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

Section 2

River Basin Characteristics

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

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

2.1 River Basin Description

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

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

2.1.1 River Basin Boundaries

The Suwannee River basin is located in south central Georgia and is flanked by the Ochlockonee and Flint River basins to the west, and the Satilla, Ocmulgee, and St. Marys River basins to the east (Figure 2-1). The portion of the Suwannee River basin located entirely in Georgia drains approximately 5,560 square miles. The Suwannee River Basin in Georgia includes the waters of the Alapaha and Withlacoochee Rivers which flow

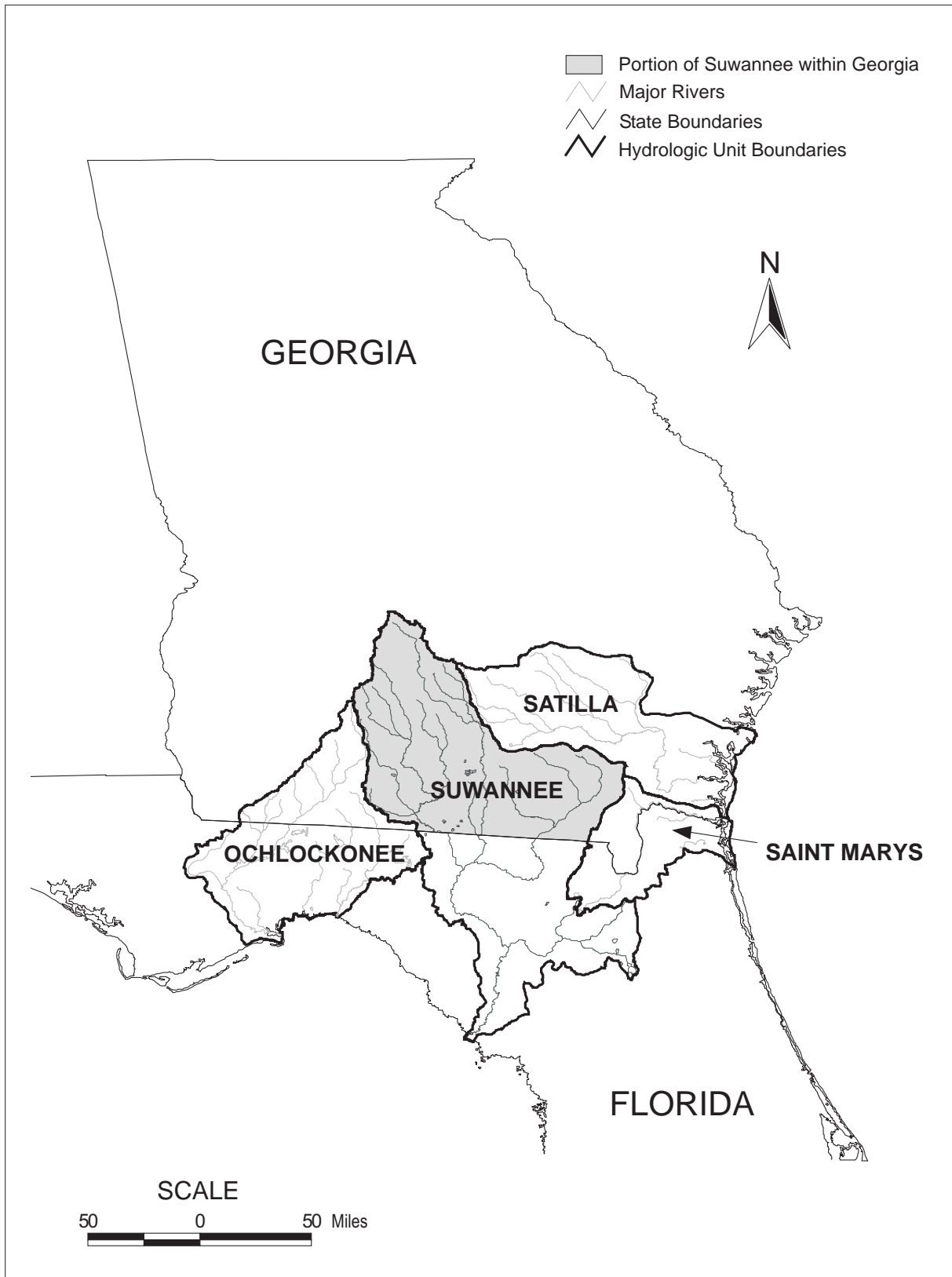


Figure 2-I. Location of the Suwannee River Basin

south into Florida and join the Suwannee River which empties into the Gulf of Mexico. The Suwannee River basin drains approximately 10,000 square miles, with approximately 5,560 square miles of the basin in Georgia.

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

Table 2-1. Hydrologic Unit Codes (HUCs) of the Suwannee River Basin in Georgia

03110201	Suwannee River
03110202	Alapaha River
03110203	Withlacoochee River
03110204	Little River

2.1.2 Climate

The Suwannee River basin is characterized by mild winters and hot summers. Mean annual precipitation ranges from 44 to 50 inches per year. Precipitation occurs as rainfall. Rainfall is fairly evenly distributed throughout the year, but a distinct dry season occurs from mid-summer to late fall. Rainfall is usually greatest in March and least in October. The mean annual temperature is about 66 degrees Fahrenheit (Journey and Atkins, 1996; citing Peck et al., 1992; Schneider et al., 1965; and Carter and Stiles, 1983).

2.1.3 Physiography, Geology, Soils, and Hydrogeology

Physiography

The Ochlockonee, Satilla, St. Marys and Suwannee River basins lie entirely within the Coastal Plain physiographic province, which extends throughout the southeastern margin of the United States. The physiography of these river basins reflects a geologic history of repeated periods of land submergence which is typical of the Coastal Plain Province. These basins include all or portions of the Tifton Upland, the Okefenokee Basin, the Bacon Terraces and the Barrier Island Sequence districts of the Coastal Plain. The Ochlockonee River basin lies within the western third of the Tifton Upland District. The Satilla River basin lies entirely within the Bacon Terraces and Barrier Island Sequence districts. The St. Marys River basin lies entirely within the Okefenokee Basin and Barrier Island Sequence districts. The Suwannee River basin lies within the Tifton Upland and Okefenokee Basin districts.

The Tifton Upland District is characterized by a well developed, extend dendritic stream pattern where narrow, rounded interfluvies occur 50 to 200 feet above relatively narrow stream valley floors. The northwestern boundary of the district is the base of the Pelham Escarpment, which rises as much as 200 feet above the Dougherty Plain to the west. The Okefenokee Basin District is typified by very low topographic relief, numerous extensive swamps, and local sand ridges. The Bacon Terraces District displays a very extended, southeast trending dendritic drainage pattern containing long, narrow interfluvies with gently rounded to flat summits that are 50 to 100 feet above narrow, marshy floodplains. The district also contains several low, moderately dissected terraces which are generally parallel to the coastline. From west to east, these are designated the Hazlehurst, Pearson, Claxton, Argyle, Waycross and Penholoway terraces. The Barrier Island Sequence District is characterized by a series of prominent marine terraces which

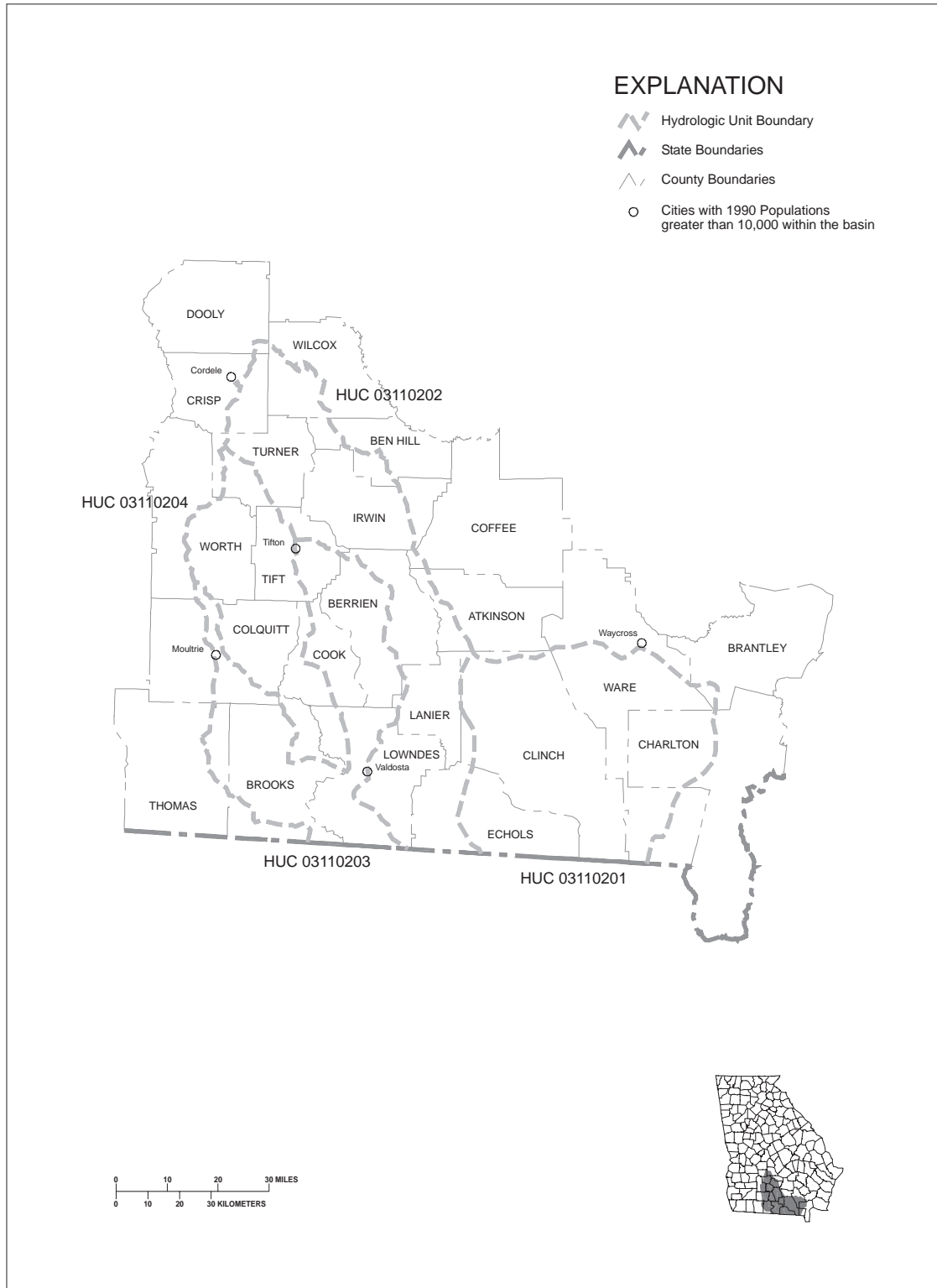


Figure 2-2. Hydrologic Units and Counties of the Suwannee River Basin

form a step-like progression of decreasing altitudes toward the sea. The former, higher sea levels created barrier island-salt marsh environments parallel to and similar to those found on the present coast. The terraces are composed of sand ridges marking the former barrier islands, and are flanked by fresh water marshes at the former salt marsh locations. They have undergone slight to moderate dissection which is generally more advanced at the western edge of the district. Trail Ridge is the most prominent of these terraces with a maximum elevation of approximately 160 feet. It marks the western boundary of the Barrier Island Sequence District where it joins the Bacon Terraces and Okefenokee Basin districts. Other, less prominent terraces in the district, from west to east, are the Wicomico, Penholoway, Talbot, Pamlico, Princess Anne, and Silver Bluff-Holocene terraces.

The streams in these basins are typical of the Coastal Plain. They generally lack the riffles and shoals that are common to streams in the Piedmont Province to the north, and exhibit more extensive floodplain development and greater sinuosity.

Carolina Bays are elliptical or “spoon-shaped” wetland depressions aligned roughly north-northwest and are logically well developed throughout the area east of the Suwannee River basin. Lime sinks and lake-filled sinks are well developed in areas underlain by limestone in the shallow subsurface, notably in the Lake Park area south and west of Valdosta, Lowndes County.

