurements exceeded a water quality standard, the waterbody was considered to be fully supporting its designated use. When less than 25 percent but more than 10 percent of the measurements exceeded a water quality standard, the waterbody was considered to be partially supporting its designated use. When more than 25 percent of the measurements exceeded a water quality standard, the waterbody was considered to be not supporting its designated use. In other waterbodies, use-support status was assigned based on fish consumption or shellfish harvesting advisories issued by the Alabama Department of Public Health. Best professional judgment was used in assigning use-support status in cases where monitored data was limited in areal extent or temporal coverage and where numeric water quality criteria were not available. Where available, biological assessment data were used in combination with other surface water quality data or information to arrive at an overall use support determination.

Changes Since the 1998 Section 303(d) List

A number of differences exist between the 2000 Section 303(d) List and the 1998 list. Many of the changes were to correct errors in the 1998 list and to provide additional or updated information about waterbodies on the list. Other significant changes since 1998 include the addition and deletion of waterbodies. The following tables show the additions to (Table 1) and deletions from (Table 2) the 1998 Section 303(d) List and provide a rationale for the changes. In Table 1 the basis for listing each new segment is given.

Changes have also been made to the TMDL completion schedule included on the 2000 Section 303(d) list. The changes reflect the pace of TMDL development that can reasonably be expected given ADEM's current funding and staffing levels and the need to meet court-ordered TMDL completion dates. The dates shown are for completion of all TMDLs required for the listed segment. Where more than one TMDL is required for a segment, TMDLs for specific pollutants may be developed well in advance of the expected completion date given on the list.

Appendix G - Table 1

Alabama's 2000 §303(d) List

Waters Added to the List

The waterbodies listed in the following table were added to Alabama's 2000 §303(d) list for the reasons presented in the table.

Waterbody ID	Waterbody Name	River Basin	County	Pollutant	Basis for Addition to the List
AL/03160205-040_01	Bay Minette Creek – from its mouth at Bay Minette to its source	Mobile	Baldwin	Mercury	Alabama Fish Consumption Advisory issued by the Alabama Department of Public Health in March 2000 advising "No Consumption" of largemouth bass.
AL/03160204-050_04	Chickasaw Creek – from its mouth at Mobile River to its source	Mobile	Mobile	Mercury	Alabama Fish Consumption Advisory issued by the Alabama Department of Public Health in March 2000 advising "No Consumption" of largemouth bass.
AL/03160205-030_01	Fowl River – from its mouth at Mobile Bay to its source (includes part of East Fowl River)	Mobile	Mobile	Mercury	Alabama Fish Consumption Advisory issued by the Alabama Department of Public Health in March 2000 advising "No Consumption" of largemouth bass.
AL/Mobile R_01	Mobile River – from its mouth at Mobile Bay to Cold Creek	Mobile	Mobile	Mercury	Alabama Fish Consumption Advisory issued by the Alabama Department of Public Health in March 2000 advising "Limited Consumption" of largemouth bass.
AL/03160204-060_02	Threemile Creek – from Telegraph Road to Illinois Central Gulf Railroad	Mobile	Mobile	Chlordane	Alabama Fish Consumption Advisory issued by the Alabama Department of Public Health in March 2000 advising "Limited Consumption" of striped bass and speckled trout and "No Consumption" of Atlantic croaker .
AL/03140106-070_02	Brushy Creek - from the Alabama – Florida state line to Boggy Branch	Perdido-Escambia	Escambia	Organic Enrichment / Low Dissolved Oxygen	Of 4 dissolved oxygen measurements made by ADEM at Escambia Co. Rd. 1 between May and September 1999, all were less than the 5.0 mg/l criterion.