Geology

Weathered, poorly consolidated sediments underlie all of these river basins, and are dominantly composed of sands, clays, and gravels which range from Miocene to Holocene in age. These sediments include the Miccosukee Formation (Pliocene age), Altamaha Formation and various formations of the Hawthorne Group (all Miocene age), as well as barrier island and marsh/lagoon facies of the numerous shoreline complexes (Pleistocene to Holocene age). Local occurrences of calcareous sediments include the Suwannee Limestone (Oligocene age) and Duplin Marl (Pliocene age). Other rock types in the area include dolomite, chert, peat, phosphate and fuller’s earth, as well as Quaternary alluvium in the flood plains along the major stream valleys. Most of these sediments were deposited in either terrestrial or shallow marine environments.

Sediments in the area are locally mined for construction sand and fill material. In addition, the Meigs Member of the Coosawhatchie Formation (Hawthorne Group) is the source of the economically important fuller’s earth clay deposits being mined in the Ochlockonee River Basin. In the past, crushed stone was produced from some of the limestone deposits, and a few of the larger Carolina Bays were mined for peat.

Soils

The Suwannee River Basin is within the Southern Coastal Plain and the Atlantic Coast Flatwoods Major Land Resource Areas (MLRA) (Figure 2-3). The soils within the river basin vary considerably, particularly from west to east across the area. The soils in this area can be combined into four major groups for discussion.

The first group of soils covers the western portion of the river basin and is in the Southern Coastal Plain. This group is dominated by nearly level and very gently sloping Tifton and Dothan soils on uplands, and nearly level Osier, Pelham, Rains, and Alapaha soils along drainageways and floodplains. Tifton and Dothan are well drained upland soils that have a sandy surface layer and a yellowish brown or strong brown, loamy subsoil. The surface layer is normally loamy sand and is about 10 inches thick. The subsoil is mostly sandy clay loam. Characteristic of these soils is a layer of plinthite in the subsoil at a depth of about 30 inches. Plinthite is an iron-rich mixture of clay with quartz

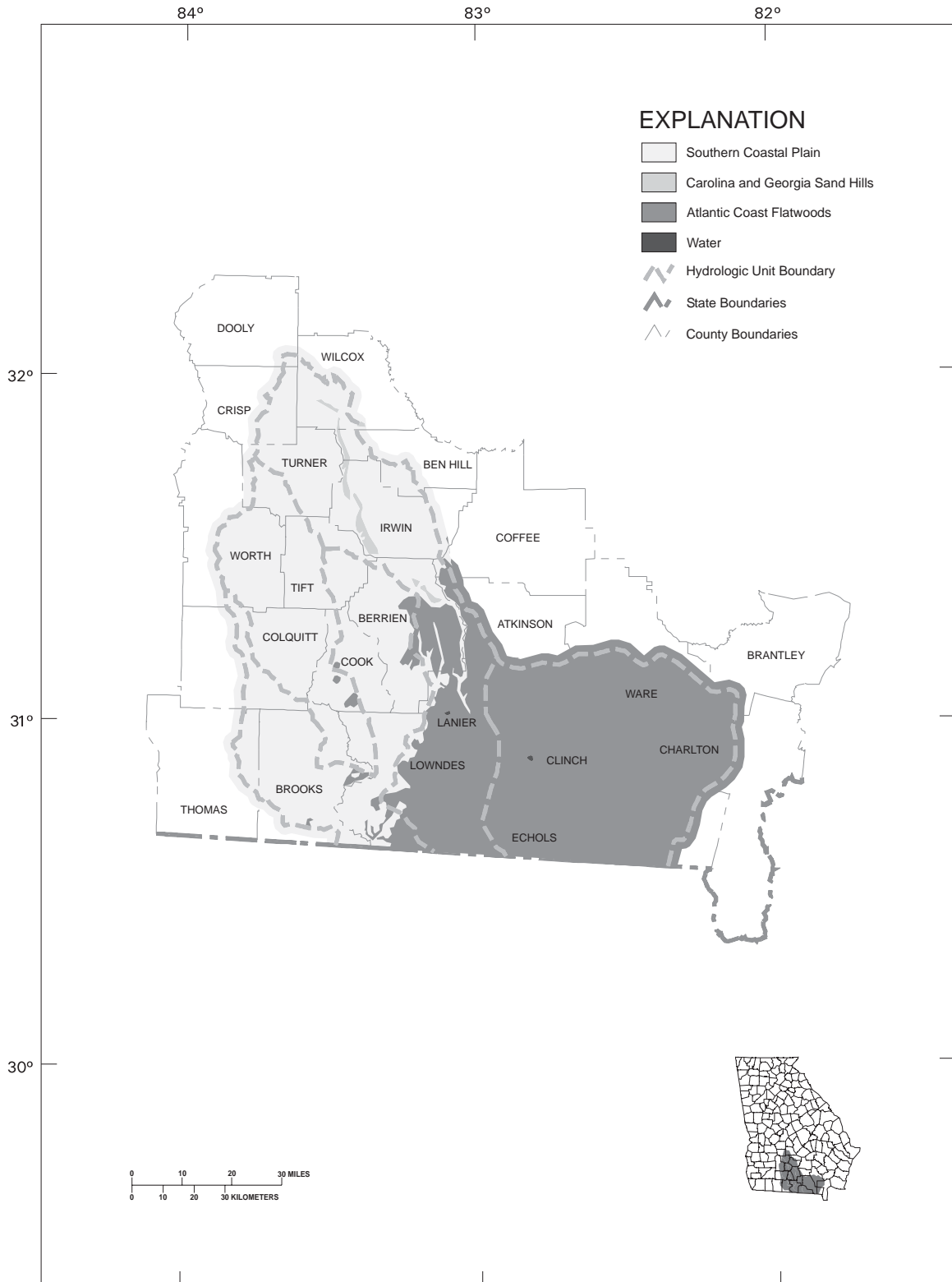


Figure 2-3. Major Land Resource Areas in the Suwannee River Basin

and other constituents that can perch water during wet seasons. The soils along drainageways and floodplains are poorly drained. Most of these soils are sandy throughout, but some of them have a loamy subsoil at various depths. Water tables are commonly at or near the surface during wet seasons, and the soils are subject to flooding.

The second group of soils are found at the transition between the Southern Coastal Plain and the Atlantic Coast Flatwoods MLRA's. This area contains some soils that are typical from both MLRA's, but it is dominated by nearly level, somewhat poorly drained and poorly drained soils, such as Leefield and Pelham. These soils have a sandy surface layer that is 20 to 40 inches thick over a loamy subsoil. Water tables range from near the surface to about 2.5 feet during wet seasons.

The third major group of soils is in the Atlantic Coast Flatwoods MLRA. This area is dominated by nearly level, poorly drained soils on broad flats, and by very poorly drained soils in depressions and along drainageways. This area is characterized by an abundance of Spodosols, which are sandy soils that have a layer where a complex of organic matter and aluminum has accumulated. Most of the soils in this area are sandy, although a loamy subsoil is sometimes found at depth of around 3 feet. Water tables are commonly at or near the surface during wet seasons, and soils in depressions are often ponded.

The fourth group of soils are also in the Atlantic Coast Flatwoods MLRA. These soils occur within the Okefenokee Swamp. This area is dominated by organic soils that are saturated and covered with water most of the time. These soils are extremely acid. They are normally underlain by sandy or loamy material at various depths. Scattered within the area of organic soils are islands of sandy mineral soils. These sandy soils are mostly poorly drained, with a water table at or near the surface during wet seasons, but they are higher in elevation and drier than the surrounding organic soils.

Hydrogeology

Coastal Plain sediments underlie the entire region and groundwater is produced from several aquifers. Sources of ground water include, in order of importance, the unconfined Surficial aquifer, the Upper and Lower Brunswick aquifers and the Upper and Lower Floridan aquifers. The Surficial aquifer is up to 230 feet thick and consists of interlayered, Miocene and younger, sand, clay and limestone. It is underlain by the Upper and Lower Brunswick aquifers both of which are composed of 150 and 70 feet, respectively, of poorly sorted sand. The Upper and Lower Floridan aquifers consist of Eocene to Oligocene carbonate rocks (largely limestone and dolostone) 700 to 2,500 feet in thickness. In each of the aquifers, except for the Surficial aquifer, the groundwater is under confined (aquifer) conditions. Most of these aquifers consistently have excellent water quality; however, the Lower Floridan aquifer is saline and generally does not meet drinking water standards.

2.1.4 Surface Water Resources

The major surface water resources of the Suwannee River basin are three major rivers, which drain portions of the basin. The eastern portion of the basin contains the headwaters for the Suwannee River. The central portion is drained by the Alapaha River, which joins the Suwannee River about 15 miles south of the stateline. The western portion of the basin comprises the Withlacoochee River watershed, which joins the Suwannee River about eight miles downstream from the confluence of the Suwannee and Alapaha rivers. The three major rivers thus cross the stateline separately, but they join long before the Suwannee reaches the Gulf of Mexico.

Some of the major streams in the basin include the Little River, Alapacha River, Okapilco Creek, Suwanoochee River, Willacoochee River and Little River. Stream networks within each HUC are shown in Figures 2-4 through 2-7.

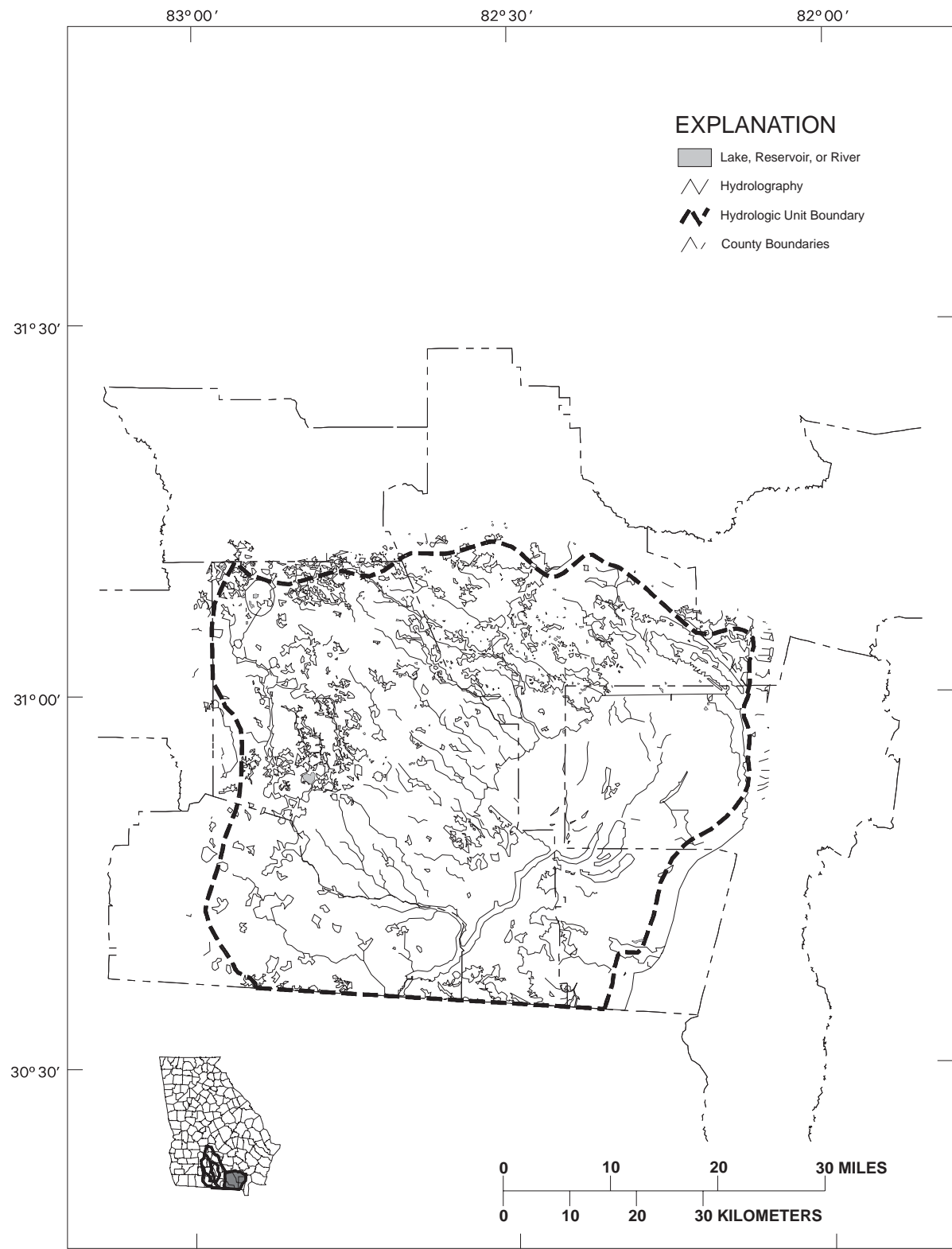


Figure 2-4. Hydrography, Suwannee River Basin, HUC 03110201

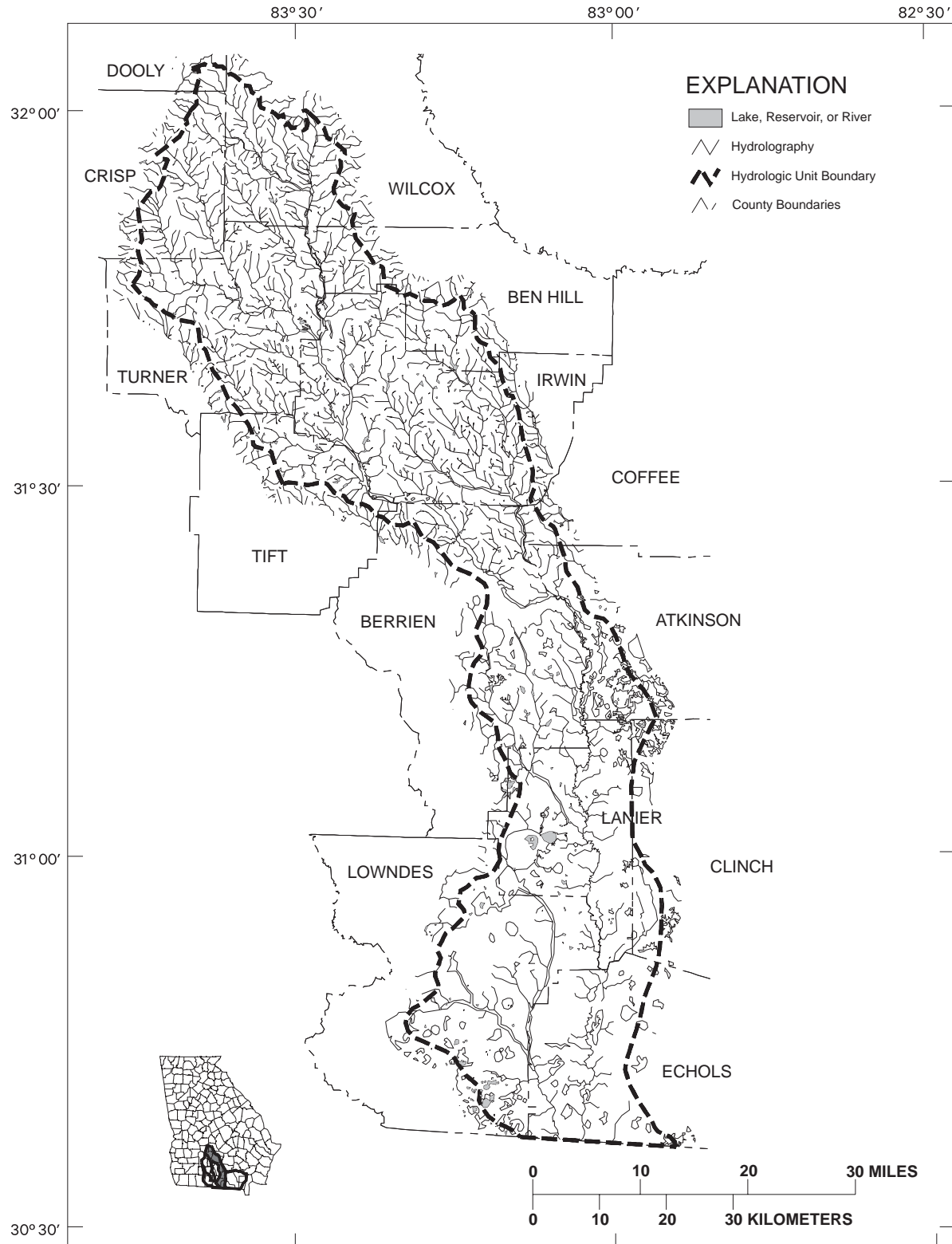


Figure 2-5. Hydrography, Suwannee River Basin, HUC 03110202

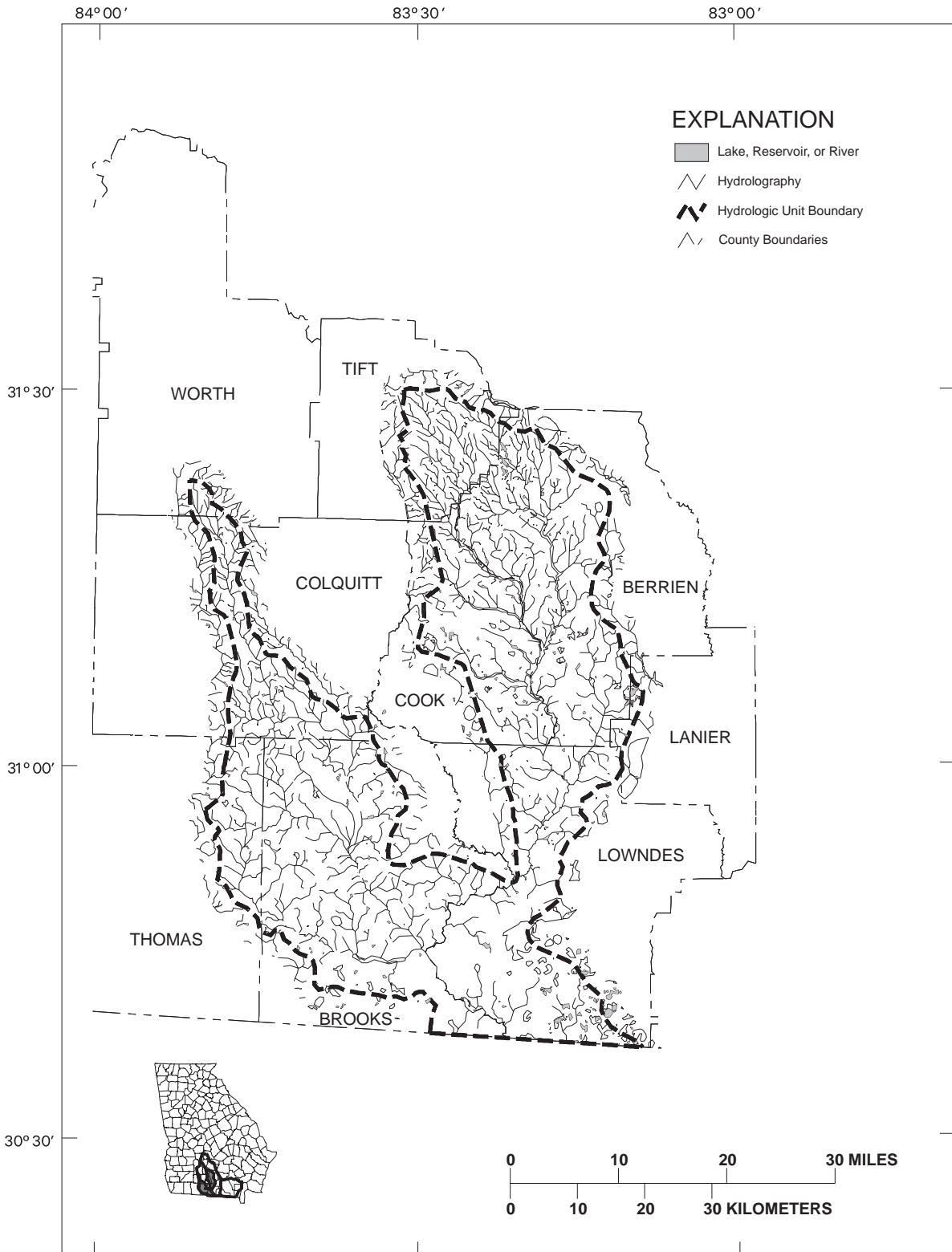


Figure 2-6. Hydrography, Suwannee River Basin, HUC 03110203

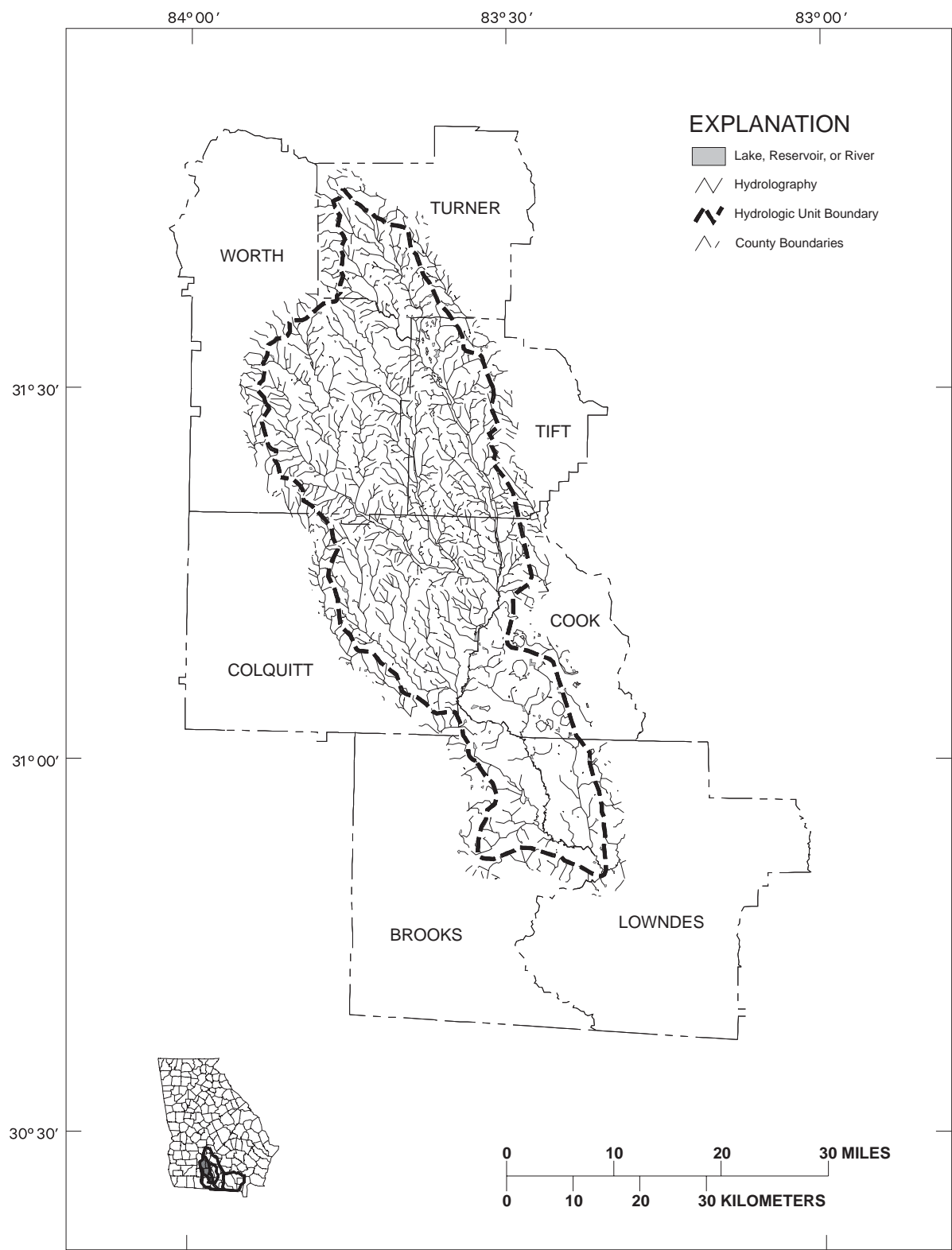


Figure 2-7. Hydrography, Suwannee River Basin, HUC 03110204

2.1.5 Ground Water Resources

Groundwater resources in the Suwannee River basin are supplied by the Floridan aquifer system, one of the most productive ground water reservoirs in the United States. The system supplies about 50 percent of the ground water used in the state. It is used as a major water source throughout most of South Georgia. A more detailed description of the Floridan aquifer system is provided below.