Waterbody ID	Waterbody Name	River Basin	County	Pollutant	Basis for Addition to the List
AL/03150110-050_01	Moores Mill Creek – from its mouth at Chewacla Creek to its source	Tallapoosa	Lee	Sedimentation (Siltation)	Sedimentation was identified as the principle cause of biological impairment at a site upstream of Chewacla Lake at site MMLT-1a in 1998. ("Monitoring of Watersheds Associated with Alabama State Parks Utilizing Chemical, Physical, and Biological Assessments", ADEM, p. 27, 1999.)
AL/Alabama R_03	Alabama River – from Pursley Creek to Beaver Creek	Alabama	Wilcox	Nutrients Organic Enrichment / Low Dissolved Oxygen	This segment separates two segments already included on the §303(d) list for the indicated causes. Of 106 dissolved oxygen measurements made at river monitoring stations within this segment between 1995 and 1999, 12 (11.3%) were less than the 5.0 mg/l criterion.
AL/06030002-160-02	Hester Creek – from Mountain Fork to its source	Tennessee	Madison	Fecal Coliform	Of 25 samples collected by USGS in 1999, 5 samples exceeded the 2000 colonies/100 ml single sample criterion for fecal coliform bacteria.
AL/06030002-190-02	Flint River – From U.S. Highway 72 (RM 27.3) to Mountain Fork	Tennessee	Madison	Fecal Coliform	Of 17 samples collected by USGS in 1999, 3 samples exceeded the 2000 colonies/100 ml single sample criterion for fecal coliform bacteria.
AL/03150202-020_01	Lee Branch – From Lake Purdy to its source	Cahaba	Shelby	Fecal Coliform	Of 10 samples collected by USGS between 1996 and 1999 at station 242340575, 4 samples exceeded the 2000 colonies/100 ml single sample criterion for fecal coliform bacteria.
AL/03170008-090_04	Collins Creek – From Big Creek to its source	Escatawpa	Mobile	Fecal Coliform	Of 23 samples collected by USGS between 1996 and 1999 at station 2479950, 3 samples exceeded the 2000 colonies/100 ml single sample criterion for fecal coliform bacteria.

Appendix G - Table 2

Alabama's 2000 §303(d) List

Waters Removed from the 1998 List

The waterbodies listed in the following table were removed from Alabama's 1998 §303(d) list and are not included on the 2000 §303(d) list for the reasons presented.

Waterbody ID	Waterbody Name	River Basin	County	Pollutant	Basis for Addition to the List
AL/03160205-040_01	Bay Minette Creek – from its mouth at Bay Minette to its source	Mobile	Baldwin	Mercury	Alabama Fish Consumption Advisory issued by the Alabama Department of Public Health in March 2000 advising "No Consumption" of largemouth bass.
AL/03160204-050_04	Chickasaw Creek – from its mouth at Mobile River to its source	Mobile	Mobile	Mercury	Alabama Fish Consumption Advisory issued by the Alabama Department of Public Health in March 2000 advising "No Consumption" of largemouth bass.
AL/03160205-030_01	Fowl River – from its mouth at Mobile Bay to its source (includes part of East Fowl River)	Mobile	Mobile	Mercury	Alabama Fish Consumption Advisory issued by the Alabama Department of Public Health in March 2000 advising "No Consumption" of largemouth bass.
AL/Mobile R_01	Mobile River – from its mouth at Mobile Bay to Cold Creek	Mobile	Mobile	Mercury	Alabama Fish Consumption Advisory issued by the Alabama Department of Public Health in March 2000 advising "Limited Consumption" of largemouth bass.
AL/03160204-060_02	Threemile Creek – from Telegraph Road to Illinois Central Gulf Railroad	Mobile	Mobile	Chlordane	Alabama Fish Consumption Advisory issued by the Alabama Department of Public Health in March 2000 advising "Limited Consumption" of striped bass and speckled trout and "No Consumption" of Atlantic croaker .
AL/03140106-070_02	Brushy Creek - from the Alabama – Florida state line to Boggy Branch	Perdido-Escambia	Escambia	Organic Enrichment / Low Dissolved Oxygen	Of 4 dissolved oxygen measurements made by ADEM at Escambia Co. Rd. 1 between May and September 1999, all were less than the 5.0 mg/l criterion.