Floridan Aquifer

The Floridan aquifer underlies the rest of the southern portion of the basin. The aquifer is overlain by approximately 25-125 feet of sandy clay residuum derived from chemical weathering of the underlying rock. The total thickness of the Floridan aquifer in the basin ranges from a few tens of feet in the north to more than 400 feet in the extreme southern portion of the basin. Clastic grains of sand and shale are major components of the Floridan aquifer near its northernmost extent, where it is dominantly limestone in the Ochlockonee basin. Throughout most of the basin, the aquifer can be divided into three thick limestone formations: the Tampa Limestone, the Suwannee Limestone and the Ocala Limestone. The Tampa Limestone consists of whitish gray limestone that has a shale bed at its base. This shale acts as a confining layer to the underlying Suwannee and Ocala limestones (Miller, 1986). Below the Tampa, the Suwannee limestone is a massive chalky unit that is easily dissolved and weathered. For this reason, the many solution cavities in the Tampa provide abundant water to the underlying Ocala Limestone. The Ocala Limestone is the principal unit of the Floridan aquifer, and contains an upper friable, porous unit and a lower fine-grained unit (Miller, 1986). This lower unit contains most of the groundwater in the Floridan aquifer (Torak and others, 1993). The Ocala is underlain by the clay-rich Lisbon Formation, which acts as a slower confining bed to the water-bearing limestones above. Well yields in the Floridan aquifer can range from about 40 GPM in the north to more than 10,000 GPM in the thickest, southern most portion of the Floridan aquifer. The Floridan serves as the main aquifer from Decatur and Seminole counties to the coast.

Recharge occurs through the sandy soil in the outcrop area. In the northern portion of the basin this unit is seen as one single aquifer and can be called either the Cretaceous Aquifer or the Dublin-Midville Aquifer. As you move to the south, an intervening clay layer becomes apparent, and divides the aquifer into two distinct units. Below is the Midville Aquifer of definite Cretaceous age. Overlying the confining shale unit is the Dublin Aquifer, which is of Cretaceous-Early Tertiary age.

2.1.6 Biological Resources

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

Fish Fauna

The fish fauna of the Georgia portion of the Suwannee River basin includes 36 species representing 13 families. The largest group of fish species found in the Suwannee basin are in the sunfish family Centrarchidae. Sunfish present in the Suwannee basin range from highly sought after game fish such as the largemouth bass, to rare species including the blackbanded sunfish. Other families with large numbers of species are the catfishes and the topminnows. Fish populations in the Georgia portion of the Suwannee basin are limited in productivity by acidic waters, low alkalinity, and extreme variation in flow.

Fisheries

The headwaters of the Suwannee River drain approximately 574 square miles of the Okefenokee Swamp. The Suwannee River flows southwest through Georgia for 33 miles before entering Florida. Once in Florida, the Suwannee converges with two of its tributaries, the Alapaha and Withlacoochee rivers, which both originate in Georgia. The Suwannee River is a blackwater stream with extremely acidic waters. A pH reading of 3.6 was recorded July 22, 1997 (U.S. Geological Survey, 1997).

The Suwannee River basin possesses a diversity of aquatic habitats providing some unique fishing opportunities. The Okefenokee National Wildlife Refuge encompasses approximately 400,000 acres and contains several open water lakes within the Okefenokee Swamp. These lakes offer excellent fishing opportunities for chain pickerel, flier, warmouth, and bullhead catfish. Like the Okefenokee Swamp the Suwannee River has good fisheries for flier, warmouth, chain pickerel, and bullhead catfishes.

Banks Lake National Wildlife Refuge is located in Lanier County and contains 1,500 acres of marsh, 1,549 acres of cypress swamp, and 1,000 acres of open water. Banks Lake is a natural pocosin or sink of ancient geological origin. This lake offers fishing opportunities for chain pickerel, warmouth, largemouth bass, bluegill, and crappie.

The Alapaha River is a small blackwater river which originates in Crisp and Wilcox counties. With the exception of high flow periods, travel by boat on the Alapaha is limited to the section of the river below the northern boundary of Berrien County. This river has good fisheries for largemouth bass, redbreast sunfish, bluegill, warmouth, crappie, and catfishes. The rare Suwannee bass is also found in the Alapaha River.

The Withlacoochee River is the only river in the Georgia portion of the Suwannee drainage that is not a typical blackwater stream. This river is largely characterized by steep limestone banks and rocky shoals. During moderate to low flows the Withlacoochee is predominately a spring-fed river. However, during high flow periods this river is influenced by swamp drainage and assumes a blackwater appearance. This river provides good fishing opportunities for largemouth bass, redbreast sunfish, warmouth, bluegill, crappie, catfishes, and the Suwannee bass.

The banded topminnow, blackbanded sunfish, and Suwannee bass are three fish species found in the Suwannee basin that are currently listed by the state as rare species. The banded topminnow and blackbanded sunfish are found in the Suwannee River. The Suwannee bass is found in both the Alapaha and Withlacoochee rivers.

2.2 Population and Land Use

2.2.1 Population

As of 1995, about 231,000 people lived in the Suwannee watershed (DRI/McGraw-Hill, 1996). Population distribution in the basin at the time of the 1990 census by census blocks is shown in Figure 2-8. Population centers in the Suwannee watershed include the development surrounding Valdosta, Tifton, Moultrie and Fitzgerald.

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

One area in which this river basin will differ slightly from state trends, is an age group of 16-24 year olds which will experience above average growth through 2050. The river basin will mirror state trends in terms of its elderly population with the 65 and older age

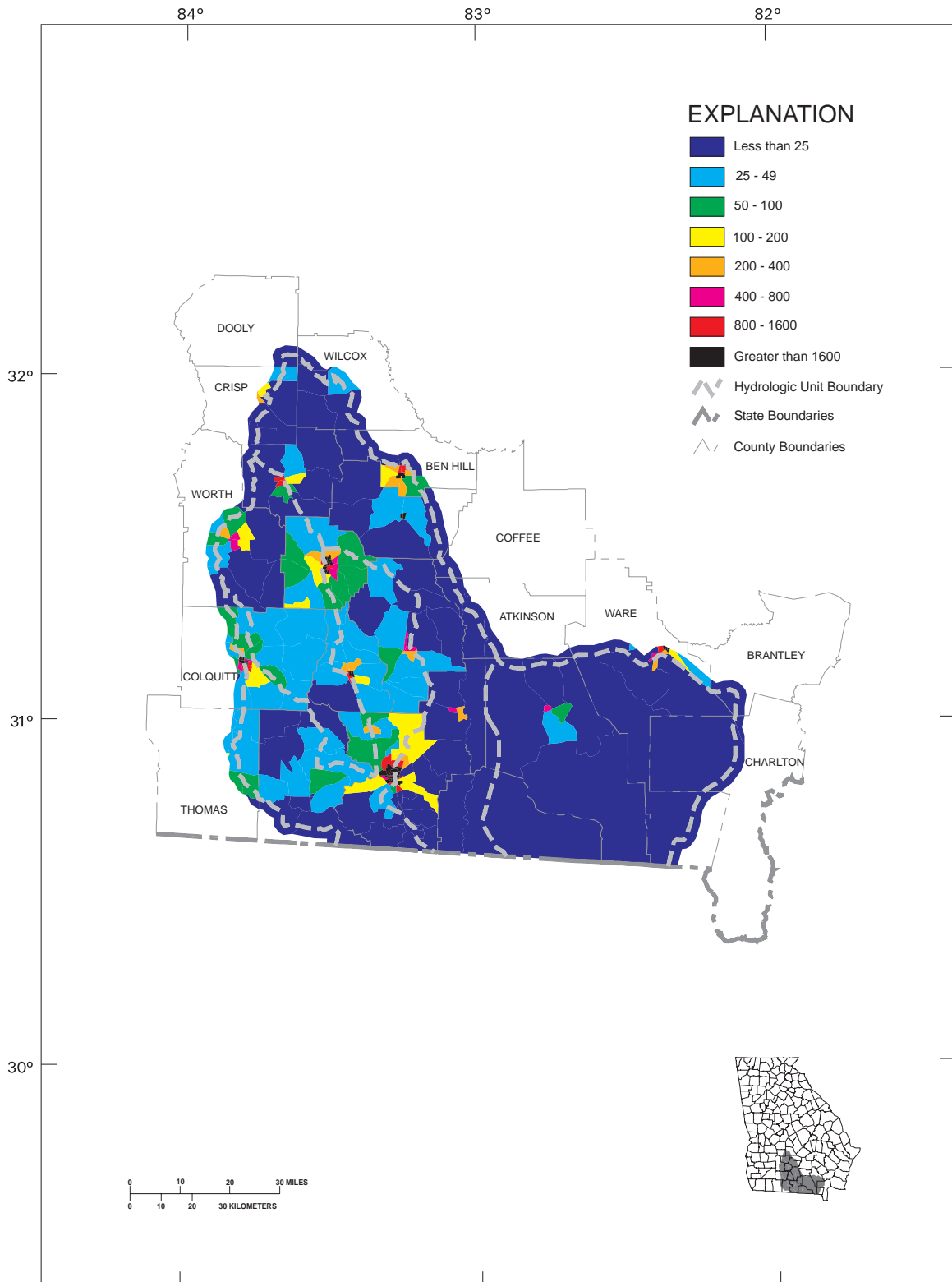


Figure 2-8. Population Density in the Suwannee River Basin (persons per square mile)

group showing a larger than average gain through 2050. Large youth and elderly populations will mean a decline in the working age population.

2.2.2 Employment

The Suwannee River basin supported 87,100 jobs in 1995. It is moving from a manufacturing- to a service-based economy. In the coming years, a decrease in jobs is expected in manufacturing and durable goods, offset by an increase in jobs in the service and trade sectors.

2.2.3 Land Cover and Use

Land use/land cover classification (Figures 2-9 through 2-16) was determined for the Suwannee River Basin based on high-altitude aerial photography for 1972-76 (U.S. Geological Survey, 1972-78). Subsequently in 1991 land cover data were developed based on interpretation of Landsat TM satellite image data obtained during 1988-90, leaf-off conditions. These two coverages differ significantly. Aerial photography allows identification of both land cover and land uses. Satellite imagery, however, detects primarily land cover, and not land use, such that a forest and a wooded subdivision may, for instance, appear similar. Satellite interpretation also tends to be less accurate than aerial photography.

The 1988-90 land cover interpretation showed 41 percent of the basin in forest cover, 20 percent in wetlands, 1 percent in urban land cover, and 30 percent in agriculture (Figures 2-13 through 2-16). Statistics for 15 landcover classes in the Georgia portion of the Suwannee River basin for the 1988-90 coverage are presented in Table 2-2 (GA DNR, 1996).

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

Class Name	%	Acres
Open Water	0.7	24,321.5
Clear Cut/Young Pine	7.3	260,783.4
Pasture	8.0	289,022.3
Cultivated/Exposed Earth	21.7	779,758.0
Low Density Urban	0.9	32,205.8
High Density Urban	0.4	12,548.3
Emergent Wetland	3.7	133,275.1
Scrub/Shrub Wetland	3.5	126,395.4
Forested Wetland	12.6	453,486.7
Coniferous Forest	16.7	601,469.0
Mixed Forest	20.4	732,923.1
Hardwood Forest	3.7	134,164.9
Salt Marsh	0.0	0.9
Brackish Marsh	0.0	0.0
Tidal Flats/Beaches	0.0	0.0
<i>Total</i>	<i>100.0</i>	<i>3,598,580.0</i>

Forestry

Forestry is a major part of the economy within the basin. Markets for forest products afford landowners excellent investment opportunities to manage and sell their timber, pine straw, naval stores, etc., products. Statewide, the forest industry output for 1997 grew to approximately \$19.5 billion dollars. The value added by this production, which includes wages, profits, interest, rent, depreciation and taxes paid into the economy reached a record high \$9.3 billion dollars. Georgians are benefited directly by 177,000

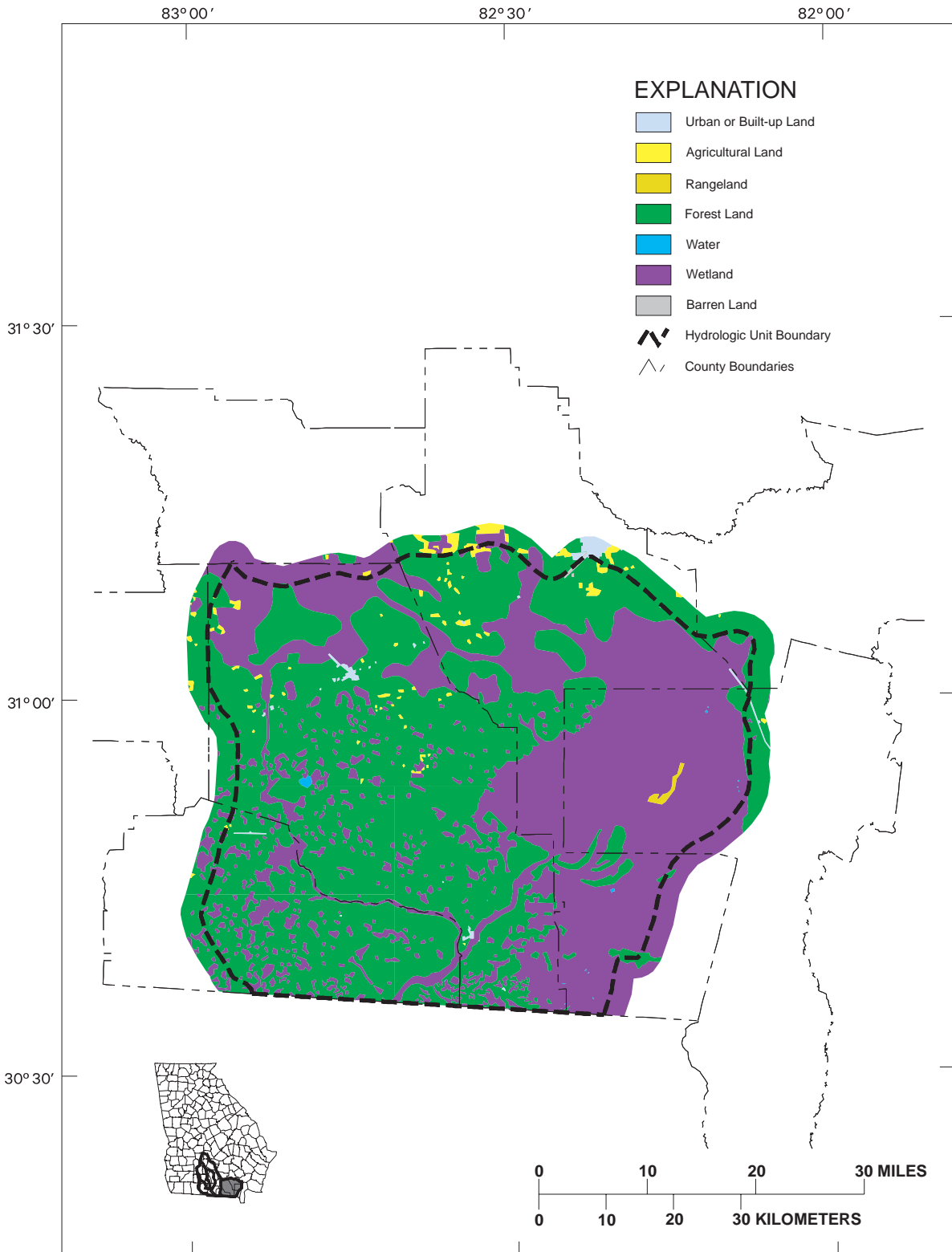


Figure 2-9. Land Use, Suwannee River Basin, HUC 03110201, USGS 1972-76 Classification Updated with 1990 Urban Areas

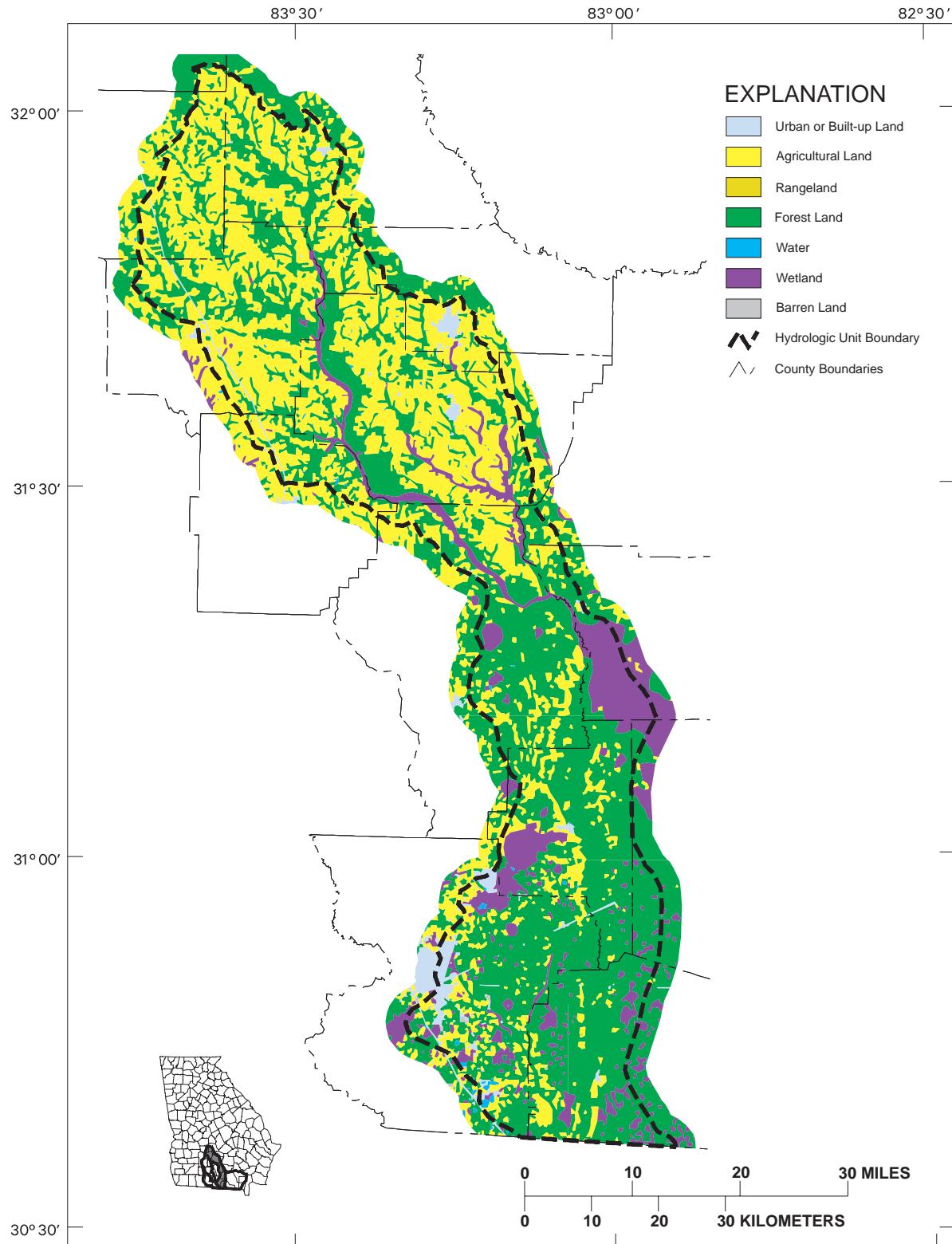


Figure 2-10. Land Use, Suwannee River Basin, HUC 03110202, USGS 1972-76 Classification Updated with 1990 Urban Areas

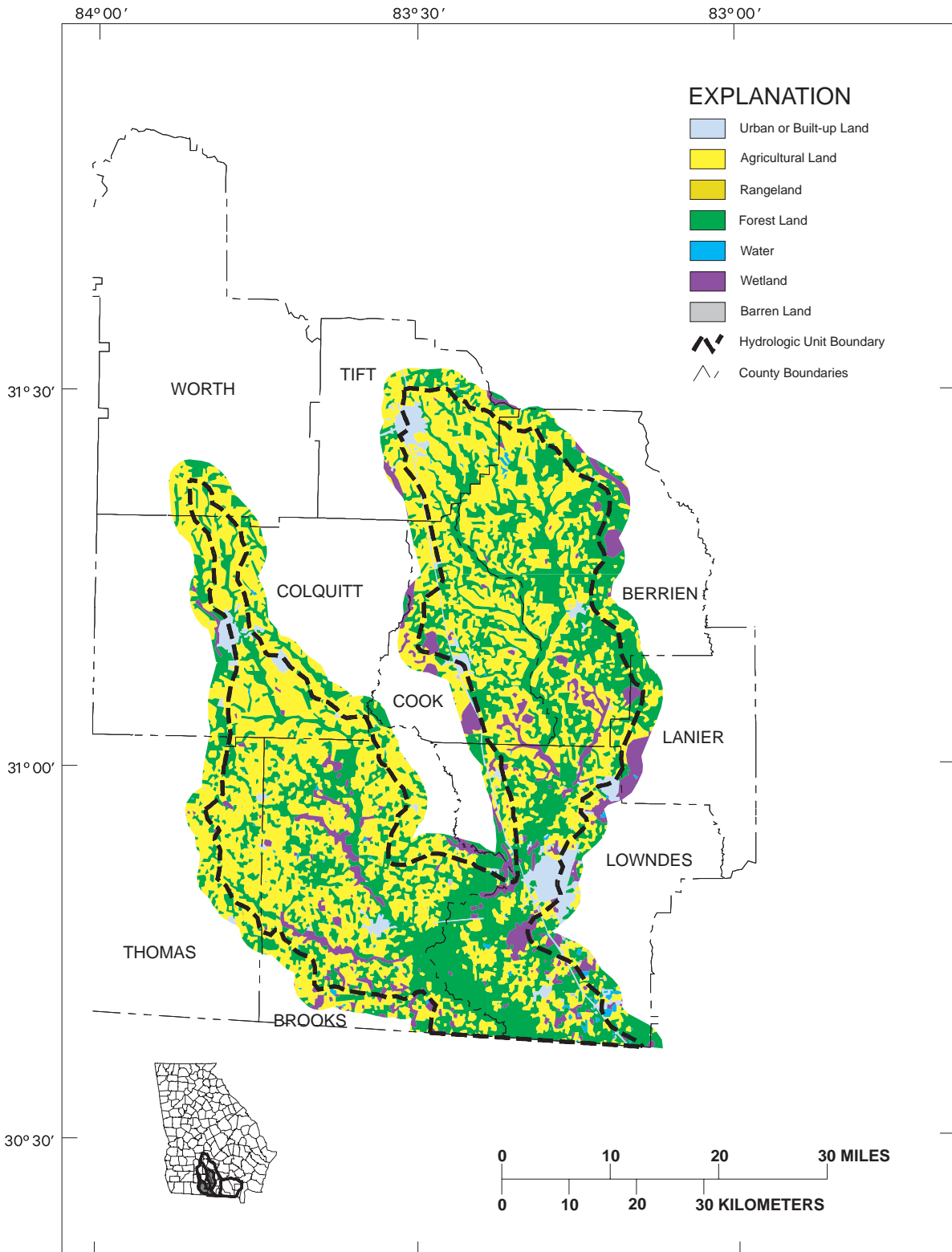


Figure 2-II. Land Use, Suwannee River Basin, HUC 03110203, USGS 1972-76 Classification Updated with 1990 Urban Areas