Waterbody ID	Waterbody Name	River Basin	County	Pollutant	Basis for Addition to the List
AL/03150110-050_01	Moores Mill Creek – from its mouth at Chewacla Creek to its source	Tallapoosa	Lee	Sedimentation (Siltation)	Sedimentation was identified as the principle cause of biological impairment at a site upstream of Chewacla Lake at site MMLT-1a in 1998. ("Monitoring of Watersheds Associated with Alabama State Parks Utilizing Chemical, Physical, and Biological Assessments", ADEM, p. 27, 1999.)
AL/Alabama R_03	Alabama River – from Pursley Creek to Beaver Creek	Alabama	Wilcox	Nutrients Organic Enrichment / Low Dissolved Oxygen	This segment separates two segments already included on the §303(d) list for the indicated causes. Of 106 dissolved oxygen measurements made at river monitoring stations within this segment between 1995 and 1999, 12 (11.3%) were less than the 5.0 mg/l criterion.
AL/06030002-160-02	Hester Creek – from Mountain Fork to its source	Tennessee	Madison	Fecal Coliform	Of 25 samples collected by USGS in 1999, 5 samples exceeded the 2000 colonies/100 ml single sample criterion for fecal coliform bacteria.
AL/06030002-190-02	Flint River – From U.S. Highway 72 (RM 27.3) to Mountain Fork	Tennessee	Madison	Fecal Coliform	Of 17 samples collected by USGS in 1999, 3 samples exceeded the 2000 colonies/100 ml single sample criterion for fecal coliform bacteria.
AL/03150202-020_01	Lee Branch – From Lake Purdy to its source	Cahaba	Shelby	Fecal Coliform	Of 10 samples collected by USGS between 1996 and 1999 at station 242340575, 4 samples exceeded the 2000 colonies/100 ml single sample criterion for fecal coliform bacteria.
AL/03170008-090_04	Collins Creek – From Big Creek to its source	Escatawpa	Mobile	Fecal Coliform	Of 23 samples collected by USGS between 1996 and 1999 at station 2479950, 3 samples exceeded the 2000 colonies/100 ml single sample criterion for fecal coliform bacteria.
AL/03160109-020-01	Duck Creek	Black Warrior	Cullman	pH	Of 73 measurements made by ADEM and others between 1991 and 1998, only 3 values (2.7%) were outside acceptable limits.

Waterbody ID	Waterbody Name	River Basin	County	Pollutant	Basis for Addition to the List
AL/03160109-180-01	Wolf Creek	Black Warrior	Walker	pH	Of 20 measurements made by ADEM in 1996, only 1 value (5%) was outside acceptable limits.
AL/03160109-180-01	Wolf Creek	Black Warrior	Walker	Metals	Of 15 measurements of total iron made by ADEM in 1996, none exceed EPA's guidance criterion of 1.0 mg/l.
AL/03160111-150-01	Short Creek	Black Warrior	Jefferson	pH	Of 52 measurements made by ADEM between 1995 and 1999, 1 value (1.9%) was outside acceptable limits.
AL/03160111-150-01	Short Creek	Black Warrior	Jefferson	Organic enrichment / DO	Of 50 measurements made by ADEM between 1995 and 1999, 2 values (4.0%) were less than the 5.0 mg/l criterion.
AL/30160112-050-01	Big Yellow Creek	Black Warrior	Tuscaloosa	pH	Of 17 measurements made by ADEM between 1988 and 1999, none were outside acceptable limits.
AL/03160112-110-01	Black Warrior River	Black Warrior	Tuscaloosa	Organic enrichment / DO	Of 42 measurements made by ADEM between 1995 and 1998, only 1 value (2.4%) was less than the 4.0 mg/l criterion.
AL/03150202-010-01	Big Black Creek	Cahaba	St. Clair	Siltation	Benthic invertebrate communities were assessed by ADEM in 1999 at 4 stations and were rated as good or excellent. Habitat at these stations was also assessed as good or excellent. In 1997 USGS benthic invertebrate assessments conducted by USGS indicated that the communities were unimpaired to slightly impaired.
AL/03150202-010-01	Big Black Creek	Cahaba	St. Clair	Other habitat alteration	Benthic invertebrate communities were assessed by ADEM in 1999 at 4 stations and were rated as good or excellent. Habitat at these stations was also assessed as good or excellent. In 1997 USGS benthic invertebrate assessments conducted by USGS indicated that the communities were unimpaired to slightly impaired.