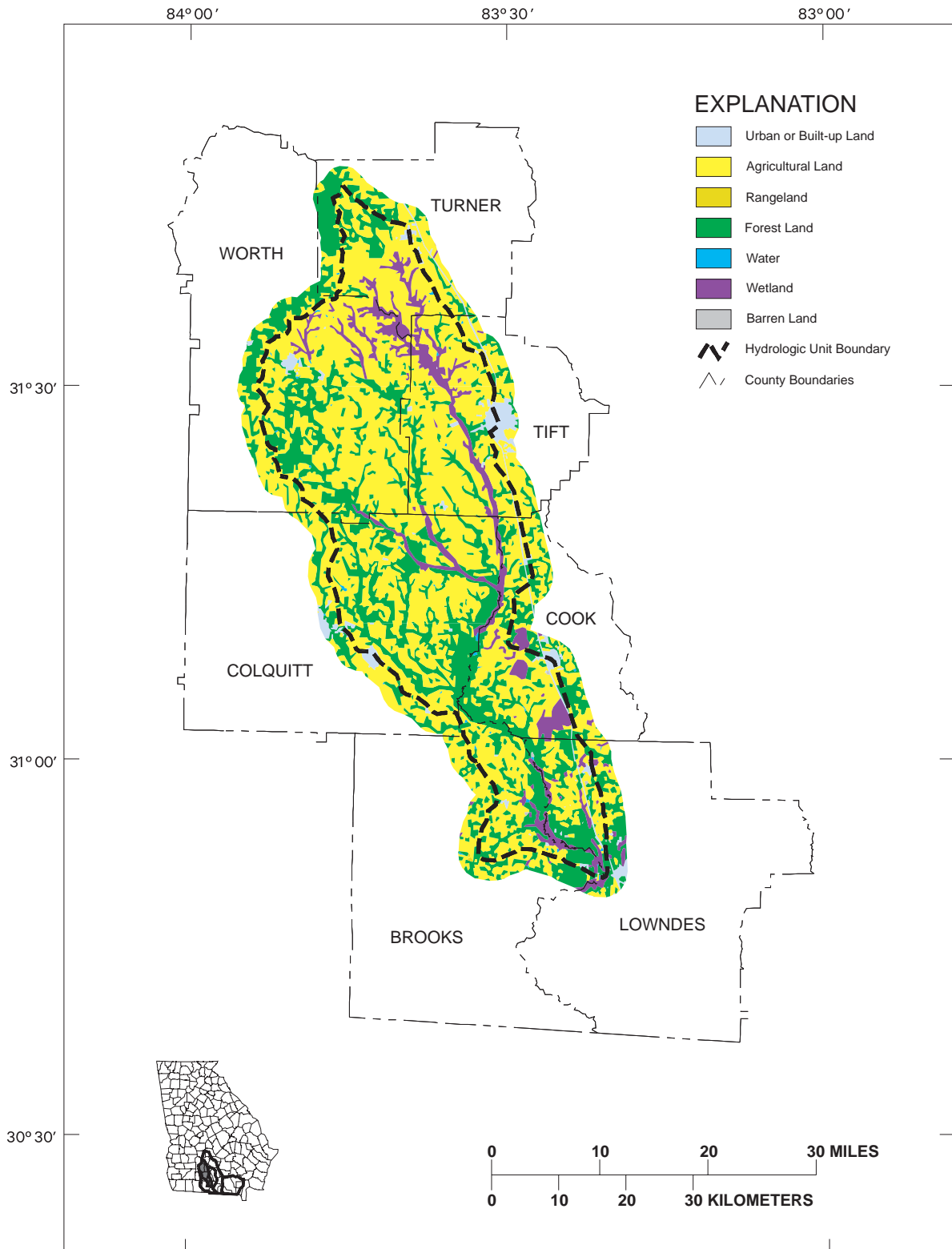


Figure 2-12. Land Use, Suwannee River Basin, HUC 03110204, USGS 1972-76 Classification Updated with 1990 Urban Areas