Waterbody ID	Waterbody Name	River Basin	County	Pollutant	Basis for Addition to the List
AL/03150202-030-05	Little Shades Creek	Cahaba	Jefferson	Organic enrichment / DO	Of 36 measurements made by ADEM in 1998, only 1 value (2.8%) was less than the 5.0 mg/l criterion.
AL/03150202-030-05	Little Shades Creek	Cahaba	Jefferson	Priority Organics	Of 4 measurements made by ADEM in 1998 and analyzed for volatile organic compounds, none were found in excess of the method detection limit of 5 ug/l.
AL/03150202-030-05	Little Shades Creek	Cahaba	Jefferson	Nonpriority Organics	Of 4 measurements made by ADEM in 1998 and analyzed for volatile organic compounds, none were found in excess of the method detection limit of 5 ug/l.
AL/03130003-180-01	Barbour Creek	Chattahoochee	Barbour	Organic enrichment / DO	Of 30 measurements made by ADEM and Auburn University in 1998 and 1999, none were less than the 5.0 mg/l criterion.
AL/03130002-200-01	West Point Lake	Chattahoochee	Chambers	Pesticides (Chlordane)	Declining chlordane levels in fish resulted in the removal of this segment from the March 2000 Fish Consumption Advisory issued by the Alabama Department of Public Health.
AL/03130002-310-01	Lake Harding	Chattahoochee	Lee	Pesticides (Chlordane)	Declining chlordane levels in fish resulted in the removal of this segment from the March 2000 Fish Consumption Advisory issued by the Alabama Department of Public Health.
AL/03140201-150-01	UT to Harrand Creek	Choctawhatchee	Coffee	Organic enrichment / DO	Of 5 measurements made by ADEM in 1999, none were less than the 5.0 mg/l criterion.
AL/03150106-340-02	Lake Neely Henry	Coosa	Etowah	Priority Organics (PCBs)	This pollutant for this segment was mistakenly included on the 1998 §303(d) list. The 1998, 1999, and 2000 Fish Consumption Advisory lists published by the Alabama Department of Public Health do not include a consumption advisory for Lake Neely Henry.