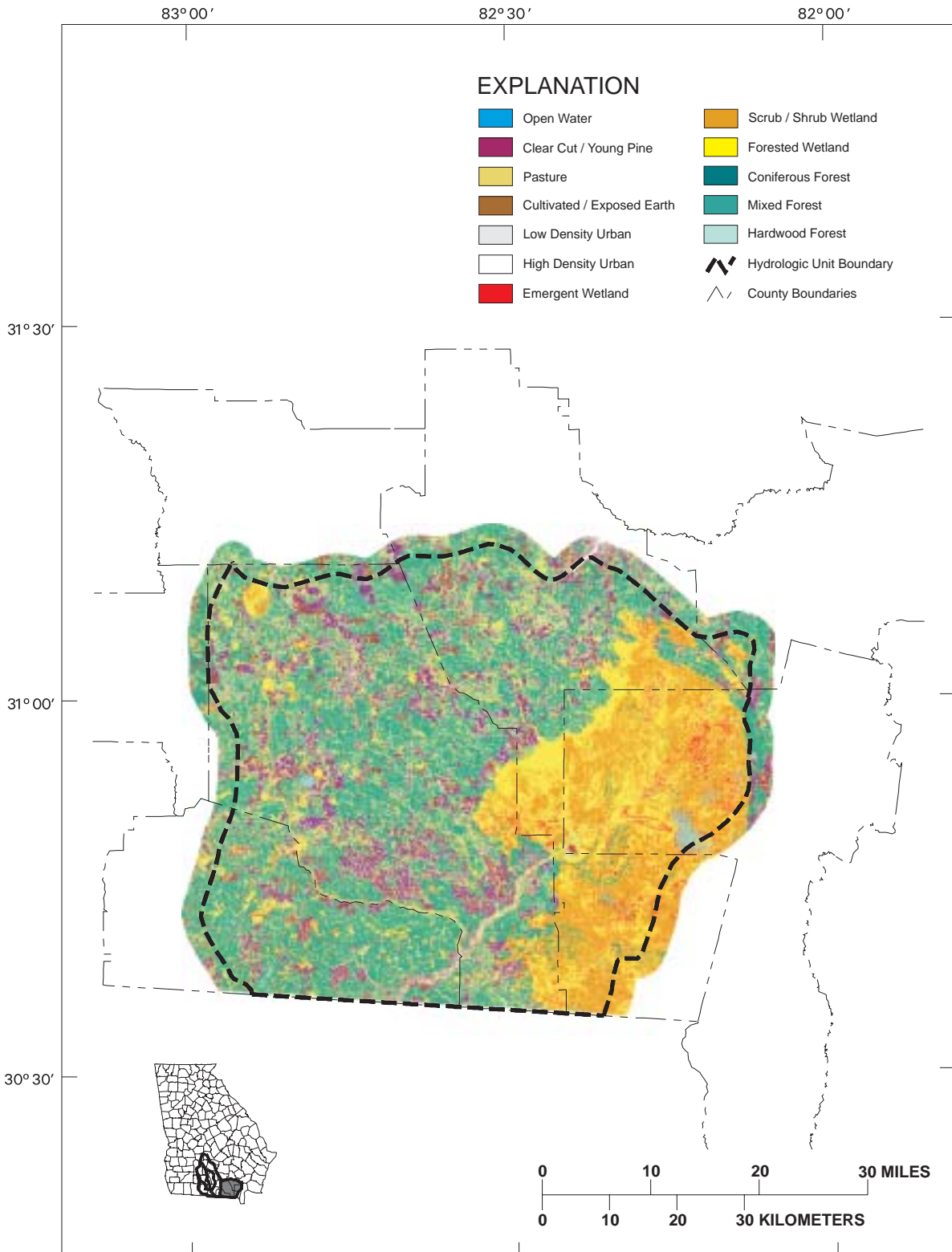


Figure 2-13. Land Cover 1990, Suwannee River Basin, HUC 03110201

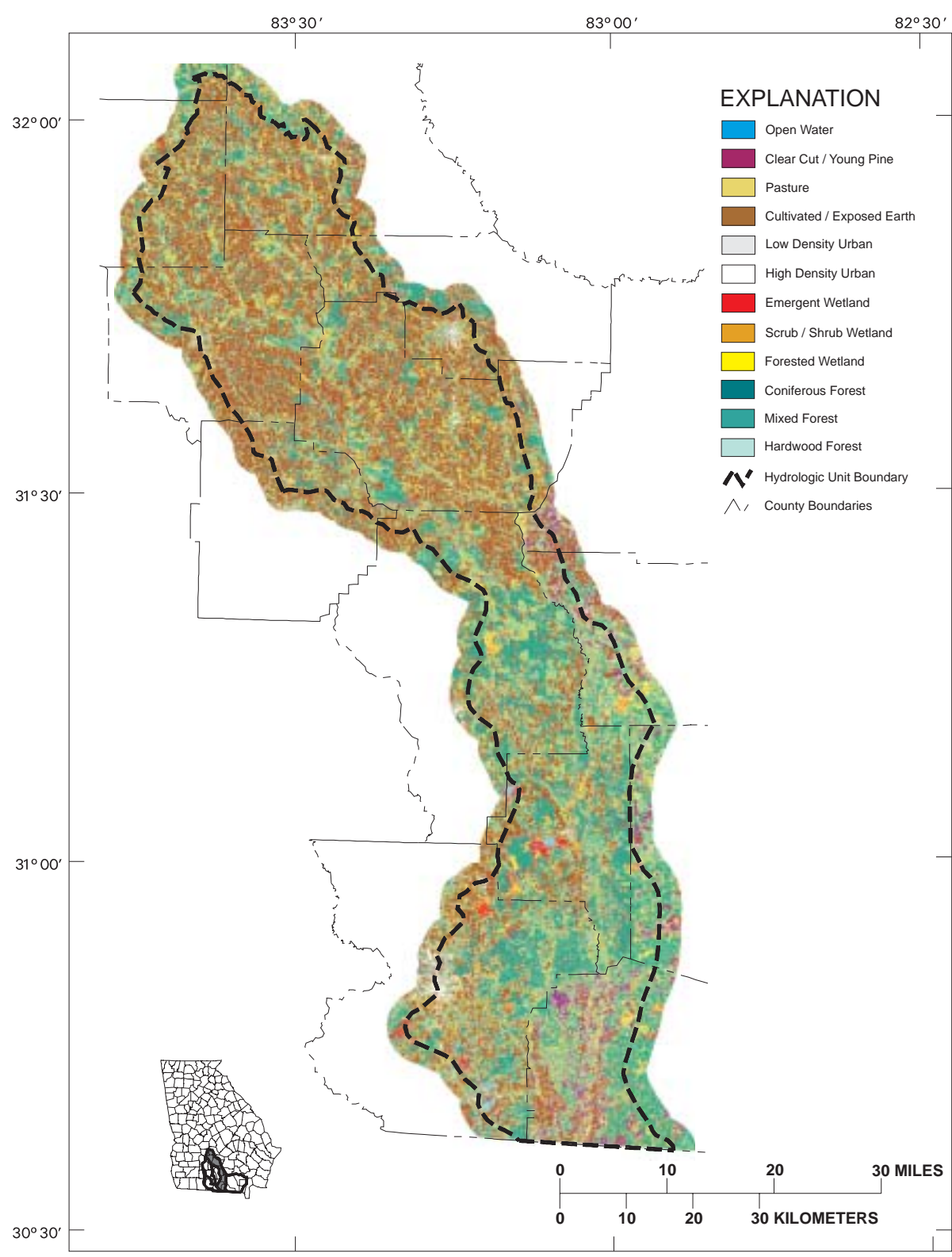


Figure 2-14. Land Cover 1990, Suwannee River Basin, HUC 03110202

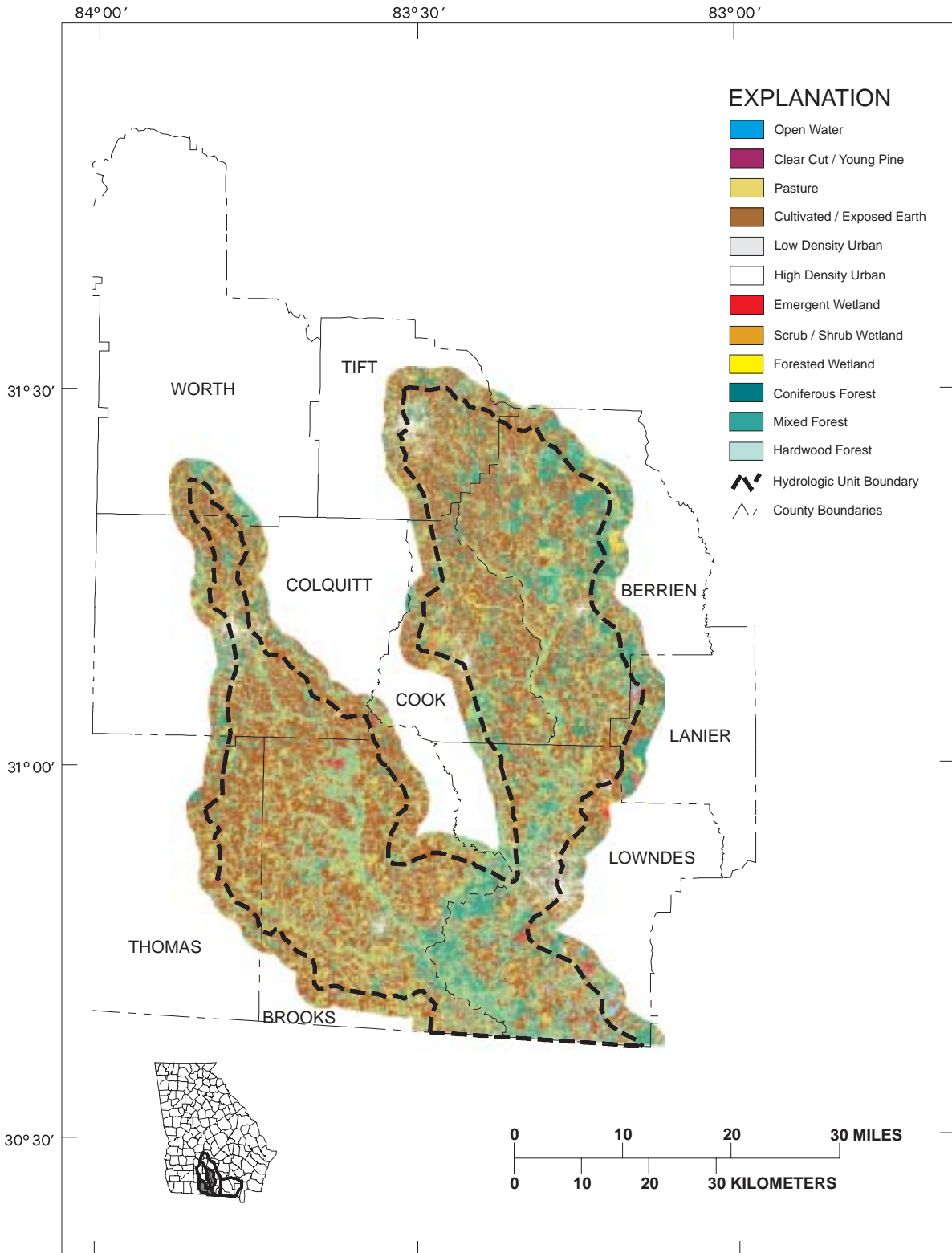


Figure 2-15. Land Cover 1990, Suwannee River Basin, HUC 03110203

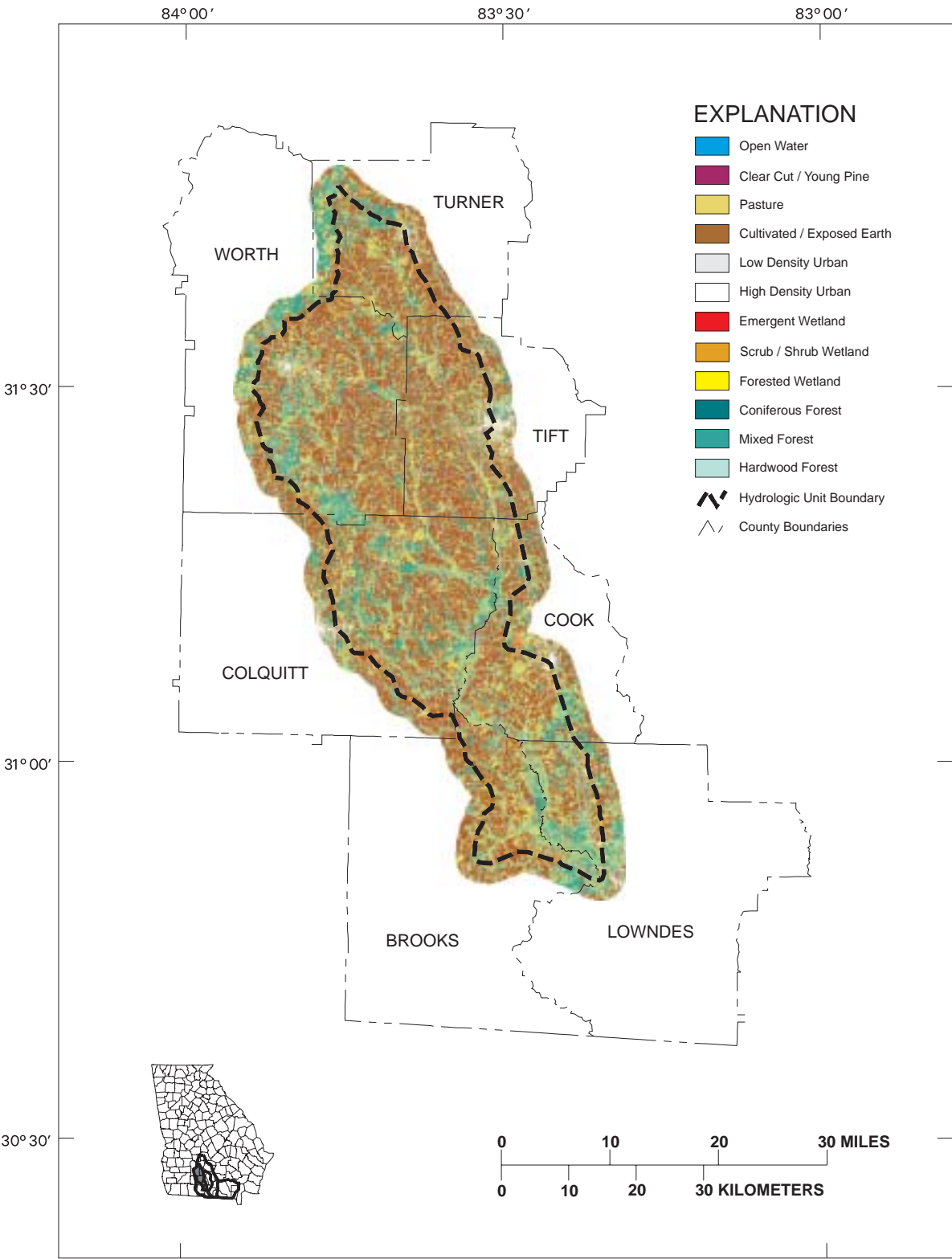


Figure 2-16. Land Cover 1990, Suwannee River Basin, HUC 03110204

job opportunities created by the manufacture of paper, lumber, furniture and various other wood products as well as benefiting the consumers of these products. Other benefits of the forest include hunting, fishing, aesthetics, wildlife watching, hiking, camping and other recreational opportunities as well as providing important environmental benefits such as clean air and water and wildlife habitat.

According to the US Forest Service's Forest Statistics for Georgia, 1997 report (Thompson, 1997), there is approximately 3,429,000 acres of commercial forestland for the entire counties within the basin. Approximately 62 percent of the total land area is commercial forest. Private landowners account for 64 percent of the commercial forest ownership while the forest industry companies account for 33 percent. Governmental entities account for about 3 percent of the forestland. Forestry acreage in the Suwannee River basin is summarized in Table 2-3. Figure 2-17 depicts silvicultural land use in the Suwannee basin.

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

County	Commercial Forest	Pine	Oak-pine	Upland Hardwood	Lowland Hardwood
Atkinson	169,900	94,500	11,300	10,600	42,200
Ben Hill	109,500	67,200	16,800	2,300	15,200
Berrien	179,600	90,100	16,300	3,200	64,600
Brooks	189,300	58,900	28,300	30,700	69,300
Charlton	307,100	202,000	41,200	7,300	38,400
Clinch	469,100	309,600	36,400	0	108,400
Colquitt	168,800	81,200	28,900	6,700	36,500
Cook	78,500	30,800	11,300	7,800	27,500
Crisp	68,500	14,700	12,400	7,600	30,000
Echols	242,600	129,800	22,200	7,000	79,400
Irwin	117,500	58,600	24,300	9,500	25,100
Lanier	91,700	48,100	3,700	1,000	35,400
Lowndes	211,900	79,400	35,400	33,500	52,200
Thomas	187,000	68,900	61,900	23,200	33,100
Tift	55,900	19,000	6,300	8,700	20,900
Turner	91,300	53,900	5,400	6,300	16,300
Ware	345,100	228,700	32,400	0	66,400
Wilcox	151,700	87,400	11,300	5,600	40,000
Worth	194,000	94,300	37,600	10,300	44,500
Total	3,429,000	1,817,100	443,400	181,300	845,400

For the period from 1982 to 1997, for the entire counties within the basin, the area classified as commercial forestland increased approximately 5 percent. The area classified as pine type decreased approximately 6 percent. The area classified as oak-pine type increased approximately 55 percent. The area classified as upland hardwood decreased approximately 21 percent. The area classified as bottomland hardwood increased approximately 3 percent. Approximately 141,700 acres were classified as non-stocked.

Agriculture

Agriculture is a significant part of the Suwannee River Basin's ecosystem. In fact, agriculture accounts for almost 29 percent of the land use in the basin.

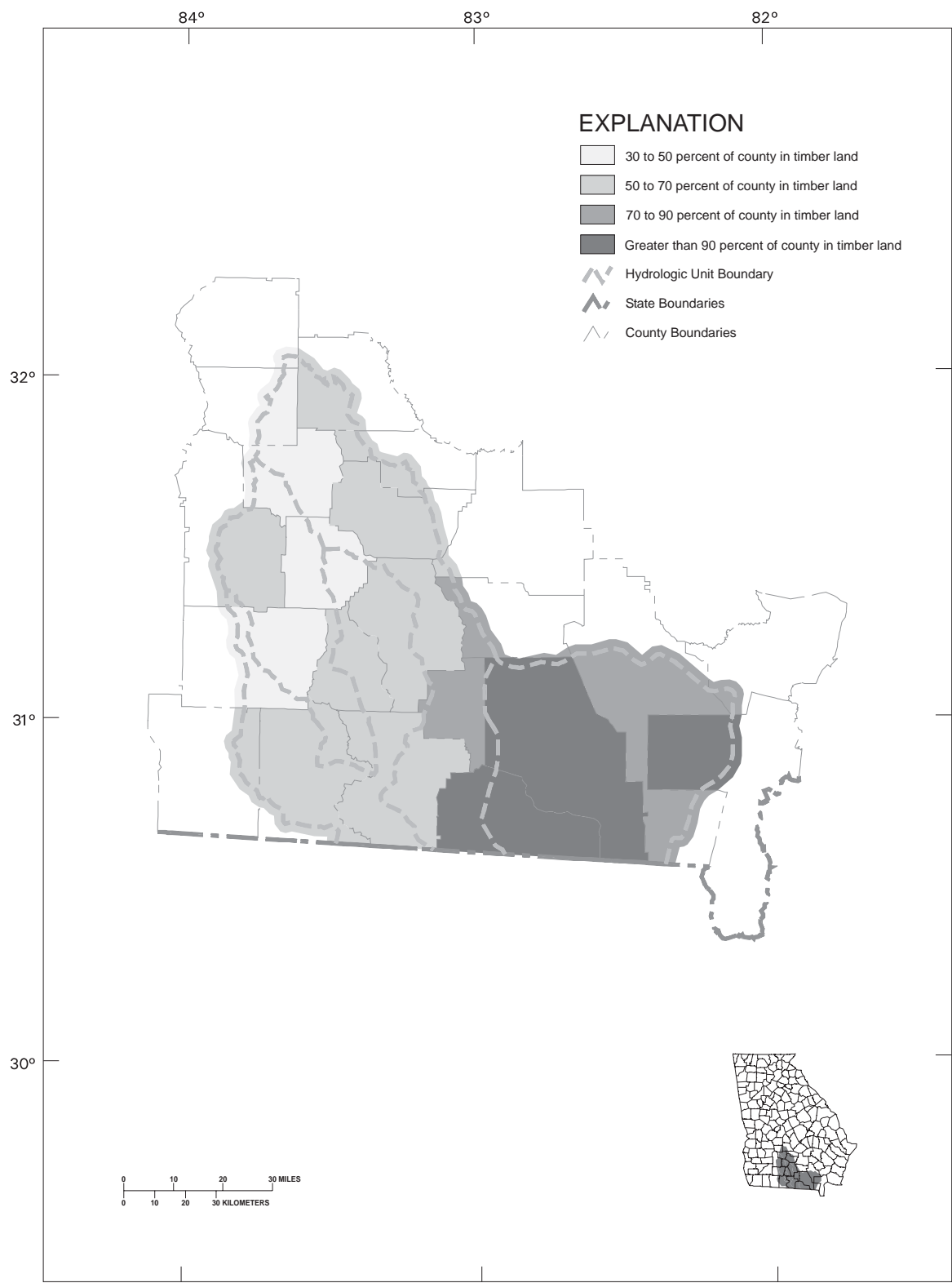


Figure 2-17. Silvicultural Land in the Suwannee River Basin

In 1997, there were some 1,040,286 acres devoted to agricultural production (Figure 2-18). All major commodities that are grown in Georgia (peanuts, corn, cotton, oats, rye, sorghum, soybeans, and tobacco) are produced in the Basin. Worth County is the basin's top peanut producing county and ranks 3rd among all counties in the State. Irwin County leads the Basin in corn production (6th in Georgia). With respect to cotton and tobacco production the Suwannee River Basin is home to seven of the State's top cotton producing counties and six of the top tobacco producing counties.

Orchard production is also significant in the area. In fact, Brooks County is Georgia's second most productive county for peaches; while Colquitt County also ranks in the top ten counties. Berrien and Thomas Counties contain significant pecan production areas. Additionally, the Basin has a strong vegetable production market with Crisp County considered Watermelon Capitol of the World.

Georgia's irrigation permit database shows 4,924 irrigation permits have been issued for the purpose of agricultural irrigation in the Suwannee River Basin. Commodity producers, in the counties that comprise the Basin, applied some 195.03 million gallons of water per day for supplemental irrigation. As a result, producers applied an average of 8.9 inches per acre during 1995. A majority of agricultural water use for irrigation came from groundwater sources, some 63 percent, in 1995. Berrien, Tift, and Turner Counties contain the largest number of irrigated acreage in the Basin.

In addition to commodity production, the Suwannee River Basin has an intensive animal industry as well. Table 2-4 shows number of animals by sector within the animal agricultural industry in the Basin. Brooks and Colquitt Counties rank among the State's top ten counties in three areas—number of cattle on farm, with milk production through number of dairy cattle on farm, and number of hogs and pigs. Poultry production is present, and growing, in the Basin due to new hatcheries and processing plants near Camilla.

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

Element	Watershed 3110201	Watershed 3110202	Watershed 3110203	Watershed 3110204	Suwannee Basin Total
Acres	37667	347905	289240	229869	904681
Dairy Cattle (Head 1997)	389	501	2351	1043	4283
All Cattle and Calves (Head 1997)	5476	40671	37876	30372	114396
Hogs and Pigs (Head 1996)	2801	28522	53822	39668	124824
Boilers (thousands, 1997)	2486005	15314946	2804340	5878195	26483486
Layers (thousands, 1997)	168401	9827	0	0	178229
Irrigated Acres (1995)	2969	80408	55079	51429	189884
Total Agriculture Acres (1989-1997)	43378	392296	341197	263415	1040286

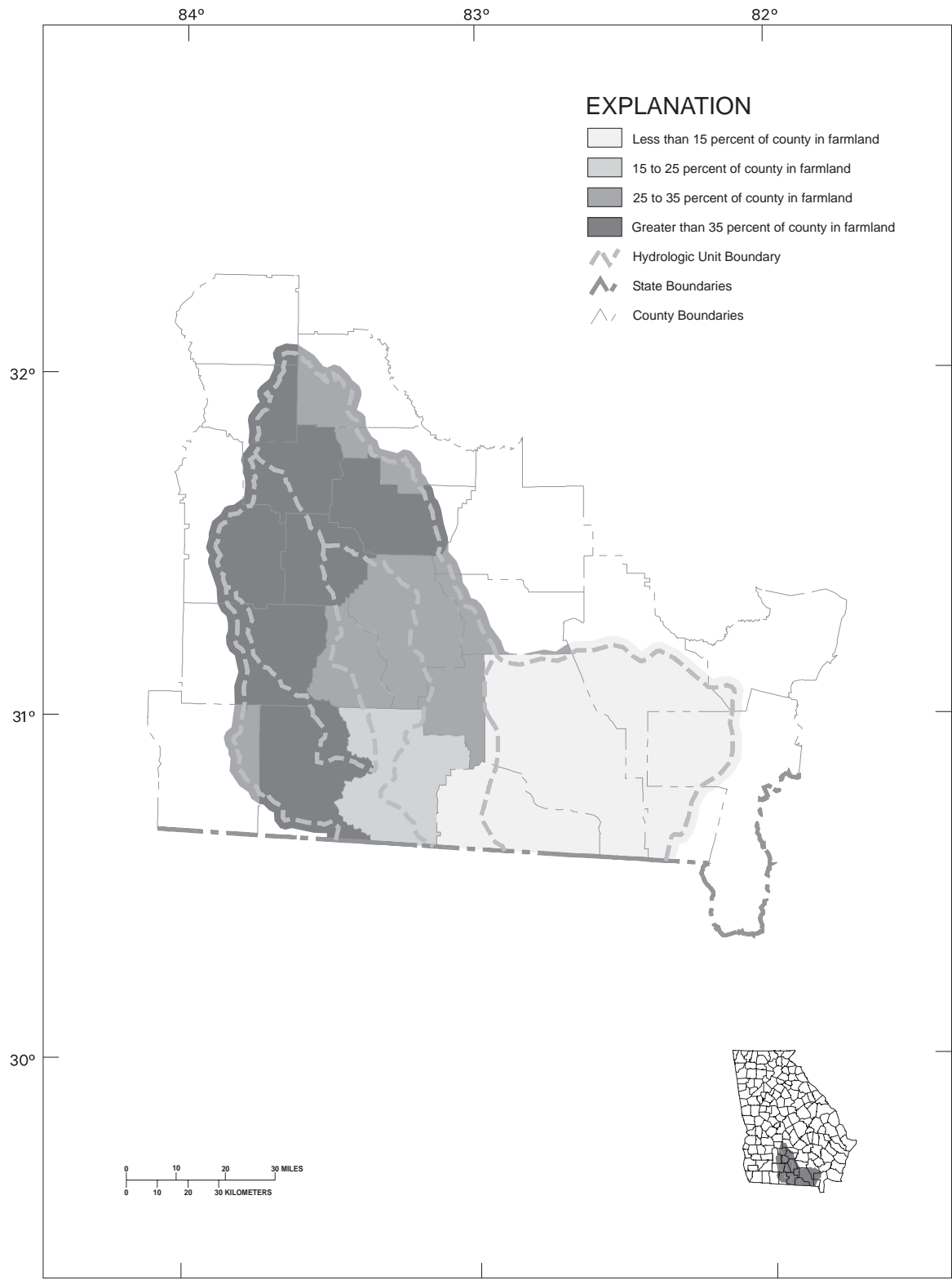


Figure 2-18. Agricultural Land in the Suwannee River Basin

Collectively, across all animal operations, there are an estimated 203,221 Animal Units (AUs) in the Basin. AUs are defined here as 1000 lb. Animal Equivalents. Animal operations, in the counties that comprise the Basin, used some 3.75 million gallons of water per day in 1995. Additionally, some 2.5 million tons per year of animal waste was generated on these operations. Producers handle animal waste through various management activities that utilize nutrients, and other soil amendment benefits, for commodity production.

Agriculture is a key component of the Ochlocknee River Basin's economy. In 1997, agriculture contributed over \$4 billion to the local economy. Along with significant agricultural production, however, comes an increased potential for agricultural non-point source pollution. As a part of the river basin planning process, the Georgia Soil and Water Conservation Commission (GSWCC)—with technical assistance from the Natural Resources Conservation Service (NRCS)—assess agricultural impacts on water quantity and water quality. Historical, present, and future agricultural water demand is assessed in Section 3; while agricultural non-point source pollution is assessed in Section 4.

2.3 Local Governments and Planning Authorities

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

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

2.3.1 Counties and Municipalities

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

The Suwannee River basin includes part or all of 20 Georgia counties (Table 2-5 and Figure 2-2); however, only six are entirely within the basin, and three counties have a small fraction (<20 percent) of their land area within the basin. Thus there are a total of 11 counties with significant jurisdictional area in the basin. Municipalities or cities are communities officially incorporated by the General Assembly. Georgia has more than 530 municipalities. Table 2-6 lists the municipalities in the Suwannee River basin.

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

Counties Entirely Within the Suwannee River Basin	Counties Partially Within the Suwannee River Basin	Counties With Less Than 20% Area Within the Basin
Tift, Berrien, Cook, Lanier, Lowndes, Echols	Clinch, Charlton, Ware, Atkinson, Irwin, Wilcox, Crisp, Turner, Worth, Colquitt, Brooks	Thomas, Coffee, Ben Hill

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

HUC 03110201				
Argyle	Edith	Homerville	Racepond	
Cogdell	Fargo	Manor	Sirmans	
Council	Fruitland	Needmore	Thelma	
Dupont	Haylow	Potter	Withers	
HUC 03110202				
Abba	Dasher	Irwinville	Ocilla	Stockton
Alapaha	Double Run	Lake Park	Pitts	Twin Lakes
Amboy	Fitzerald	Lakeland	Rebecca	Valdosta
Bannockburn	Harding	Mayday	Rochelle	Weber
Chula	Hatley	Myustic	Seville	Westwood
Dakota	Howell	Naylor	Staterville	Worth
HUC 03110203				
Adel	Brookfield	Fender	Nankin	Ray City
Baden	Cecil	Kinderlou	Nashville	Sparks
Barretts	Clyattville	Laconte	Ousley	Tifton
Barwick	Dixie	Lenox	Pavo	Unionville
Berlin	Enigma	Moultrie	Quitman	
HUC 03110204				
Cloverdale	Sumner	Omega	Ellenton	Hahira
Shingler	Poulan	Crosland	Barney	
Sylvester	TyTy	Norman Park	Morven	

2.3.2 Regional Development Centers

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

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

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

Regional Development Center	Member Counties with Land Area in the Suwannee Basin
Southwest Georgia	Colquitt, Thomas, Worth
Middle Flint	Crisp
Heart of Georgia – Altamaha	Wilcox
South Georgia	Ben Hill, Berrien, Brooks, Cook, Irwin, Lanier Echols, Lowndes, Tift, Turner
Southeast Georgia	Atkinson, Charlton, Clinch, Coffee, Ware

2.4 Water Use Classifications

2.4.1 Georgia's Water Use Classification System

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

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

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

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

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

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

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

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

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

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

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

2.4.2 Water Use Classifications for the Suwannee River Basin

Waters in the Suwannee River basin are classified as fishing.

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