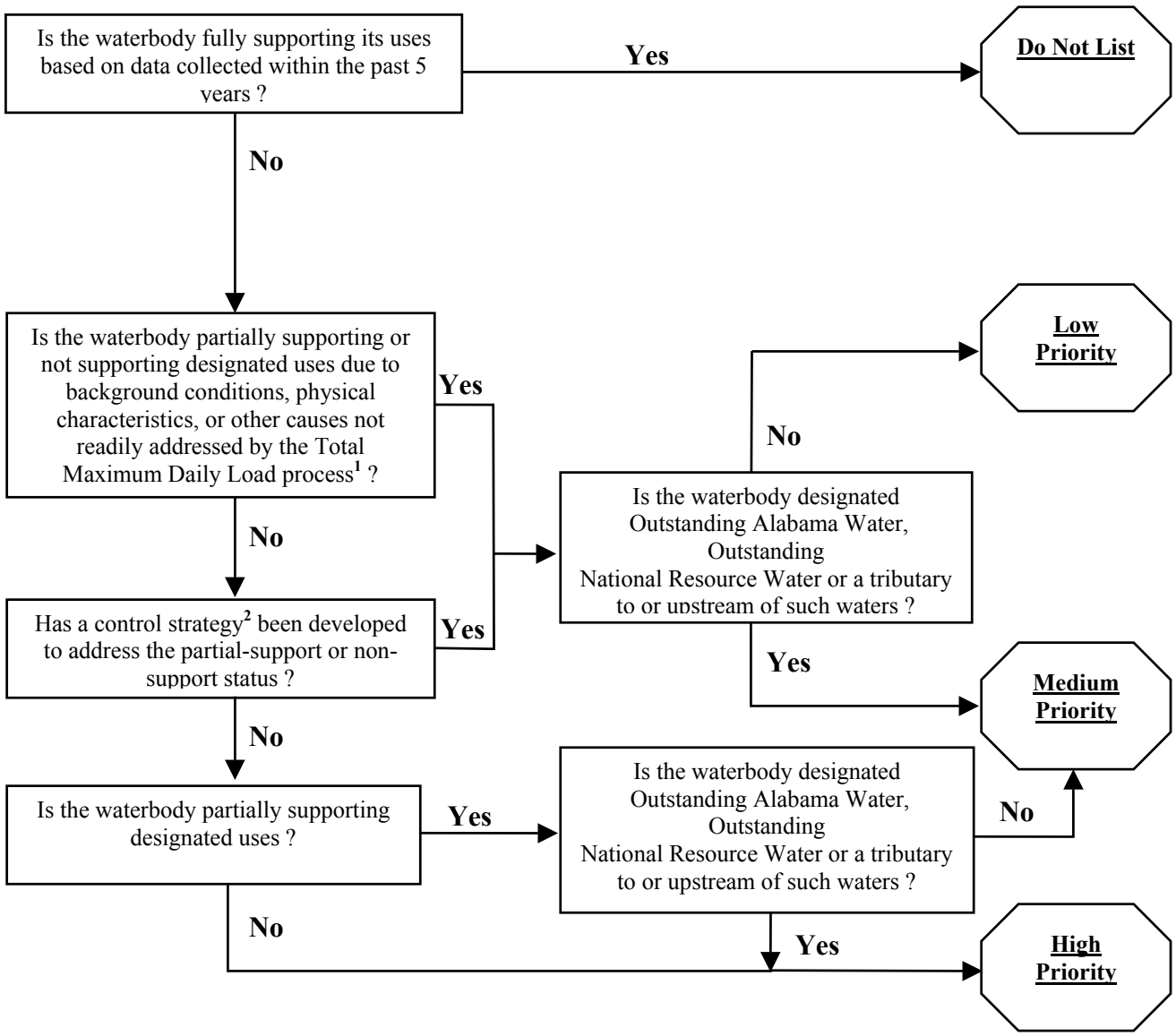
Waterbody ID	Waterbody Name	River Basin	County	Pollutant	Basis for Addition to the List
AL/03150107-190-01	Lay Lake	Coosa	Talladega	Flow Alteration	This cause was inadvertently included on the 1998 §303(d) list. It does not appear on the 1994 or 1996 lists. Flow alteration is not a pollutant for which a TMDL can be developed and is, therefore, not appropriate for inclusion on the §303(d) list.
AL/03150105-280-01	Weiss Lake	Coosa	Cherokee	Organic enrichment / DO	Of 565 measurements made by ADEM and others between 1989 and 1999, 11 (1.9%) were less than the 5.0 mg/l criterion.
AL/03150105-240-01	Wolf Branch	Coosa	Cherokee	Organic enrichment / DO	Of 8 measurements made by ADEM in 1999, none were less than the 5.0 mg/l criterion.
AL/03150105-240-01	Wolf Branch	Coosa	Cherokee	Ammonia	Of 7 measurements made by ADEM in 1999, all were less than the method detection level of 0.015 mg/l.
AL/03170008-090-01	Boggy Branch	Escatawpa	Mobile	Pathogens	Of 23 measurements made by USGS between 1996 and 1999, 2 (8.7%) exceeded the 2000 colonies/100 ml criterion.
AL/03170009-030-01	Bayou La Batre	Escatawpa	Mobile	pH	Low pH values measured at Alabama Highway 188 are due to natural conditions (acid clay soils and tannic acid from decaying vegetation) and are typical of coastal blackwater streams.
AL/03170008-090-02	Hamilton Creek	Escatawpa	Mobile	Organic enrichment / DO	Of 129 measurements made by USGS between 1990 and 1999, none (0.0%) were less than the 5.0 mg/l criterion.
AL/03140107-040-01	Intracoastal Waterway	Mobile	Baldwin	Temperature	Of 675 measurements made by ADEM at trend station IC1 and at Coastal ALAMAP stations in Regions 4 and 6 between 1990 and 1999, 18 (2.7%) exceeded the temperature criterion of 90 °F.

Waterbody ID	Waterbody Name	River Basin	County	Pollutant	Basis for Addition to the List
AL/03160204-050-03	Chickasaw Creek	Mobile	Mobile	pH	Low pH values measured at several locations throughout this watershed are due to natural conditions (acid clay soils and tannic acid from decaying vegetation) and are typical of coastal blackwater streams.
AL/03160204-060-01	Threemile Creek	Mobile	Mobile	pH	Of 68 measurements made by ADEM between 1990 and 1999, six (8.8%) were outside acceptable limits.
AL/03160205-020-02	Dog River	Mobile	Mobile	pH	Low pH values measured at Navco Park are due to natural conditions (acid clay soils and tannic acid from decaying vegetation) and are typical of coastal blackwater streams.
AL/03160205-050-03	Cowpen Creek	Mobile	Baldwin	pH	Low pH values measured at Baldwin County Road 33 near Clay City are due to natural conditions (acid clay soils and tannic acid from decaying vegetation) and are typical of coastal blackwater streams.
AL/03160205-050-02	Fish River	Mobile	Baldwin	pH	Low pH values measured at several locations throughout this watershed are due to natural conditions (acid clay soils and tannic acid from decaying vegetation) and are typical of coastal blackwater streams.
AL/03140103-050-01	Indian Creek	Perdido-Escambia	Covington	Organic enrichment / DO	The point source contributing to low dissolved oxygen levels in 1985 was removed in 1988. Data collected in 1999 indicates full use support.
AL/03140103-050-01	Indian Creek	Perdido-Escambia	Covington	Nutrients	The point source contributing nutrients in 1985 was removed in 1988. Data collected in 1999 indicates full use support.
AL/03140103-080-01	Bay Branch	Perdido-Escambia	Covington	Organic enrichment / DO	The point source contributing to low dissolved oxygen levels in 1985 was removed in 1988. Data collected in 1999 indicates full use support.

Waterbody ID	Waterbody Name	River Basin	County	Pollutant	Basis for Addition to the List
AL/03140103-080-01	Bay Branch	Perdido-Escambia	Covington	Pathogens	Of 9 measurements made by ADEM at several locations in 1991 and 1999, none exceeded the 2000 colonies/100 ml criterion.
AL/03140106-190-01	Blackwater River	Perdido-Escambia	Baldwin	Metals (Cu, Pb, Zn)	Metal concentrations at the USGS sampling location are the result of natural conditions and are, therefore, not a violation of Alabama water quality standards.
AL/03150109-050-01	Tallapoosa River	Tallapoosa	Randolph	Flow alteration	Flow alteration is not a pollutant for which a TMDL can be developed and is, therefore, not appropriate for inclusion on the §303(d) list.
AL/03150110-140_01	Line Creek	Tallapoosa	Macon	Flow alteration	Flow alteration is not a pollutant for which a TMDL can be developed and is, therefore, not appropriate for inclusion on the §303(d) list.
AL/06030002-160-02	Hester Creek	Tennessee	Madison	Organic enrichment / DO	Of 38 measurements made by ADEM, TVA, and USGS between 1997 and 1999, none were less than the 5.0 mg/l criterion.
AL/06030002-160-02	Hester Creek	Tennessee	Madison	Siltation	The 1997 TVA habitat assessment rates the habitat for this segment as excellent. The maximum turbidity and total suspended solids levels measured by TVA in 1997 were 5.3 NTU and 5.0 mg/l, respectively.
AL/06030002-160-01	Mountain Fork	Tennessee	Madison	Siltation	The 1997 TVA habitat assessment rates the habitat for this segment as excellent. In 1998 ADEM assessed two reaches of Mountain Fork at three sites. Habitat quality was assessed as excellent at all three sites. The maximum turbidity and total suspended solids levels measured by ADEM were 11.2 NTU and 12.0 mg/l, respectively, during a high flow event on May 13, 1998.

Waterbody ID	Waterbody Name	River Basin	County	Pollutant	Basis for Addition to the List
AL/06030002-160-01	Mountain Fork	Tennessee	Madison	Organic enrichment / DO	Of 13 measurements made by ADEM and TVA in 1997 and 1998, none were less than the 5.0 mg/l criterion.
AL/06030002-330-08	Rock Creek	Tennessee	Cullman	Organic enrichment / DO	Of 5 measurements made by TVA in 1997, none were less than the 5.0 mg/l criterion.
AL/06030005-040-01	Town Creek	Tennessee	Lawrence	pH	Of 81 measurements made by ADEM and TVA between 1988 and 1998, 7 (8.6%) were outside acceptable limits.
AL/06030001-280-01	Short Creek	Tennessee	Marshall	Pathogens	Of 62 measurements made by ADEM at several locations between 1996 and 1998, 3 (4.8%) exceeded the 2000 colonies/100 ml criterion.
AL/03160106-200-01	Tombigbee River	Upper Tombigbee	Pickens	Flow alteration	Flow alteration is not a pollutant for which a TMDL can be developed and is, therefore, not appropriate for inclusion on the §303(d) list.

2000 §303(d) List Prioritization Strategy



1 Examples of other causes not readily addressed by the TMDL process include in place contaminants, flow regulation/modification, unknown sources, and atmospheric deposition.

2 Examples of control strategies include wastewater treatment upgrades or removal, best management practice implementation, and permit modifications.